



**National Aeronautics and
Space Administration
Langley Research Center**

**Scientific and Technical
Information Program Office**

Scientific and Technical Aerospace Reports

STAIR

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NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA scientific and technical information (STI) program plays a key part in helping NASA maintain this important role.

The NASA STI program operates under the auspices of the Agency Chief Information Officer. It collects, organizes, provides for archiving, and disseminates NASA's STI. The NASA STI program provides access to the NASA Aeronautics and Space Database and its public interface, the NASA Technical Report Server, thus providing one of the largest collections of aeronautical and space science STI in the world. Results are published in both non-NASA channels and by NASA in the NASA STI Report Series, which includes the following report types:

- **TECHNICAL PUBLICATION.** Reports of completed research or a major significant phase of research that present the results of NASA Programs and include extensive data or theoretical analysis. Includes compilations of significant scientific and technical data and information deemed to be of continuing reference value. NASA counterpart of peer-reviewed formal professional papers but has less stringent limitations on manuscript length and extent of graphic presentations.
- **TECHNICAL MEMORANDUM.** Scientific and technical findings that are preliminary or of specialized interest, e.g., quick release reports, working papers, and bibliographies that contain minimal annotation. Does not contain extensive analysis.
- **CONTRACTOR REPORT.** Scientific and technical findings by NASA-sponsored contractors and grantees.

- **CONFERENCE PUBLICATION.** Collected papers from scientific and technical conferences, symposia, seminars, or other meetings sponsored or co-sponsored by NASA.
- **SPECIAL PUBLICATION.** Scientific, technical, or historical information from NASA programs, projects, and missions, often concerned with subjects having substantial public interest.
- **TECHNICAL TRANSLATION.** English-language translations of foreign scientific and technical material pertinent to NASA's mission.

Specialized services also include creating custom thesauri, building customized databases, and organizing and publishing research results.

For more information about the NASA STI program, see the following:

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Hanover, MD 21076-1320

Introduction

Scientific and Technical Aerospace Reports (STAR) is an online information resource listing citations and abstracts of NASA and worldwide aerospace-related scientific and technical information (STI). Updated biweekly, *STAR* highlights the most recent additions to the NASA Aeronautics and Space Database. Through this resource, the NASA STI Program provides timely access to the most current aerospace-related research and development (R&D) results.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and application, as well as aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation and other topics of high national priority. The listing is arranged first by 11 broad subject divisions, then within these divisions by 76 subject categories and includes two indexes: subject and author.

STAR includes citations to R&D results reported in:

- NASA, NASA contractor, and NASA grantee reports
- Reports issued by other U.S. Government agencies, domestic and foreign institution, universities, and private firms
- Translations
- NASA-owned patents and patent applications
- Other U.S. Government agency and foreign patents and patent applications
- Domestic and foreign dissertations and theses

The NASA STI Program

The NASA STI Program was established to support the objectives of NASA's missions and research to advance aeronautics and space science. By sharing information, the NASA STI Program ensures that the U.S. maintains its preeminence in aerospace-related industries and education, minimizes duplication of research, and increases research productivity.

Through the NASA Center for AeroSpace Information (CASI), the NASA STI Program acquires, processes, archives, announces, and disseminates both NASA's internal STI and world-wide STI. The results of 20th and 21st century aeronautics and aerospace research and development, a worldwide investment totaling billions of dollars, have been captured, organized, and stored in the NASA Aeronautics and Space Database. New information is continually announced and made available as it is acquired, making this a dynamic and historical collection of value to business, industry, academia, federal institutions, and the general public.

The STI Program offers products and tools that allow efficient access to the wealth of information derived from global R&D efforts. In addition, customized services are available to help tailor this valuable resource to meet your specific needs.

For more information on the most up-to-date NASA STI, visit the STI Program's Web site at <http://www.sti.nasa.gov>.

NASA STI Availability Information

NASA Center for AeroSpace Information (CASI)

Through NASA CASI, the NASA STI Program offers many information products and services to the aerospace community and to the public, including access to a selection of full text of the NASA STI. Free registration with the program is available to NASA, U.S. Government agencies and contractors. To register, contact CASI at help@sti.nasa.gov. Others should visit the program at www.sti.nasa.gov. The 'search selected databases' button provides access to the NASA Technical Reports Server (NTRS) – the publicly available contents of the NASA Aeronautics and Space Database.

Each citation in *STAR* indicates a 'Source of Availability.' When CASI is indicated, the user can order this information directly from CASI using the [STI Online Order Form](#), e-mail to help@sti.nasa.gov, or telephone the STI Help Desk at 301-621-0390. Before ordering you may access [price code tables](#) for STI documents and videos. When information is not available from CASI, the source of the information is indicated when known.

NASA STI is also available to the public through Federal information organizations. NASA CASI disseminates publicly available NASA STI to the National Technical Information Service (NTIS) and to the Federal Depository Library Program (FDLP) through the Government Printing Office (GPO). In addition, NASA patents are available online from the U.S. Patent and Trademark Office.

National Technical Information Service (NTIS)

The National Technical Information Service serves the American public as a central resource for unlimited, unclassified U.S. Government scientific, technical, engineering, and business related information. For more than 50 years NTIS has provided businesses, universities, and the public timely access to well over 2 million publications covering over 350 subject areas. Visit NTIS at <http://www.ntis.gov>.

The Federal Depository Library Program (FDLP)

The U.S. Congress established the **Federal Depository Library Program** to ensure access for the American public to U.S. Government information. The program acquires and disseminates information products from all three branches of the U.S. Government to nearly 1,300 Federal depository libraries nationwide. The libraries maintain these information products as part of their existing collections and are responsible for assuring that the public has free access to the information. Locate the Federal depository libraries at <http://www.gpoaccess.gov/index.html>.

The U.S. Patent and Trademark Office (USPTO)

The U.S. Patent and Trademark Office provides online access to full text patents and patent applications. The database includes patents back to 1976 plus some pre-1975 patents. Visit the USPTO at <http://www.uspto.gov/patft/>.

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[**Subject Term Index**](#)

[**Personal Author Index**](#)

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01

AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics, see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20080035609 Teasdale (Armstrong), LLP, Saint Louis, MO, USA

Wind Turbine Rotor Blade with In-Plane Sweep and Devices Using Same, And Method for Making Same

Wetzel, K. K., Inventor; 29 Sep 04; 11 pp.; In English

Contract(s)/Grant(s): NREL-ZAM-7-13320-26; DE-AC36-83CH10093

Patent Info.: Filed 29 Sep 04; US-Patent-Appl-SN-10-953 040

Report No.(s): PB2008-102028; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A wind turbine includes a rotor having a hub and at least one blade having a torsionally rigid root, an inboard section, and an outboard section. The inboard section has a forward sweep relative to an elastic axis of the blade and the outboard section has an aft sweep.

NTIS

Patent Applications; Turbine Blades; Wind Turbines; Windpower Utilization

02

AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans, and other elements of turbomachinery. For related information see also 34 Fluid Mechanics and Thermodynamics.

20080034859 California Univ., Los Angeles, CA, USA

Monitoring and Modeling of Ultrafine Particles and Black Carbon at the Los Angeles International Airport

Fanning, E.; Yu, R. C.; Lu, R.; Froines, J.; Jun. 20, 2007; 78 pp.; In English

Contract(s)/Grant(s): ARB-04-325

Report No.(s): PB2008-101770; No Copyright; Avail.: National Technical Information Service (NTIS)

A study to monitor and model ultrafine particles (UFP) and black carbon was performed at and in the vicinity of Los Angeles International Airport. The study was designed to capture the highly time-varying nature of ultrafine particle emission from aircraft by using near real time instruments. Three field studies were performed in Los Angeles during 2005-2006.

NTIS

Carbon; Particle Emission; Exhaust Emission

20080035181 Army High Performance Computing Research Center, Minneapolis, MN USA

Dynamic-Mesh CFD and Its Application to Flapping-Wing Micro-Air Vehicles

Johnson, Andrew A; Nov 2006; 29 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-D-0001

Report No.(s): AD-A480973; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480973>

We are currently developing new numerical simulation methods and computational fluid dynamics (CFD) codes designed for advanced fluid-structure interaction (FSI) applications that have moving mechanical components and/or changing domain shapes. The method is called Dynamic-Mesh (DM) and is currently being implemented in parallel within our XFlow CFD

simulation code. This method involves the tight coupling of automatic mesh generation (AMG) technology with more traditional parallel CFD methods designed for unstructured meshes. By coupling these two distinct technologies together, the mesh generation process never stops and continues throughout the entire simulation. By doing this, we can define a so-called 'dynamic' mesh that has the ability to adjust, change, and modify its structure in response to any changes in geometry or other factors. DM-CFD technology of XFlow can be used to model the fluid flow around or within flapping-wing vehicles, rotorcraft, engines, turbines, pumps, airdrop systems, and has applicability to modeling free-surface flow, fluid-particle flow, energy/nuclear systems, and many bio-medical applications. Traditionally, these are some of the most difficult applications to simulate. We are currently demonstrating and testing the DM technique and the capabilities of XFlow through a series of complex FSI applications. These applications include the simulation of airdrop systems involving the deployment (i.e. opening) of parachutes, bio-medical applications, and the simulation of micro air vehicles (MAV) and biological systems. Results of the modeling of a flapping-wing MAV will be highlighted here to demonstrate the capabilities and potential of the DM method in XFlow, as well as providing some illustrative results for an interesting application.

DTIC

Computational Fluid Dynamics; Drone Vehicles; Flapping; Wings

20080036437 Calspan-Buffalo Univ. Research Center, NY USA

Pre-Flight Ground Testing of the Full-Scale HIFiRE-1 at Fully Duplicated Flight Conditions

Wadhams, Tim P; MacLean, Matthew G; Holden, Michael S; Mundy, Erik; May 14, 2008; 23 pp.; In English

Contract(s)/Grant(s): FA9550-07-1-0150

Report No.(s): AD-A481826; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481826>

As part of an experimental study to obtain detailed heating and pressure data over the full-scale HIFiRE-1 flight geometry, CUBRC has completed a 30-run matrix of ground tests, sponsored by the AFOSR, to determine the optimal flight hardware and instrumentation configuration necessary to achieve and make measurements of desired flow phenomena during the flight experiment HIFiRE-1 stands for Hypersonic International Flight Research and Experimentation and the flight vehicle consists of a blunt nose, cone cylinder, and flare regions. The primary objective of the HIFiRE-1 flight experiment is to collect high quality flight data to be used for CFD code and ground test facility validation in regions of boundary layer transition as well as regions of separated shock wave/boundary layer interaction at the cylinder/flare junction.

DTIC

Flight Conditions; Flight Tests; Ground Tests; Hypersonic Flight

20080036586 Teledyne Scientific and Imaging, LLC, Thousand Oaks, CA USA

Mathematical Fluid Dynamics of Store and Stage Separation, Multi-Body Flows and Flow Control

Malmuth, Norman D; Fedorov, Alexander V; Feb 2008; 49 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-C-0030

Report No.(s): AD-A482016; No Copyright; Avail.: Defense Technical Information Center (DTIC)

New insights have been gained in atmospheric and space launch stage separation from our studies of the aerodynamic interference between multiple bodies in supersonic flow. Quick means of estimating and controlling repulsion or attraction lift is an important enabling technology to size launch separation rocket motors. Asymptotic methods, scattering, slender body theories and CFD modeling have provided valuable systematic approximations schemes that advantageously couple with modern computational methods. Our theoretical solutions for lift force interference between multiple bodies give good agreement with numerical solutions and experimental data. These solutions shed light on important scattering phenomena not previously recognized as relevant. The analyses allow us to identify lumped dimensionless parameters and provide scaling laws as well as closed-form expressions for the interference that can be used for interpolation and extrapolation of CFD solutions as well as efficient testing and design of new flight vehicles. This approach simplifies trajectory predictions in which inertial and aerodynamic forces are strongly coupled. There are cases when acceleration of the body C.G. and/or the pitching angular velocity are not small and the unsteady effects become appreciable. First steps in mathematical modeling of these effects have been made. Typical phases of the transient process were identified. For each phase, analytical solutions of the flow potential and wave drag were obtained. The transient process was also simulated numerically by solving 3-D Euler equations. The theoretical wave drag is in excellent agreement with CFD in all phases of the transient process. These results provide a good launching pad for theoretical modeling of unsteady body motions including the coupling between body dynamics and aerodynamics.

DTIC

Fluid Dynamics; Mathematical Models; Stage Separation; Supersonic Flow

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; airport ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety and 85 Technology Utilization and Surface Transportation.

20080035160 Civil Aerospace Medical Inst., Oklahoma City, OK, USA

Analyzing Vehicle Operator Deviations

Scarborough, Alfretria; Bailey, Larry; Pounds, Julia; July 2008; 42 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AM-HRR-523

Report No.(s): DOT/FAA/AM-08/17; OK-08-4726; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Runway incursions (RIs) are one of the top safety issues for the Federal Aviation Administration (FAA). Considerable effort has gone into understanding how pilot deviations and air traffic control (ATC) operational errors contribute to RIs. In contrast, little is known about human factors issues related to vehicle operator deviations (VODs). VODs occur when a vehicle enters the airport movement area without ATC approval. We developed a VOD prediction model to help understand the human factors causes associated with different types of VODs. We then examined the validity of the model, using logistic regression and directed graphical modeling. Although the results of our analyses provided partial support for our prediction model, much of the data that we needed was missing due to incomplete reporting of the human factors associated with a given VOD. To aid in the development of a more comprehensive VOD reporting process, we adapted a human factors taxonomy used in air traffic control (JANUS-ATC) to ground operations (JANUS-GRO). JANUS-GRO was then used to demonstrate how VOD reporting could be improved.

Author

Runway Incursions; Pilot Error; Air Traffic Control; Operational Problems; Error Analysis; Models

20080035161 Civil Aeromedical Inst., Oklahoma City, OK, USA

En Route Operational Errors: Transfer of Position Responsibility as a Function of Time on Position

Bailey, Larry; Pounds, Julia; Scarborough, Alfretria; July 2008; 55 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): AM-BHRR524

Report No.(s): DOT/FAA/AM-08/16; No Copyright; Avail.: CASI: [A04](#), Hardcopy

Operational Errors (OEs) can occur anytime while a controller is on position. However, the historical trend has been that a higher percentage of OEs occur early on position and then tapers off as on-position time increases. This trend has been consistently observed across the different air traffic options and time of day. Past efforts at reducing OEs that occur early on position have focused on improvements associated with the position relief briefing. Despite these efforts, nothing has been able to reverse the trend in OEs. We conducted a retrospective analysis of enroute OEs to determine if there were human factors considerations unrelated to the position relief briefing checklist that may explain why OEs occur early following a position transfer. Our results suggest that position transfers differ by type (replacement vs. providing workload reduction) and the amount of time available (time pressure vs. no pressure). Moreover, the human factors considerations differ between the type of transfer and the amount of available time. Although the position relief briefing checklist is well grounded in human factors principles, the checklist itself is insufficient for assessing the various states of mind a controller is operating under immediately following a position transfer.

Author

Air Traffic Control; Air Traffic Controllers (Personnel); Errors; Work; Time

20080035222 Federal Aviation Administration, Oklahoma City, OK USA

Drug Usage in Pilots Involved in Aviation Accidents Compared With Drug Usage in the General Population: From 1990 to 2005

Botch, Sabra R; Johnson, Robert D; Apr 2008; 12 pp.; In English

Report No.(s): AD-A481072; DOT/FAA/AM-08/10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481072>

Civil aviation pilots represent a small subsection of the general population. Therefore, one might expect to see the same types of drugs used by pilots that are found in the general population. The purpose of this study was to compare usage of both

illegal drugs and abused prescription medications in pilots involved in civil aviation accidents from 1990 to 2005 with that of the general population in the USA. Comparisons included abused drugs routinely screened for by the Federal Aviation Administration (FAA) such as marijuana, cocaine, methamphetamine, and ecstasy, as well as prescription medications-barbiturates, benzodiazepines, opiates, and ketamine. The Civil Aerospace Medical Institute's (CAMI's) Forensic Toxicology Research Laboratory analyzes postmortem specimens collected from pilots involved in civil aviation accidents. Toxicological information for cases in which pilots were found positive for prescription or illicit compounds was obtained from CAMI's ToxFlo (DiscoverSoft Development, LLC) toxicology database. Statistics on drug usage, trends, and demographics of users in the USA were obtained from National Institute on Drug Abuse, Substance Abuse and Mental Health Services Administration, Office of National Drug Control Policy, Drug Enforcement Administration, and the Drug Abuse Warning Network (DAWN). Trends in illicit and prescription drug use in pilots of civil aviation accidents are comparable to those seen in emergency departments (ED) and community data from major metropolitan areas collected by DAWN and Community Epidemiology Work Group (CEWG). Of the 5,321 pilots involved in aviation accidents during the examined time period, there were 467 occurrences of either illicit drugs or commonly abused prescription drugs accounting for 11% of all pilots that were involved in aviation accidents.

DTIC

Aircraft Accidents; Drugs; Pilots

20080035239 Federal Aviation Administration, Washington, DC USA

Use of Weather Information by General Aviation Pilots. Part 1. Quantitative: Reported Use and Value of Providers and Products

Knecht, William R; Mar 2008; 26 pp.; In English

Report No.(s): AD-A481118; DOT-FAA-AM-08-6; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481118>

Data obtained from 221 general aviation (GA) pilots were examined to determine their usage patterns for weather information. Weather products, providers, and en-route information sources were ranked according to relative use and rated by perceived information value, frequency of use, and time invested per usage. The measures were highly correlated. Conclusion #1: A small fraction of pilots show sparse use patterns and these may be at risk for flying with inadequate preparation. Conclusion #2: There seems to be a strong tendency for many pilots to prefer relatively simple forms of information (e.g., METARS). This may present a problem, given the often-complex nature of weather.

DTIC

Civil Aviation; General Aviation Aircraft; Pilots; Weather

20080035240 Federal Aviation Administration, Washington, DC USA

Use of Weather Information by General Aviation Pilots. Part 2. Qualitative: Exploring Factors Involved in Weather-Related Decision Making

Knecht, William R; Mar 2008; 26 pp.; In English

Report No.(s): AD-A481119; DOT-FAA-AM-08-7; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481119>

Interview data obtained from 221 general aviation (GA) pilots are qualitatively scored for factors which influence weather-related decision making. Factors finding relatively strong support are (a) the specific type of weather to be faced (storms, ice, visibility, and cloud ceiling are of greatest concern to GA pilots), (b) type of flight (IFR vs. VFR), (c) pilot physiological state (primarily disorientation), and (d) the inherent uncertainty of weather and the resultant cognitive difficulty of understanding this uncertainty. Factors finding more modest support are (a) social and/or economic pressures, and (b) impulsive behavior. Additionally, relatively strong support is found in previously unpublished data for the influence of mission goals. Research directions, remediations, and the value of qualitative analysis are discussed.

DTIC

Civil Aviation; Decision Making; General Aviation Aircraft; Pilots; Weather

20080035480 Army Research Inst. for the Behavioral and Social Sciences, Fort Rucker, AL USA

Finding The 'Right Stuff': Development of an Army Aviator Selection Instrument

Katz, Lawrence C; Nov 28, 2006; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481060; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481060>

The current test for selection into the Army flight school is the Alternate Flight Aptitude Selection Test (AFAST). Since

it was first developed in 1988, the AFAST has been scrutinized for deficiencies, including minimal predictive validity and operational support, past expropriation of testing materials, general limitations of paper and pencil testing, a less-than-optimal selection strategy, and the likelihood that it does not measure the correct set of attributes given the considerable change in aviator requirements and in the applicant population. In June of 2004, this prompted the Army to seek to replace the AFAST with an alternate, computer-administered test for Army flight training with an emphasis on the aptitudes required for Future Force aviator performance within the Future Combat Systems environment. The Army further recognizes the need to include or adapt existing tests within DOD, to have the capability of rapidly assessing the performance or validity of the new instrument, to revise the instrument when necessary, to have the capability of adapting its application to selection for related occupational categories such as Unmanned Aerial Vehicle (UAV) Operators, and to develop an instrument for classification of aviators into appropriate aircraft/mission types. In response to these needs, the Army Research Institute developed a computer-based, web-administered aviator selection battery to correct identified deficiencies of the Army's current selection instrument, the AFAST. A rigorous six-stage process included the identification of viable predictor and criterion measures and the preliminary validation of the prototype instrument. This effort laid the groundwork for aviator classification into assigned aircraft/mission types and for Unmanned Aviation Systems (UAS) operator selection. Twelve briefing charts summarize the presentation.

DTIC

Aircraft Pilots; Aptitude; Classifications; Flight Training; Military Personnel; Personnel Selection; Pilots; Psychological Tests

20080036145 Government Accountability Office, Washington, DC, USA

FAA Airspace Redesign: An Analysis of the New York/New Jersey/Philadelphia Project

July 31, 2008; 102 pp.; In English; Original contains black and white illustrations

Report No.(s): GAO-08-786; No Copyright; Avail.: CASI: [A06](#), Hardcopy

GAO evaluated FAA's compliance with the National Environmental Policy Act (NEPA) and environmental justice directives in conducting the New York/New Jersey/Philadelphia Airspace Redesign project. In assessing compliance, GAO used established court precedent applying these requirements, as well as the standard of review for agency actions established by the Administrative Procedure Act (APA), which is deferential to agency decision making. Courts interpret the APA standard--whether an agency's actions were 'arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law'--as mandating that an agency act reasonably in carrying out NEPA's requirements and that the agency's ultimate decisions be reasonable and not arbitrary and capricious. GAO reviewed FAA's compliance with respect to five key issues: the statement of the project's purpose and need, the evaluation of alternatives, consideration of the project's environmental effects, public participation, and environmental justice matters. GAO selected these issues based on public concerns raised during and after the NEPA process, congressional interest, the views of experts we interviewed, and GAO's evaluation of the range of concerns presented.

Derived from text

Airspace; Environment Effects; New Jersey; New York City (NY); Flight Paths; Air Traffic

20080036443 Army Aeromedical Research Lab., Fort Rucker, AL USA

Performance Sustainment of Two Man Crews During 87 Hours of Extended Wakefulness With Stimulants (Dexedrine, Caffeine, Modafinil) and Napping: Analysis of Aircrew Performance During In-Flight Emergency Situations

Estrada, Arthur; Ramiccio, John G; Leduc, Patricia A; Curry, Ian P; May 2008; 40 pp.; In English

Contract(s)/Grant(s): Proj-878

Report No.(s): AD-A481844; USAARL-2008-09; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481844>

The objective of this effort, a small part of a larger study, was to determine the extent to which dextroamphetamine, caffeine, modafinil, and placebo affected participant ability to employ good aircrew coordination practices and function as an effective crew during emergency situations. Thirty-two UH-60 rated aviators, participating as crews of two under one of the four conditions, were assessed for aircrew coordination, crew response time, and seven flight performance measures during emergencies presented at 23, 47, and 71 hours of continuous wakefulness. While some aspects of the flight performance revealed statistically significant differences, it is clear that drug condition made no consistent significant difference in aircrew performance. The fatigue effect was limited to aircrew coordination, while not significantly affecting flight performance or response time. The variable which had the most significant albeit inconsistent effect on performance was flight experience. The

findings demonstrate that analyses of performance during relatively short, stimulating experiences do not provide reliable evidence as to the effectiveness of stimulants.

DTIC

Caffeine; Central Nervous System Stimulants; Coordination; Drugs; Emergencies; Flight Crews; Stimulants; Wakefulness

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance and evaluation, and aircraft and flight simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Technology Utilization and Surface Transportation.

20080034943 Black Lowe and Graham, PLLC, Seattle, WA, USA

Attachment Apparatus for Injection Molded Frameless Canopies

Wood, J. H., Inventor; Sewell, T. A., Inventor; Miener, S. J., Inventor; 7 Oct 04; 12 pp.; In English

Contract(s)/Grant(s): F33615-97-2-3407

Patent Info.: Filed Filed 7 Oct 04; US-Patent-Appl-SN-10-960 144

Report No.(s): PB2008-101249; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An apparatus and method for latching a canopy to a vehicle, such as an aircraft, that avoids plastic creep and crazing due to concentrated loads is provided. The apparatus includes first attachment components that are at least partially embedded within an injection-molded canopy and second attachment components that are connected to the canopy rail for attaching to the one or more first attachment components and thereby attaching the canopy to the canopy rail.

NTIS

Injection; Injection Molding; Patent Applications; Creep Properties

20080035201 National Aerospace Lab., Bangalore, India

MAV2008: 1st US-Asian Demonstration and Assessment of Micro Air Vehicle (MAV) and Unmanned Ground Vehicle (UGV) Technology. Schedule of Events, Abstracts and Profiles

Upadhyaya, A R; Shubha, V; Stierna, Eric; May 9, 2008; 90 pp.; In English

Contract(s)/Grant(s): FA48690814041

Report No.(s): AD-A481019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481019>

The activity brought together teams from around the world to address these challenges for micro air vehicles (MAVs): flight, cooperative flight, cooperation with ground-based vehicles, loitering, and sensing surroundings. The test scenario mission was to assist commandos rescue hostages being held by insurgents in a bank building. There were booby traps (mines and explosives) laid around the building and insurgents circling the building in a vehicle. The MAVs and UGVs, working together, were to assist in decommissioning the mines, identify the locations of the explosives and hostages and identify a path for ingress by the commandos. At least 12 teams entered, but none could meet all requirements. A summary of the required tasks and of the teams of participants is provided.

DTIC

Abstracts; Asia; Competition; Drone Vehicles; Schedules; Unmanned Ground Vehicles

20080035353 General Accounting Office, Washington, DC USA

Unmanned Aircraft Systems: Federal Actions Needed to Ensure Safety and Expand Their Potential Uses Within the National Airspace System

Dillingham, Gerald L; Spisak, Teresa; Fallon, Colin; Giebel, Jim; Gilman, Evan; Hooper, David; Khanna, Jamie; Lentini, Patty; Ormond, Josh; Panwar, Manhav; May 2008; 74 pp.; In English

Report No.(s): AD-A481287; GAO-08-511; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Federal agencies such as DHS, the Department of Commerce, and NASA use UASs in many areas, such as border security, weather research, and forest fire monitoring. These agencies have plans to expand their UAS use in domestic airspace, and local governments and commercial entities also have interest in using UASs. Many factors support the potential for expanded use of UASs. For example, the nation's industrial base has expanded to support military operations and the number of trained UAS operators is increasing as personnel return from overseas duty. Moreover, some of the technology used in military UAS operations could be applied to civil uses. DHS is expanding its use of UASs for border security and NASA is

likely to continue using UASs to gather scientific data. Additionally, local law enforcement and firefighting agencies have expressed interest in using UASs to assist at crime scenes and wildfire locations, and commercial users envision using UASs for tasks such as photographing real estate or inspecting pipelines. According to an industry forecast, the market for government and commercial-use UASs could grow in the future. The forecast also indicates that the USA could account for 73 percent of the world's research and development investment for UAS technology over the coming decade. According to a UAS study and experts we surveyed, UAS development could lead to technological advances that could benefit all national airspace users. For example, some experts we surveyed noted that improved collision avoidance technologies developed for UASs could lead to reduced aircraft separation requirements, which could increase airspace capacity. Additionally, UASs could produce environmental benefits if they assume some missions currently performed by manned aircraft by using quieter engines that produce fewer emissions, according to experts we surveyed.

DTIC

Fire Fighting; Law (Jurisprudence); National Airspace System; Pilotless Aircraft; Remotely Piloted Vehicles; Safety; United States

20080035377 Library of Congress, Washington, DC USA

Navy-Marine Corps Strike-Fighter Shortfall: Background and Options for Congress

O'Rourke, Ronald; May 12, 2008; 7 pp.; In English

Report No.(s): AD-A481368; CRS-RS22875; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Navy and Marine Corps Strike-Fighters. The Navy and Marine Corps, which are both part of the Department of the Navy (DON), each operate hundreds of strikefighters, which are tactical aircraft that can conduct both air-to-ground (i.e., strike) and air-to-air (i.e., fighter) operations. Strike-fighters constitute the majority of the aircraft in each of the Navy's 10 active-duty aircraft carrier air wings (CVWs) of the 70 or more aircraft typically embarked on a Navy aircraft carrier, 44 are strike-fighters. Strikefighters also constitute a significant portion of the Marine Corps three active-duty Marine air wings (MAWs). Some Marine Corps strike-fighters are assigned to Navy CVWs. The principal strike-fighter operated by the Navy and Marine Corps is the F/A-18 Hornet/Super Hornet, manufactured by Boeing. The older A through D models of the F/A-18 are called Hornets, while the newer, larger, and more capable E and F models are called Super Hornets. The Navy operates more than 600 Hornets and Super Hornets, while the Marine Corps operates more than 200 Hornets, plus roughly 130 AV-8B Harriers, which are short takeoff, vertical landing (STOVL) attack aircraft.

DTIC

Aircraft Carriers; Attack Aircraft; Navy; Short Takeoff Aircraft

20080035481 Ollila Setter, LLC, Boulder, VA, USA

Temperature Sensor System For Mobile Platforms

Flemming, R. J., Inventor; 7 Sep 04; 11 pp.; In English

Contract(s)/Grant(s): FAA-98-C-00031

Patent Info.: Filed Filed 7 Sep 04; US-Patent-Appl-SN-10-935 530

Report No.(s): PB2008-101719; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A temperature sensor system includes a body and window arrangement. The body defines an air intake and is flush mounted to a mobile platform having a boundary layer. The window arrangement is integrated into the body and transfers a first signal and receives a second signal. The second signal represents energy from the first signal that is reflected by air particles beyond the boundary layer. The second signal is processed to determine a temperature beyond the boundary layer. The air intake receives air particles, transfers a first set of the air particles to a first air vent into the mobile platform, receives the first set of the air particles from a second air vent from the mobile platform, vents the first set of the air particles, and vents a second set of the air particles that bypass the first air vent.

NTIS

Atmospheric Temperature; Patent Applications; Remote Sensors; Temperature Sensors

20080035513 Defense Advanced Research Projects Agency, Arlington, VA USA

Micro-Air Vehicle (MAV) - Demonstrated Backpackable Autonomous VTOL UAV Providing Hover and Stare RSTA to the Small Military Unit

Newman, Daniel; Nov 1, 2006; 24 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481068>

The objective of the Micro Air Vehicle (MAV) Advanced Concept Technology Demonstration (ACTD) is to demonstrate

an affordable, responsive, easy-to-operate, backpackable reconnaissance and surveillance system. The MAV system provides the small unit with militarily useful real-time combat information about difficult-to-observe or distant areas and objects in urban and complex terrain. The paper will review the MAV program, outline several of the ongoing studies of other military applications of MAV, and provide a description of the ongoing Military Utility Assessment (MUA) being conducted by the U.S. Army.

DTIC

Autonomy; Cities; Hovering; Reconnaissance; Surveillance; Vertical Takeoff Aircraft

20080036300 Army Research Lab., Adelphi, MD USA

A Constant False Alarm Rate-(CFAR) Based Change Detection Approach to Helicopter Diagnostics

Ranney, Kenneth; Khatri, Hiralal; Silvius, Jerry; Tom, Kwok; del Rosario, Romeo; Apr 2008; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481585; ARL-TN-0310; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481585>

We extend results obtained for fault detection and present a procedure for calculating condition indicators that is tailored to detect a recently observed fault. We illustrate how it arises naturally from consideration of statistics commonly calculated as part of constant false alarm rate (CFAR) target detection algorithms.

DTIC

Change Detection; Diagnosis; False Alarms; Fault Detection; Helicopters; Maintenance

20080036334 New Mexico State Univ., Las Cruces, NM USA

Strategies for the Interpretive Integration of Ground and Aerial Views in UGV Operations

Chadwick, Roger A; Gillan, Douglas J; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0009

Report No.(s): AD-A481642; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481642>

Two experiments examined the cognitive process of aerial view target localization. Participants were shown ground-view images with designated targets, and tasked with locating the target in an aerial view. The first study examined photographic image sets in both a qualitative and quantitative manner, including a think-aloud protocol analysis. The second study used manipulated three dimensional model images to isolate effects of color, shape, and other attributes. Results show a strong cue dominance effect for unique colors, sex differences, and minor view angle effects. We discuss a proposed cognitive model for this task and suggest recommendations for assistive unmanned ground vehicle (UGV) interface features.

DTIC

Drone Vehicles; Photographs

20080036383 Defence Science and Technology Organisation, Victoria, Australia

Assessment of the Effect of Pitting Corrosion on the Safe Life Prediction of the P-3C

Shekhter, Alexandra; Loader, Christopher; Hu, Weiping; Crawford, Bruce R; Dec 2007; 43 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481730; DSTO-TR-2080; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481730>

This report presents the results of an experimental programme aimed at assessing the implications of pitting corrosion damage on P-3C safe lives calculated using the methods developed in the P-3C Service Life Assessment Program, the Equivalent Crack Size method and the Crack Initiation method. The results of both of these methods were that, for the pitting corrosion distribution used, the safe life prediction was not invalidated by corrosion. However, larger corrosion pits or a change of corrosion mechanism may invalidate safe life predictions.

DTIC

Corrosion; Life (Durability); Patrols; Pitting; Predictions

20080036398 Colorado Univ., Boulder, CO USA

High Performance and High-Fidelity Aeroelastic Simulation of Fixed Wing Aircraft with Deployable Control Surfaces

Lesoinne, Michael; Oct 9, 2007; 14 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0084

Report No.(s): AD-A481758; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481758>

The goals of this research is to overcome the difficulties created by mesh shearing in the simulation of aircraft with large control surface deflection. The origin of the difficulties for the correct modeling of large control surface deflection is that they introduce shearing in the mesh at the place where the control surface meets the fixed part of the wing. Such a geometrical shearing is very difficult to handle, in particular in Finite Volume or Finite Element approaches. One option to tackle this problem is the use of Chimera grids. However Chimera grid approaches are relatively expensive in geometric computation and introduce an interpolation error due to the overlap of the grids. We have proposed to explore two alternate methods to tackle this issue: Meshfree methods and Level-Set Methods. At the end of the project, we had demonstrated that the node activation/deactivation method worked on a sample one dimensional problem and the implementation in two dimensions is still in progress.

DTIC

Aeroelasticity; Aircraft Configurations; Control Surfaces; Fixed Wings; Simulation

20080036606 Air Force Packaging Technology and Engineering Facility, Wright-Patterson AFB, OH USA

Development of the MQ-9 Reaper Fuselage Container

Bozzuto, Matthew P; Evans, Susan J; May 20, 2008; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-06-P-103

Report No.(s): AD-A482086; AFPTEF-08-R-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Packaging Technology & Engineering Facility (AFPTEF) was tasked with the design of a new shipping and storage container for the MQ-9 Reaper fuselage in March of 2006. The previous container did not adequately satisfy user needs and Air Force requirements. A main problem was that it was designed for an MQ-9 Reaper fuselage, wings, and tails combined, which exceeded the 10,000 lb Air Force requirement for available ground support equipment. AFPTEF designed a smaller container for only the fuselage and a separate container for the wings and tails in order to bring container weights down under the 10,000 lb upper limit. Both containers feature retractable casters for rapid C-130 deployment and easier handling. The fuselage container features a wire rope isolator mounted cradle system to protect the fuselage (20G fragility), ballast storage areas, and shadow box storage areas for assorted small parts. The new container, CNU-697/E, designed with SAE ARP1967A, is an aluminum, long-life, controlled breathing, reusable shipping and storage container. CNU-697/E protects the MQ-9 Reaper fuselage mechanically and environmentally and has passed all qualification tests per ASTM D4169.

DTIC

Drone Vehicles; Fuselages

20080036661 Army War Coll., Carlisle Barracks, PA USA

Unmanned Aircraft Systems' Role In Network Centric Warfare

Carney, Duane T; Feb 4, 2008; 35 pp.; In English

Report No.(s): AD-A482197; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent proliferation of Unmanned Aircraft Systems (UAS) has significantly affected combat operations. Current operational theaters serve as proving grounds for both programmed and experimental UAS; many are successfully supporting the commanders situational awareness requirements. Wartime commanders are increasing their requests for UAS. The Department of Defense's (DOD) subsequent actions to fulfill these requirements attest to their growing relevance. Like many of the technical capabilities fielded as part of DOD transformation, UAS requires communications networking resources to operate in order to realize their maximum potential. However, fully integrating UAS within these operational theaters continues to challenge military leaders. DOD cannot progress on the path to implement its vision of Network Centric Warfare (NCW) without fully integrating UAS into the theater communications network. This paper examines UAS' role in NCW. It starts by providing brief background on NCW and UAS to establish their distinct relevance. Then it addresses three key

considerations necessary to fully integrate these two elements: UAS' role in facilitating information dissemination, UAS' role as an aerial communications relay, and UAS' ability to operate within a constrained frequency spectrum environment. It then concludes with recommendations for establishing UAS as a valuable theater asset within the network-centric warfare environment.

DTIC

Communication Networks; Drone Vehicles; Unmanned Aircraft Systems; Warfare

20080036663 Arizona Univ., Tucson, AZ USA

Numerical Investigation of Transition in Supersonic Boundary Layers Using DNS and LES

Fasel, Hermann F; Husmeier, Frank; Mayer, Christian S; Mar 31, 2008; 232 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0170

Report No.(s): AD-A482199; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work focuses on instability mechanisms of high-speed boundary layers over flat plates and cones with a circular cross section. Supersonic transition investigations at Mach 2 and hypersonic transition investigations at Mach 8 are performed using Direct Numerical Simulations (DNS). At wind-tunnel conditions, these simulations allow for comparison with experimental measurements to verify fundamental stability characteristics. For the DNS of boundary-layer transition at Mach 2, the experimental studies by Kosinov et al. (1994) and Ermolaev et al. (1996) for a flat plate serve as reference and provide the physical conditions for the numerical setup. In these experiments, the weakly nonlinear regime of transition was studied resulting in the discovery of asymmetric subharmonic resonance triads. Scrutinizing the experimental data, reveals however the presence of another, possibly competing breakdown mechanism, in the experiments. Both mechanisms were addressed in detail in this work. To better understand geometrical influences, flat-plate and cylindrical geometries are studied under after-shock conditions of the conical investigations (experiments). This allows for a direct comparison with the results of the sharp cone to evaluate the influence of spanwise curvature and cone opening angle. The ratio of the boundary layer thickness to the spanwise radius is used to determine the importance of spanwise curvature effects. For a cone, in downstream direction the radius increases linearly while the boundary layer thickness stays almost constant. Hence, spanwise curvature effects are strongest close to the nose tip and decrease in downstream direction. Their influences on the secondary instability mechanisms provide some preliminary guidance in the design for future high-speed air vehicles.

DTIC

Boundary Layers; Direct Numerical Simulation; Hypersonic Aircraft; Large Eddy Simulation; Numerical Analysis; Supersonic Boundary Layers

06

AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also 04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.

20080035501 Buchanan Ingersoll, PC, Alexandria, VA, USA; Lockheed Martin Corp., Bethesda, MD, USA

Tactical All Weather Precision Guidance and Navigation System

Howle, W. M., Inventor; Kim, P. Y., Inventor; Knecht, G. W., Inventor; Wheeler, S. L., Inventor; Holden, C., Inventor; 30 Sep 04; 23 pp.; In English

Contract(s)/Grant(s): F08635-C-0128

Patent Info.: Filed 30 Sep 04; US-Patent-Appl-SN-10-953 274

Report No.(s): PB2008-102144; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Precision navigation within a theater of operations is performed by receiving, at each of a plurality of spaced apart known locations, GPS satellite signals from a plurality of GPS satellites, wherein the known locations approximately define the theater of operations. A measure of error in the GPS satellite signal for each of the plurality of GPS satellites is determined. The measures of error in the GPS satellite signals are utilized to correct GPS satellite signals received at an unknown location within the theater of operations. The corrected GPS satellite signals are then used to determine a precise position of the unknown location within the theater of operations.

NTIS

Global Positioning System; Navigation; Navigation Satellites; Patent Applications

AIRCRAFT PROPULSION AND POWER

Includes primary propulsion systems and related systems and components, e.g., gas turbine engines, compressors, and fuel systems; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power; 28 Propellants and Fuels; and 44 Energy Production and Conversion.

20080034700 Evans (Adams), PC, Charlotte, NC, USA; General Electric Co., Schenectady, NY, USA

Aerodynamic Fastener Shield for Turbomachine

Anderson, W. C., Inventor; Senyo, J., Inventor; Epstein, M. J., Inventor; Dong, Z., Inventor; 15 Sep 04; 13 pp.; In English
Contract(s)/Grant(s): F33657-99-0-2050

Patent Info.: Filed Filed 15 Sep 04; US-Patent-Appl-SN-10-941 213

Report No.(s): PB2008-101231; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A fastener shield for use in a fluid flow path within a gas turbine engine for reducing fluid drag and heating generated by fluid flow over a plurality of circumferentially spaced fasteners. The fastener shield has a radially-extending, downstream-facing mounting flange with a plurality of circumferentially spaced bolt holes positioned to receive respective engine mounting bolts therethrough and to attach the mounting flange to elements of the turbine engine. A curved, upstream-facing fastener shield cover is positioned in spaced-apart relation to the mounting flange for at least partially covering and separating an exposed, upstream-facing portion of the bolts from the fluid flow to thereby reduce drag and consequent heating of the bolts.

NTIS

Fasteners; Gas Turbine Engines; Patent Applications; Turbomachinery

20080034750 Honeywell International, Inc., Morristown, NJ, USA

Compressor Including an Aerodynamically Variable Diffuser

Slovisky, J. A., Inventor; Barton, M. T., Inventor; Gunaraj, J. A., Inventor; Mansour, M. L., Inventor; Palmer, D. L., Inventor; 31 Aug 04; 12 pp.; In English

Contract(s)/Grant(s): DAA-H10-02-0003

Patent Info.: Filed Filed 31 Aug 04; US-Patent-Appl-SN-10-931 502

Report No.(s): PB2008-100773; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A compressor includes a diffuser, a recirculation duct, and a flow control valve. The recirculation duct has an inlet in fluid communication with the air outlet of the diffuser, and an outlet in fluid communication with the air inlet of the diffuser. The flow control valve is selectively moveable between open and closed positions, to thereby fluidly couple and isolate, respectively, the recirculation duct inlet and outlets. During operation of the compressor, the flow control valve may be opened, which circulates a portion of the compressed air discharged from the diffuser air outlet back to the diffuser air inlet. The air that is circulated back to the diffuser air inlet reduces the effective area of the diffuser air inlet, thereby increasing the surge margin of the compressor.

NTIS

Aerodynamics; Compressors; Diffusers

20080034784 Schwegman, Lundberg, Woessner and Kluth, Minneapolis, Macau; General Electric Co., Washington, DC, USA

Thermal Barrier Coating with Reduced Sintering and Increased Impact Resistance, and Process of Making Same

Spitsberg, I., Inventor; Venkataramani, V. S., Inventor; Boutwell, B., Inventor; 24 Aug 04; 12 pp.; In English

Contract(s)/Grant(s): N00019-96-C-0176

Patent Info.: Filed Filed 24 Aug 04; US-Patent-Appl-SN-10-925 125

Report No.(s): PB2008-101156; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A composition is disclosed that includes an at least partially stabilized zirconia matrix with a pentavalent oxide first dopant and an oxide second dopant. A coated article is disclosed for use in a high temperature gas turbine. The coated article can include an yttria-stabilized zirconia, a pentavalent oxide first dopant, and an oxide second dopant. The ratio of the pentavalent oxide second dopant to the oxide third dopant can be less than or equal to about 1. The composition can reduce sintering of the thermal barrier coating.

NTIS

Impact Resistance; Patent Applications; Sintering; Thermal Control Coatings

20080034801 Carlson, Gaskey and Olds, P.C., Birmingham, MI, USA

Turbine Blade Nested Seal Damper Assembly

Beattie, J., Inventor; 13 Sep 04; 7 pp.; In English

Contract(s)/Grant(s): N00019-02-C3003

Patent Info.: Filed Filed 13 Sep 04; US-Patent-Appl-SN-10-939 766

Report No.(s): PB2008-101174; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A turbine blade damper seal assembly includes a seal and a damper that both abut a radially outermost non-gas path surface. The seal is fabricated from a plastically deformable material and nests within a recess of the damper. The damper is fabricated from a rigid material that absorbs vibrational energy generated during operation. The recess within the damper provides for both the damper and the seal to be positioned at the radially outermost non-gas path surface.

NTIS

Turbine Blades; Dampers; Seals (Stoppers)

20080034847 Bachman and Lapointe, P.C., New Haven, CT, USA

Turbine Engine Component Manufacture

Hudson, E. A., Inventor; Harding, B. R., Inventor; 26 Aug 04; 15 pp.; In English

Contract(s)/Grant(s): USAF-F33615-97-C-2779

Patent Info.: Filed Filed 26 Aug 04; US-Patent-Appl-SN-10-926 467

Report No.(s): PB2008-101099; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A cooled turbine engine component is made by providing first and second pieces respectively having first and second surfaces. At least one circuit is formed in at least one of the first and second surfaces. A first plurality of apertures is provided in the first piece to form inlets to the at least one circuit. A second plurality of apertures is provided in the second piece to form outlets to the at least one circuit. A combination of the first and second pieces is assembled and integrated.

NTIS

Engine Parts; Patent Applications; Turbine Engines

20080035006 Bachman and Lapointe, P.C., New Haven, CT, USA

Vernier Duct Blocker (PAT-APPL-10-961 178)

Swanson, T. A., Inventor; Jones, J. E., Inventor; 8 Oct 04; 8 pp.; In English

Contract(s)/Grant(s): N00019-02C-3003

Patent Info.: Filed Filed 8 Oct 04; US-Patent-Appl-SN-10-961 178

Report No.(s): PB2008-102185; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A vernier duct blocker comprising a plurality of vanes each having a width and comprising a forward portion and an aft portion defining a plurality of gas paths each of the plurality of vanes being separated by a plurality of widths, and a rotatably movable ring interposed between the forward portion and the aft portion comprising a plurality of openings each having a width, wherein the width of one of the plurality of vanes differs from the width of another one of the plurality of vanes.

NTIS

Ducts; Gas Turbine Engines; Patent Applications

20080035007 General Electric Aircraft Engines, Cincinnati, OH, USA

Turbine Engine Shroud Segment

Darkins, T. G., Inventor; Alford, M. E., Inventor; Noe, M. E., Inventor; Crissman, C. C., Inventor; 8 Oct 04; 9 pp.; In English

Contract(s)/Grant(s): F-33615-97-C-27787UW

Patent Info.: Filed Filed 8 Oct 04; US-Patent-Appl-SN-10-962 310

Report No.(s): PB2008-102186; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A turbine engine shroud segment comprises a body including an outer surface away from which an integral attachment system projects. The attachment system comprises a plurality of at least two axially spaced apart circumferentially extending rows of discrete projection hook segments to interrupt a potential hoop stress path through the attachment system. Each projection hook segment includes a segment support surface aligned circumferentially and radially with other segment support surfaces in a row.

NTIS

Patent Applications; Shrouds; Turbine Engines

20080035008 Honeywell International, Inc., Morristown, NJ, USA

Method for Modifying Gas Turbine Nozzle Area

Morris, M. C., Inventor; Strangman, T. E., Inventor; Wilson, C. A., Inventor; Wolfmeyer, G. W., Inventor; Halfmann, S. H., Inventor; 12 Oct 04; 10 pp.; In English

Contract(s)/Grant(s): DMJ02-94-C-0030

Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-963 185

Report No.(s): PB2008-102187; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method of modifying a turbine nozzle area comprises depositing a thermal barrier coating (TBC) on the nozzle endwalls to provide a minimum nozzle area, evaluating an airflow through the nozzle, and machining the TBC to increase the nozzle area. Adjacent segment area variation may be minimized, improving engine reliability by reducing the aerodynamic excitation to the down stream blade.

NTIS

Gas Turbines; Patent Applications; Nozzles; Thermal Control Coatings

20080035016 Idaho Univ., Moscow, ID, USA

One-Dimensional Engine Modeling and Validation Using Ricardo Wave

Cordon, D.; Dean, C.; Steciak, J.; Beyerlein, S.; Sep. 2007; 48 pp.; In English

Contract(s)/Grant(s): DTRS98-G-0027

Report No.(s): PB2008-100795; NIATT-N07-09; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The use of one-dimensional CFD engine simulation is an essential tool to the engine development process. Engine design through simulation can drastically reduce time needed to perform engine experiments and prototyping, as most engine experiments can be simulated within the software. As long as a model can be validated to high degree of accuracy (i.e. +/- 5%), the model can be used with a high level of confidence to optimize engine parameters. This work has used only a small fraction of WAVE's potential. More sophistication is possible in the areas of combustion kinetics, computational fluid dynamics, and emissions abatement through the use of advanced features and co-simulation. The intention of this research was to learn the process of one-dimensional CFD engine simulation and document what has been learned about the process as well as the potential of the software for future work. The research opportunities available with this software are endless and far-reaching. The software can also be used as an essential engine technology learning tool in technical elective courses such as ME433 - Combustion Engine Systems. Any questions that may arise about standard engine operation or combustion processes can be investigated with WAVE.

NTIS

Computational Fluid Dynamics; Engine Design; Reaction Kinetics

20080035608 Honeywell International, Inc., Morristown, NJ, USA

Compliant Mounting System for Turbine Shrouds

Allan, A. R., Inventor; Hadder, J. L., Inventor; Zurmehly, G. E., Inventor; 27 Sep 04; 9 pp.; In English

Contract(s)/Grant(s): DAAH10-03-2-0007

Patent Info.: Filed Filed 27 Sep 04; US-Patent-Appl-SN-10-950 750

Report No.(s): PB2008-102026; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The mounting of low expansion full ring shrouds in a turbine engine requires radial compliance to limit the stresses experienced by the shroud due to thermal growth differences between the shroud and its support. The present invention provides a method of providing radial compliance with no looseness in the mounting system. The compliant mounting system of the present invention also allows for axial motion of the shroud, should such motion be needed or desired. The lack of looseness in the shroud mounting system of the present invention results in an ability to achieve smaller tip clearances and thus better engine performance.

NTIS

Elastic Properties; Patent Applications; Shrouds; Turbine Engines; Turbines

20080036014 Pratt and Whitney Aircraft, East Hartford, CT, USA

Transient Liquid Phase Bonding Using Sandwich Interlayers

Das, G., Inventor; 4 Oct 04; 12 pp.; In English

Contract(s)/Grant(s): AF-F33615-98-C-2823

Patent Info.: Filed Filed 4 Oct 04; US-Patent-Appl-SN-10-957 805

Report No.(s): PB2008-102003; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Systems and methods for transient liquid phase bonding are described herein. Embodiments of these systems and methods utilize sandwich interlayers to produce stronger, more homogeneous bonds than currently possible. These sandwich interlayers comprise a middle bonding layer sandwiched between two outer bonding layers. The middle bonding layer comprises a different composition, and may even comprise a different form, than the outer bonding layers. In embodiments, these sandwich interlayers may be used to join a single crystal material to a polycrystalline material to make a gas turbine engine component, such as an integrally bladed rotor.

NTIS

Bonding; Interlayers; Liquid Phases; Patent Applications

20080036136 Marshall Gerstein and Borun, LLP, Chicago, IL, USA; United Technologies Corp., East Hartford, CT, USA

Rich Catalytic Injection

Veninger, A., Inventor; 30 Sep 04; 8 pp.; In English

Patent Info.: Filed Filed 30 Sep 04; US-Patent-Appl-SN-10-954 323

Report No.(s): PB2008-100117; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A gas turbine engine includes a compressor, a rich catalytic injector, a combustor, and a turbine. The rich catalytic injector includes a rich catalytic device, a mixing zone, and an injection assembly. The injection assembly provides an interface between the mixing zone and the combustor. The injection assembly can inject diffusion fuel into the combustor, provides flame aerodynamic stabilization in the combustor, and may include an ignition device.

NTIS

Gas Turbine Engines; Injection; Injectors; Patent Applications

20080036649 Ramgen Power Systems, Inc., Bellevue, WA USA

Ramgen Power Systems-Supersonic Component Technology for Military Engine Applications

Sohn, Chang W; Holcomb, Franklin H; Baldwin, Peter; Lawlor, Shawn; Steele, Robert C; Belshaw, Karen; Tamm, Gunnar; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W9132T-04-2-0007; HR0011-06-C-0026

Report No.(s): AD-A482178; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ramgen Power Systems, Inc. (RPS) is currently developing two high efficiency gas turbine engine concepts to create two entirely new gas turbine engines. The superior efficiency results from: (1) high pressure shock wave compression and supersonic expansion phenomena that produce high component efficiencies and (2) a unique configuration that minimizes flow stream turning losses throughout the engine. The RPS engine concept can be configured as a high-pressure ratio simple-cycle design for propulsion applications or as a low-pressure ratio recuperated engine. The RPS engine can be applied to a mobile power plant (such as military propulsion system for future combat systems), to a stationary power generator (such as a standalone power-only mode device), or to a fuel cell in a hybrid configuration. This paper presents the development of the RPS gas turbine technology and potential applications to the two specific engine cycle configurations, i.e., an indirect fuel cell / RPS turbine hybrid-cycle, and a simple-cycle turbine. The system promises a Specific Fuel Consumption (SFC) equal to or better than the SFC of current reciprocating diesel engines in this size range, but with a 10:1 weight reduction and a 4:1 improvement in time between overall maintenance. This represents a potential 2:1 increase in fuel efficiency at full power over existing gas turbines in this size range.

DTIC

Gas Turbines; Military Technology; Technology Utilization

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities, piloting, flight controls, and autopilots. For related information see also 05 Aircraft Design, Testing and Performance; and 06 Avionics and Aircraft Instrumentation.

20080035101 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Modelling of Integrated INS/GPS Navigation Systems with Respect to Performance and Jamming Resistance

Ruizenaar, M. G. A.; Weiss, M.; June 2008; 34 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): TNO Proj. 015.34789

Report No.(s): TNO-DV 2008 A201; TD2008-0077; Copyright; Avail.: Other Sources

Developments in the area of weapons and munitions are going fast. Some of these developments are aimed at increasing the maximum range and precision of the munitions. An important trend is the use of GPS in munitions, in combination with inertial navigation. With the use of GPS, an accurate navigation system can be accomplished. However, inherent to the use of RF-receivers in GPS, it is vulnerable to jamming. The vulnerability depends on the bandwidth of the GPS tracking receiver which in turn depends on the dynamics of the guided munition (due to the Doppler-effects). The Netherlands Ministry of Defense has requested TNO to acquire knowledge on the aforementioned new developments. For this, research program V519 has been started. As part of this program a simulation model has been realized of an Ultra Tightly Coupled INSIGPS integrated navigation system (UTC-system). This type of system uses information from the inertial sensors to decrease the bandwidth of the GPS-receiver and as a result increasing the jamming-resistance. The study has shown some general weaknesses of the GPS-receivers, making the GPS-receiver extra vulnerable to jamming. Furthermore, preliminary-results show that the integration of GPS with inertial navigation has a serious positive effect on the performance of the weapon. A new development in the area of integrated navigation system is the so-called Deeply Coupled navigation system. In this report the basics of this system are described.

Author

Global Positioning System; Inertial Navigation; Sensors; Missiles; Precision Guided Projectiles; Jamming; Technology Assessment

20080035112 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Advanced Control Options for Guided Weapons - An Overview

vanDalen, W. R.; April 2008; 28 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 014.17064

Report No.(s): TNO-DV 2007 A524; TD2007-0235; Copyright; Avail.: Other Sources

New methods for in-flight control of guided weapons are emerging fast. The Netherlands Defence Organisation desires to keep up with these developments. Therefore, a literature study has been performed by TNO, Defence, Security and Safety, aimed at determining what these developments are and what their significance to the Netherlands Armed Forces is. The developments that could become important in future warfare are: grid fins, deflecting nose, one degree of freedom drag control, flow effector control, jet actuators, aerodynamic forces that induce gyroscopic motion, shifting mass within the projectile's body, freely rotating body section and parachutes. Furthermore, an interesting trend has been identified: more and more unguided munitions are turned into guided rounds by attaching guidance kits.

Author

Precision Guided Projectiles; Weapons Development; Technology Assessment; Research and Development

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see *03 Air Transportation and Safety*. For aeronautical facilities see *14 Ground Support Systems and Facilities (Space)*.

20080035198 Library of Congress, Washington, DC USA

Securing General Aviation

Elias, Bart; Dec 15, 2005; 47 pp.; In English

Report No.(s): AD-A481012; CRS-RL33194; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481012>

General aviation (GA) -- a catch-all category that includes about 57% of all civilian aviation activity within the USA --

encompasses a wide range of airports, aircraft, and flight operations. Because GA plays a small but important role in the U.S. economy, improving upon GA security without unduly impeding air commerce or limiting the freedom of movement by air remains a significant challenge. However, policy makers have received mixed signals about the relative security risk posed by GA, due to its diversity and a general lack of detailed information regarding the threat and vulnerability of various GA operations. While some recent high-profile breaches of GA security point to persisting vulnerabilities and limited intelligence information suggests a continued terrorist interest in using GA aircraft, it is evident that GA airports, aircraft, and operations vary significantly with regard to security risk. While the small size and slow speed of most GA aircraft significantly limits the risk they pose, some experts still fear that they could be used as a platform for a chemical, biological, radiological, or nuclear attack. Certain sectors of GA such as crop dusters and larger business aircraft present more specific risks because of their unique capabilities and aircraft characteristics. Because various segments of GA differ significantly in terms of their perceived risk, mitigation strategies should arguably be tailored to some degree based on risk. In step with the premise that security measures should be predicated on assessments of risk, a provision in the FY2006 Department of Homeland Security Appropriations Act (P.L. 109-90) requires the DHS to examine the vulnerability of high-risk sites to possible terrorist attacks using GA aircraft. Based on an analysis of risk, a variety of options exist for mitigating security risks that can be tailored to specific GA airports and operations.

DTIC

Airports; Civil Aviation; General Aviation Aircraft; Law (Jurisprudence); Risk; Security; Terrorism

20080035255 Army Engineer Research and Development Center, Vicksburg, MS USA

Quality Assurance for Rapid Airfield Construction

Freeman, Reed B; Mann, Travis A; Mason, L W; Gartrell, Chad A; Moore, Vernon M; May 2008; 123 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481168; ERDC/GSL-TR-08-7; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481168>

This investigation was conducted to formalize a quality assurance (QA) process for rapid airfield construction. The specific aspects of QA that were addressed included compaction operations and the assessment of strength for both soil and stabilized soil layers. The QA for compaction relies on the construction of a test section for determining optimum number of compaction coverages and target soil properties. The essential pieces of equipment for the compaction QA process include a microwave oven, a Clegg hammer, and tools necessary to conduct a volume-replacement density test for in-place soil. This density test, which was developed during this investigation, involves the use of steel shot as the volume replacement material. The use of steel shot, instead of a conventional sand cone apparatus, was found to make the test both simpler and quicker. The Clegg hammer results are the primary means of judging compaction; thus, the requirements for density tests are minimized through a stepwise acceptance procedure. Statistical criteria for evaluating Clegg hammer and density measurements are also included herein. For estimating soil strength in terms of California bearing ratio, the conventional use of the dual-mass dynamic cone penetrometer is recommended. For estimating the strength of cement-stabilized soil and cement plus fiber-stabilized soil, a correlation between Clegg hammer results and unconfined compressive strength was developed.

DTIC

Airports; Compacting; Construction; Landing Sites; Quality Control

20080035512 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Inland Resupply Without a Road or Runway: Airdrop Solutions Including High-Altitude Precision Systems

Williamson, Derek L; Mar 2008; 172 pp.; In English

Report No.(s): AD-A481064; AFIT/GLM/ENS/08-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481064>

Given the variety of airdrop options now available, it may be difficult to determine the best mix of paradrop and aircraft types to employ, how the chosen types affect delivery weight capacity and what the least cost would be for the operation while still accomplishing the mission regarding drop zone weight, altitude, offset, and accuracy requirements. This research creates a planning tool to analyze these decisions and also identify trends regarding the best aircraft and paradrop types to use considering cost and capability in a strategic rather than tactical setting. This is accomplished through the formulation of a linear program implemented as a spreadsheet model for several different scenarios. This research indicates that new high-altitude precision airdrop (HAPAD) systems will make conventional airdrop obsolete due to both cost and performance

and that C-5 aircraft, if used, have the potential to dramatically increase airdrop capacity at competitive cost, particularly when using 30,000 lb HAPAD. Also, regarding cost, this research suggests airdrop system design life needs to match life expectancy and that all relevant costs must be included to make an accurate comparison with alternative resupply methods.

DTIC

Air Drop Operations; Airdrops; High Altitude; Roads; Runways

12

ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration see *91 Lunar and Planetary Science and Exploration*.

20080036095 Gates and Cooper, Los Angeles, CA, USA; Boeing Co., Seattle, WA, USA

Target Acquisition Control for Spacecraft Gimballed Payload

Tsao, T. C., Inventor; Liu, K., Inventor; 28 Sep 04; 18 pp.; In English

Contract(s)/Grant(s): F04701-99-C-0027

Patent Info.: Filed 28 Sep 04; US-Patent-Appl-SN-10-951 670

Report No.(s): PB2008-100692; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method and apparatus for controlling a gimballed platform. The method comprises the steps of computing an acquisition phase gimbal angle rate command $\omega_{\text{cmd}}(\text{sub } \text{Acq})$ from a measured LOS angle error $\Delta \theta(\text{sub } \text{LOS})$ for an initial control period T while computing an estimated LOS angle rate $\dot{\omega}(\text{sub } \text{LOS})$, computing a tracking phase gimbal angle rate command $\omega_{\text{cmd}}(\text{sub } \text{Trk})$ using a controller having an output initialized with the estimated LOS angle rate $\dot{\omega}(\text{sub } \text{LOS})$, and commanding the gimballed platform according to an angle rate command ω_{cmd} , wherein the angle rate command ω_{cmd} is the acquisition phase angle rate command $\omega_{\text{cmd}}(\text{sub } \text{Acq})$ during the initial control period T and the tracking phase gimbal angle rate command $\omega_{\text{cmd}}(\text{sub } \text{Trk})$ after the initial control period T .

NTIS

Patent Applications; Payloads; Gimbals; Spacecraft

20080036598 American Academy of Arts and Sciences, Cambridge, MA USA

Reconsidering the Rules for Space Security

Gallagher, Nancy; Steinbruner, John D; Apr 2008; 99 pp.; In English

Report No.(s): AD-A482054; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The rules that currently govern the use of space were codified in the 1967 Outer Space Treaty less than a decade after the first satellites were flown. They were designed to protect the common interest of all societies while regulating the competition for military advantage that dominated the pioneering programs of the USA and the Soviet Union. The rules assured universal rights of access and precluded sovereign jurisdiction over orbital transit. They permitted military support services, including reconnaissance, as long as the activity was peaceful, not aggressive. Orbiting weapons of mass destruction and using celestial bodies for military purposes were categorically prohibited, but sending nuclear missiles through space or placing conventional weapons there were not. The USA was the principal sponsor of the original rules but has become the principal obstacle to their legal elaboration. In order to protect efforts to develop ballistic missile defense, the USA has refused since the 1980s to consider explicit rules prohibiting deliberate attack on space objects and the deployment of weapons in space. It has assertively blocked formal attempts to organize negotiations on those topics and has stood virtually alone against the rest of the world in doing so. The 2006 U.S. National Space Policy and supporting documents formulate the intention to dominate space for national military advantage and to control access by all other countries. The USA is spending tens of billions of dollars each year far more than all other countries combined to acquire advanced military space capabilities. The U.S. national security strategy outlines an intention to use these capabilities to eliminate emerging threats before hostile states or terrorist groups acquire dangerous technology a standard of preventive protection that it does not propose to cede to any other country.

DTIC

Aerospace Systems; Security; Warfare

13
ASTRODYNAMICS

Includes powered and free flight trajectories; orbital and launching dynamics.

20080035365 Naval Postgraduate School, Monterey, CA USA

A Comparative Analysis Of Guidance Laws for Boost-Phase Ballistic Missile Intercept Using Exo-Atmospheric Kill Vehicles

Jang, Sang-Keun; May 2008; 61 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481330; NPS-CS-08-009; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Boost-phase intercept of a threat intercontinental ballistic missile (ICBM) is the first layer of a multi-layer missile defense strategy. Space-based interceptors possess certain kinematic advantages over ground-based interceptors in defeating an ICBM threat during boost phase. This paper explores the performance of various guidance laws that might be used by an exo-atmospheric kill vehicle (EKV) launched from a space platform to defeat a hostile, ground-launched ICBM during boost phase. Proportional navigation guidance, bang-bang guidance and predictive guidance are investigated using simulated missile and EKV trajectories. Performance results are presented with respect to miss distance, intercept time, launch envelope, and total control effort. The total control effort is directly related to fuel consumption, and smaller values translate to less weight in fuel or longer potential intercept ranges. Large launch envelopes mean fewer required EKV carriers. In general, the predictive guidance algorithm performs the other guidance algorithms in these simulations, but it did prove to be sensitive to time-to-go errors.

DTIC

Acceleration (Physics); Antimissile Defense; Ballistic Missiles; Intercontinental Ballistic Missiles; Laws

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing and Performance*; and *20 Spacecraft Propulsion and Power*.

20080035215 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Modeling GPS Satellite Orbits Using KAM Tori

Derbis, Rachel M; Mar 2008; 87 pp.; In English

Report No.(s): AD-A481056; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481056>

Global Positioning System (GPS) satellite orbits are modeled using Kolmogorov, Arnold, Moser (KAM) tori. Precise Global Positioning System satellite locations are analyzed using Fourier transforms to identify the three basis frequencies in an Earth Centered, Earth Fixed (ECEF) rotating reference frame. The three fundamental frequencies are 1) the anomalistic frequency, 2) a combination of earth's rotational frequency and the nodal regression rate, and 3) the apsidal regression rate. A KAM tori model fit to the satellite data could be used to predict future satellite locations. This model would allow rapid determination with fewer computational requirements than the typical method of integrating through an orbit.

DTIC

Artificial Satellites; Global Positioning System; Navigation Satellites; Satellite Orbits; Toruses

20080035424 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Internal Mass Motion for Spacecraft Dynamics and Control

Hall, Christopher D; May 1, 2008; 5 pp.; In English

Contract(s)/Grant(s): FA9550-1-0217

Report No.(s): AD-A481480; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present a detailed description of the application of a noncanonical Hamiltonian formulation to the modeling, analysis, and simulation of the dynamics of gyrostair spacecraft with internal mass motion. The methods have been applied to the practical implementation of control of a three-dimensional air bearing spacecraft simulator. We also present the analysis of electrodynamic tether systems, including optimal control of a simplified model.

DTIC

Dynamic Control; Electrodynamics; Hamiltonian Functions; Spacecraft Control

20080036222 Lockheed Missiles and Space Co., Sunnyvale, CA, USA

Figures of Merit for Rocket Boosters

Hunter, Maxwell W., II; Adler, Ronald J.; [2008]; 24 pp.; In English; Original contains black and white illustrations
Report No.(s): CN-164-692; Copyright; Avail.: Other Sources

Two new figures of merit are introduced, which are directly related to the cost of a rocket launch vehicle. The first is the ratio of empty vehicle structure mass to payload mass, and the second is the ratio of propellant mass to payload mass. When multiplied by the unit costs (per kg) of vehicle and propellant they give the respective costs per kg of payload in orbit. The analysis concentrates on single stage to orbit hydrogen oxygen rockets, although the ideas are general. The figures of merit are expressed as functions of the mass ratio and the propellant mass fraction. The rocket equation gives the required mass ratio to reach orbit; the propellant mass fraction is treated as an empirical parameter to measure the structural efficiency of a rocket. The figure of merit functions are plotted versus the propellant mass fraction in the results curves. The actual cost per kg of a vehicle is difficult to quantify, but the vehicle figure of merit provides a measure of the relative economic viability. The vehicle figure of merit curve clearly shows that the propellant mass fraction must be well above .883 for orbital capability. A sharp knee occurs in the curve at about .90 to .92; above the knee the vehicle to payload ratio is less than 2. The propellant figure of merit curve behaves similarly; there is an asymptote at the same point and a knee in the same region. Propellant costs are a small part of the present cost of spaceflight, but they are important since they provide a guide to future spaceflight cost limits. The propellant cost curve behaves like the propellant figure of merit curve. Above a propellant mass fraction of about .95 it is about equal to a limit value of \$2.95/kg. The ratios of structure and propellant to payload mass are graphed for 3 real vehicles - the C5A airplane, the 34D Titan, and the shuttle - as well as for a hypothetical hydrogen oxygen single stage to orbit rocket. The implications of the comparison are discussed and it is concluded that the single stage vehicle is very attractive, if it can be built with a propellant mass fraction of at least .92.

Author

Booster Rocket Engines; Figure of Merit; Single Stage Rocket Vehicles; Aerospace Vehicles

20080036292 Utah State Univ., Logan, UT USA

Tomographic Remote Observer of Ionospheric Disturbances

Swenson, Charles; Carney, Matthew; Clements, Jared; Burk, Karl; Nov 15, 2007; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-1-0301

Report No.(s): AD-A481571; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481571>

This document presents the final report for the USUSat III program funded by the Air Force Office of Scientific Research. The goal of this program has been to develop a next generation of engineers and scientists with skills in space systems. This objective was to be accomplished through a design and fabrication competition between university teams. The competing teams were all sponsored in the University Nanosatellite Program by the Air Force Research Laboratory and the Air Force Office of Scientific Research. The winning team was determined by a panel of judges at the Final Competition Review in March of 2007. The USUSat III was not ranked among the top three proto-flight spacecraft and was not selected to be developed for flight.

DTIC

Aerospace Systems; Ionospheric Disturbances; Tomography

20080036650 Naval Research Lab., Bay Saint Louis, MS USA

On the Relationship Between Satellite-Estimated Bio-Optical and Thermal Properties in the Gulf of Mexico

Jolliff, Jason K; Kindle, John C; Penta, Bradley; Helber, Robert; Lee, Zhongping; Shulman, Igor G; Amone, Robert A; Rowley, Clark D; Mar 15, 2008; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N0001405WX20735

Report No.(s): AD-A482181; NRL/JA/7330-06-6303; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Three years of Sea-viewing Wide Field-of-view Sensor (SeaWiFS) ocean color data were combined with three-dimensional thermal fields generated by the U.S. Navy's Modular Ocean Data Assimilation System (MODAS) in order to examine the interdependencies between bio-optical fields and their relationship to seasonal and mesoscale changes in upper ocean thermal structure. The combined data set suggests that the oceanic boundary layer within the Gulf of Mexico may be broadly defined by two seasonally occurring bio-thermal periods. A winter mixing period, characterized by net heat losses to the atmosphere, deepening of the isothermal layer depth, and annual maxima of satellite-estimated colored detrital matter (CDM) absorption coefficients and surface pigment concentration, was allowed by a thermally stratified period characterized

by net surface ocean heating, reduced isothermal layer depths, and annual minima in surface bio-optical fields. Variability in the interdependencies of ocean color products was used to diagnose an attendant shift in the Size-Structures of surface phytoplankton communities as well as identify CDM as the constituent responsible for the majority of blue-light absorption in Gulf of Mexico surface waters. The mesoscale circulation, as resolved by MODAS thermal fields into cold and warm-core eddies, appears to significantly modulate the seasonal bio-optical cycle of CDM absorption and surface pigment concentration. An empirical model was developed to describe CDM absorption as a function of upper ocean thermal energy. The model accounted for nearly half the variance in the satellite-estimate of this bio-optical variable. Large mismatches between the model and satellite data implied episodes of shelf water export to the deep Gulf of Mexico.

DTIC

Absorptivity; Cooling; Estimating; Gulf of Mexico; Optical Properties; Thermodynamic Properties

20080036820 NASA Marshall Space Flight Center, Huntsville, AL, USA

Ares V: Refining a New Heavy Lift Capability

Creech, Steve; Sumrall, Phil; July 15, 2008; 2 pp.; In English; 8th NRO/AIAA Space Launch Integration Forum, 15-16 Jul. 2008, Chantilly, VA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: **A01**, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036820>

The Ares V cargo launch vehicle represents a significant new national commitment to expand human space exploration beyond low Earth orbit. Viewed more broadly, this new heavy-lift rocket will be an advancement over the national strategic capability lost when the Saturn V program ended more than three decades ago. The Ares V is one of two new launch vehicles being designed by NASA to support U.S. Space Exploration Policy. NASA selected the Ares I crew launch vehicle and the Ares V (Figure 1) during extensive independent and internal architecture and vehicle trade studies to complete the International Space Station, retire the current Space Shuttle fleet, return to the Moon by 2020, and journey to destinations beyond. These vehicles share components derived from the Apollo-era Saturn, Space Shuttle, and contemporary launch vehicle programs to provide safe, affordable, reliable, versatile sustainable space transportation to support national space goals for decades to come.

Author

Ares 5 Cargo Launch Vehicle; Load Carrying Capacity

17

SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information see also *04 Aircraft Communications and Navigation*; and *32 Communications and Radar*.

20080036077 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Small Body GN&C Research Report: A G-Guidance Enhancement to Increase Mission Functionality

Carson, John M., III; Ackmese, Behcet; August 3, 2006; In English; Original contains color illustrations

Report No.(s): JPL-D-35898; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40914>

G-Guidance is a robust G&C (guidance and control) algorithm developed under the small-body GN&C task. The G-Guidance scheme utilizes a model predictive control approach, along with a convexification of the governing dynamics, control constraints, and trajectory/state constraints. This report details an enhancement to the FY2005 G-Guidance algorithm; the addition of a fire-second approach helps to nullify velocity errors and hit desired final velocities much more precisely than the original Fire-first scheme developed in FY2005. The enhancement preserves the primary benefit of the algorithm, which is to ensure required thruster silent times during trajectory maneuvers. The fire-second scheme increases the versatility of the algorithm for missions employing G-Guidance. For instance, a landing sequence could employ the fire-second scheme to ensure a null final velocity at landing, whereas an ascent sequence could utilize a fire-first scheme to ensure there is no drift of the spacecraft toward the ground at the beginning of the maneuver. Examples are provided within to demonstrate a fire-first versus fire-second guidance scheme. As in the existing G-Guidance algorithm, the examples and schemes incorporate gravity models and thruster firing times into discrete dynamics that are solved as an optimal control problem to minimize fuel consumption or thruster energy expenditure.

Author

Optimal Control; Algorithms; Spacecraft Guidance; Spacecraft Control

20080036078 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Small Body GN&C Research Report: A Guidance and Control Technique for Small-Body Proximity Operations with Guaranteed Guidance Resolvability and Required Thruster Silent Time

Carson, John M., III; Ackmese, A. Behcet; September 2, 2005; 22 pp.; In English; Original contains color and black and white illustrations

Report No.(s): JPL D-32958; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40913>

The guidance and control (G&C) algorithms for enabling small-body proximity operations are developed by using a model predictive control approach along with a convexification of the governing dynamics, control constraints, and trajectory/state constraints. The open-loop guidance is solved ahead of time or in a resolvable, real-time manner through the use of PWG (Pseudo Way-point Generation), a technique developed in this research. The PWG scheme ensures required thruster silent times during trajectory maneuvers. The feedback control is implemented to track the PWG trajectories in a manner that guarantees the resolvability for the open-loop problem, enabling the ability to update the G&C in a model-predictive manner. The schemes incorporate gravity models and thruster ring times into discrete dynamics that are solved as an optimal control problem to minimize fuel consumption or thruster energy expenditure. The optimal control problem is cast as an LMI (Linear Matrix Inequality) and then solved through Semi-Definite Programming techniques in a computationally efficient manner that provides convergence and constraint guarantees.

Author

Spacecraft Guidance; Spacecraft Control; Optimal Control; Algorithms; Trajectories

20080036099 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Entry, Descent, and Landing Communications for the 2007 Phoenix Mars Lander

Kornfeld, Richard P.; Garcia, Mark D.; Craig, Lynn E.; Butman, Stan; Signori, Gina M.; Journal of Spacecraft and Rockets; May 2008; Volume 45, No. 3, pp. 534-547; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40901>; <http://dx.doi.org/10.2514/1.33789>

This paper addresses NASA's requirement on the 2007 Phoenix Mars Lander to provide spacecraft communications during entry, descent, and landing on Mars to allow the identification of probable root cause should any mission failure occur. The Phoenix mission launched on 4 August 2007 and will land on 25 May 2008 on the northern plains of Mars to conduct a three-month study of the Martian environment. The paper discusses the architectural trades in designing a communications link and surveys the entry, descent, and landing communications approaches taken by previous missions. It then discusses the Phoenix-specific constraints and degrees of freedoms and presents a novel and robust implementation approach to entry, descent, and landing communications. The overall methodology and conclusions described herein can serve as a pathfinder for the entry, descent, and landing communications architecture and implementation of future Mars landed missions.

Author

Data Links; Mars Landing; Phoenix Mars Lander; Spacecraft Communication; Interplanetary Communication; Spacecraft Tracking

20080036102 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mars Aerobraking Spacecraft State Estimation by Processing Inertial Measurement Unit Data

Jah, Moriba K.; Lisano, Michael E., II; Born, George H.; Axelrad, Penina; June 19, 2006; 24 pp.; In English; SpaceOps 2006 Conference, 19-23 Jun. 2006, Rome, Italy; Original contains color and black and white illustrations

Report No.(s): AIAA-2006-5920; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40897>

Aerobraking is an efficient technique for orbit adjustment of planetary spacecraft, such as Magellan (Venus), Mars Global Surveyor, and Mars Odyssey. Determination of the vehicle state during the aerobraking phase has conventionally been performed using only radiometric tracking data prior to and following the atmospheric drag pass. This approach is sufficiently accurate and timely to meet current mission operational requirements; however, it is expensive in terms of ground support and leads to delayed results because of the need for post-drag pass data. This research presents a new approach to estimation of the vehicle state during the atmospheric pass that sequentially incorporates observations from an Inertial Measurement Unit (IMU) and models of the vehicle and environment. The approach, called Inertial Measurements for Aerobraking Navigation (IMAN), is shown to perform at a level comparable to the conventional methods in terms of navigation accuracy and superior

to them in terms of availability of the results immediately after completion of the pass. Furthermore, the research shows that IMAN can be used to reliably predict subsequent periapsis times and locations over all aerobraking regimes. IMAN also yields accurate peak dynamic pressure and heating rates, critical for a successful corridor control strategy, comparable to navigation team reconstructed values. This research also provides the first instance of the utilization of the Unscented Kalman Filter for the purpose of estimating an actual spacecraft trajectory arc about another planet.

Author

Aerobraking; Inertial Navigation; Aerocapture; Aeromaneuvering; Mars Landing; Interplanetary Navigation

20080036588 NASA Marshall Space Flight Center, Huntsville, AL, USA

Wireless Power Transmission Options for Space Solar Power

Potter, Seth; Henley, Mark; Davis, Dean; Born, Andrew; Howell, Joe; Mankins, John; May 29, 2008; 26 pp.; In English; 27th Annual International Space Development, 29 May - 1 Jun. 2008, Washington, DC, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

Space Solar Power (SSP), combined with Wireless Power Transmission (WPT), offers the far-term potential to solve major energy problems on Earth. In the long-term, we aspire to beam energy to Earth from geostationary Earth orbit (GEO), or even further distances in space. In the near-term, we can beam power over more moderate distances, but still stretch the limits of today's technology. In recent studies, a 100 kWe-class 'Power Plug' Satellite and a 10 kWe-class Lunar Polar Solar Power outpost have been considered as the first steps in using these WPT options for SSP. Our current assessments include consideration of orbits, wavelengths, and structural designs to meet commercial, civilian government, and military needs. Notional transmitter and receiver sizes are considered for use in supplying 5 to 15 MW of power. In the longer term, lunar or asteroidal material can be used. By using SSP and WPT technology for near-term missions, we gain experience needed for sound decisions in designing and developing larger systems to send power from space to Earth.

Author

Transmitter Receivers; Geosynchronous Orbits; Earth Orbits; Potential Energy; Wireless Communication

18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance*; *39 Structural Mechanics*; and *16 Space Transportation and Safety*.

20080036190 NASA Marshall Space Flight Center, Huntsville, AL, USA

A Fast, Affordable, Science and Technology SATellite (FASTSAT) and the Small Satellite Market Development Environment

Boudreaux, Mark; Montgomery, Edward; Cacas, Joseph; June 2008; 2 pp.; In English; 26th International Symposium on Space Technology and Science, 1-9 Jun. 2008, Shizuoka, Japan; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036190>

The National Aeronautics and Space Administration at Marshall Space Flight Center and the National Space Science and Technology Center in Huntsville Alabama USA, are jointly developing a new class of science and technology mission small satellites. The Fast, Affordable, Science and Technology SATellite (FASTSAT) was designed and developed using a new collaborative and best practices approach. The FASTSAT development, along with the new class of low cost vehicles currently being developed, would allow performance of ~ 30 kg payload mass missions for a cost of less than 10 million US dollars.

Author

Low Cost; Satellites

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *15 Launch Vehicles and Launch Operations*, and *44 Energy Production and Conversion*.

20080036104 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Wear Mechanisms in Electron Sources for Ion Propulsion, 2: Discharge Hollow Cathode

Mikellides, Ioannis G.; Katz, Ira; Goebel, Dan M.; Jameson, Kristina K.; Polk, James E.; Journal of Propulsion and Power; July 2008; ISSN 0748-4658; Volume 24, No. 4, pp. 866-865; In English; 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference, 8-11 Jul. 2007, Cincinnati, OH, USA; Original contains black and white illustrations

Report No.(s): Paper 5192; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40907>; <http://dx.doi.org/10.2514/1.33462>

The wear of the keeper electrode in discharge hollow cathodes is a major impediment to the implementation of ion propulsion onboard long-duration space science missions. The development of a predictive theoretical model for hollow cathode keeper life has long been sought, but its realization has been hindered by the complexities associated with the physics of the partially ionized gas and the associated erosion mechanisms in these devices. Thus, although several wear mechanisms have been hypothesized, a quantitative explanation of life test erosion profiles has remained incomplete. A two-dimensional model of the partially ionized gas in a discharge cathode has been developed and applied to understand the mechanisms that drove the erosion of the keeper in two long-duration life tests of a 30-cm ion thruster. An extensive set of comparisons between predictions by the numerical simulations and measurements of the plasma properties and of the erosion patterns is presented. It is found that the near-plume plasma oscillations, predicted by theory and observed by experiment, effectively enhance the resistivity of the plasma as well as the energy of ions striking the keeper.

Author

Hollow Cathodes; Ion Propulsion; Ion Engines; Wear; Plasma Oscillations; Electrical Resistivity; Electron Sources

20080036560 NASA Marshall Space Flight Center, Huntsville, AL, USA

Space Nuclear Power and Propulsion: Materials Challenges for the 21st Century

Houts, Mike; June 23, 2008; 56 pp.; In English; 2008 National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036560>

The current focus of NASA's space fission effort is Fission Surface Power (FSP). FSP systems could be used to provide power anytime, anywhere on the surface of the Moon or Mars. FSP systems could be used at locations away from the lunar poles or in permanently shaded regions, with no performance penalty. A potential reference 40 kWe option has been devised that is cost-competitive with alternatives while providing more power for less mass. The potential reference system is readily extensible for use on Mars. At Mars the system could be capable of operating through global dust storms and providing year-round power at any Martian latitude. To ensure affordability, the potential near-term, 40 kWe reference concept is designed to use only well established materials and fuels. However, if various materials challenges could be overcome, extremely high performance fission systems could be devised. These include high power, low mass fission surface power systems; in-space systems with high specific power; and high performance nuclear thermal propulsion systems. This tutorial will provide a brief overview of space fission systems and will focus on materials challenges that, if overcome, could help enable advanced exploration and utilization of the solar system.

Author

Nuclear Propulsion; Propulsion System Configurations; Propulsion System Performance; Aerospace Systems; Cost Effectiveness; Fuels

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 25 through 29*. For astrochemistry see category *90 Astrophysics*.

20080034708 Orrick, Herrington and Sutcliffe, LLP, Irvine, CA, USA; California Univ., Berkeley, CA, USA

Microfluidic Dynamic Vapor Control System

Bachman, M., Inventor; Li, G. P., Inventor; Wu, L., Inventor; 18 Oct 04; 7 pp.; In English

Contract(s)/Grant(s): DARPA-442521-23102

Patent Info.: Filed Filed 18 Oct 04; US-Patent-Appl-SN-10-967 913

Report No.(s): PB2008-100755; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A microfluidic dynamic vapor control system adapted to change the chemistry of small drops by dynamically controlling the vapor content surrounding the drops. The small volume surface area ratio makes this an efficient mechanism for controlling chemistry in nanovolumes. The system uses small reservoirs of material that can produce vapor on demand, and microfluidic channels that direct the vapor into a small chamber that holds a drop of the solution of interest. By changing the vapors that enter the chamber, the chemical composition of the drop can be modified.

NTIS

Drops (Liquids); Dynamic Control; Microfluidic Devices; Patent Applications; Vapors

20080034846 UT-Battelle, LLC, Oak Ridge, TN, USA

Angled Tip for a Scanning Force Microscope

Cui, H., Inventor; 31 Aug 04; 19 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 31 Aug 04; US-Patent-Appl-SN-10-930 359

Report No.(s): PB2008-101100; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A microscope probe includes a cantilever having a carbon nanostructure attached thereto at a distally oriented angle. A method of making the microscope probe can include the steps of: providing a cantilever; depositing a masking layer on a surface of the cantilever; developing a deterministic spot of the masking layer; removing the deterministic spot of the masking layer from the cantilever to form a deterministic spot of exposed cantilever; depositing a layer of nanostructure-growth catalyst directly on and in contact with the cantilever at the deterministic spot of exposed cantilever; removing the masking layer from the cantilever so that a dot of the catalyst remains on the cantilever at the deterministic spot; and growing a nanostructure at the deterministic spot.

NTIS

Carbon Nanotubes; Microscopy; Patent Applications; Scanners

20080034851 Myers Bigel Sibley and Sajovec, Raleigh, NC, USA

Tunable Nonfouling Surface of Oligoethylene Glycol

Chilkoti, A., Inventor; Ma, H., Inventor; 20 Feb 04; 13 pp.; In English

Contract(s)/Grant(s): NSF-EEC-02-10590; NSF-DBI-0098534

Patent Info.: Filed Filed 20 Feb 04; US-Patent-Appl-SN-10-783 054

Report No.(s): PB2008-101189; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An article having a nonfouling surface thereon comprises: (a) a substrate having a surface portion; (b) a linking layer on the surface portion; and (c) a polymer layer formed on the linking layer, preferably by the process of surface-initiated polymerization of monomeric units thereon, with each of the monomeric units comprising a monomer core group having at least one protein-resistant head group coupled thereto, to thereby form a brush molecule on the surface portion. The brush molecule comprising a stem formed from the polymerization of the monomer core groups, and a plurality of branches formed from the hydrophilic head group projecting from the stem. Methods of making and using such articles, are also described.

NTIS

Glycols; Patent Applications; Proteins; Substrates

20080034856 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; California Univ., Berkeley, CA, USA

Single Ion Conductor Cross-Linked Polymeric Networks

Kerr, J. B., Inventor; Wang, S., Inventor; Hou, J., Inventor; Sloop, S. E., Inventor; Han, Y. B., Inventor; 19 Sep 05; 18 pp.; In English

Contract(s)/Grant(s): DE-AC02-05CH11231; DE-AC03-76F00098

Patent Info.: Filed Filed 19 Sep 05; US-Patent-Appl-SN-11-230 709

Report No.(s): PB2008-101087; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Single ion conductors comprising polymer electrolytes prepared by grafting a salt compound onto a comb-branch polymer or dendrimer are disclosed having superior properties.

NTIS

Conductors; Crosslinking; Electrical Resistivity; Ions; Patent Applications

20080034868 Schwegman, Lundberg, Woessner and Kluth, Minneapolis, Macau

Methods of Using Vectors to Treat Metabolic Disorders

Whitley, C. B., Inventor; McIvor, R. S., Inventor; 14 Feb 05; 37 pp.; In English

Contract(s)/Grant(s): NIH-POI-HD32652

Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-057 410

Report No.(s): PB2008-101183; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Isolated nucleic acid-based vectors and lentivirus vectors, and methods of using those vectors to inhibit or prevent metabolic disorders in a mammal, are provided.

NTIS

Metabolism; Patent Applications

20080034942 Morris Manning and Martin, LLP, Atlanta, GA, USA; Arkansas Univ., Fayetteville, AR, USA

Surface-Modified Single-Walled Carbon Nanotubes and Methods of Detecting a Chemical Compound Using Same

Zhao, W., Inventor; Song, C., Inventor; 21 Dec 04; 52 pp.; In English

Patent Info.: Filed Filed 21 Dec 04; US-Patent-Appl-SN-11-020 024

Report No.(s): PB2008-100726; No Copyright; Avail.: CASI: [A04](#), Hardcopy

A method for surface modification of single walled carbon nanotubes. In one embodiment, the method includes the steps of providing a detergent solution, adding a plurality of single walled carbon nanotubes into the detergent solution, performing a first sonication to disperse the single walled carbon nanotubes in the detergent solution, and performing a second sonication after the first sonication to make detergent encased single walled carbon nanotubes. At least one of the plurality of single walled carbon nanotubes is at least partially wrapped by one or more detergent molecules to make it a detergent encased single walled carbon nanotube. In one embodiment, the detergent comprises SDS, PSS or a combination of them.

NTIS

Carbon Nanotubes; Chemical Composition; Detection; Detergents; Molecules; Patent Applications

20080035009 Los Alamos National Lab., NM USA

Preparation of Nanoporous Metal Foam From High Nitrogen Transition Metal Complexes

Tappan, B. C., Inventor; Huynh, M. H. V., Inventor; Hiskey, M. A., Inventor; Son, S. F., Inventor; Oschwald, D. M., Inventor; 12 Oct 04; 14 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-964 218

Report No.(s): PB2008-102188; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Nanoporous metal foams are prepared by ignition of high nitrogen transition metal complexes. The ammonium salts of iron(III) tris(bi(tetrazolato)-amine), cobalt(III) tris(bi(tetrazolato)amine), and high nitrogen compounds of copper and silver were prepared as loose powders, pressed into pellets and wafers, and ignited under an inert atmosphere to form nanoporous metal foam monoliths having very high surface area and very low density.

NTIS

Complex Compounds; Foams; Metal Foams; Metals; Nitrogen; Patent Applications; Transition Metals

20080035015 Massachusetts Dept. of Public Health, Boston, MA, USA

Health Consultation: Former Zonolite Facility, Wemelco Way, Easthampton, Hampshire County, Massachusetts. EPA Facility ID: MAD019335561

Dec. 15, 2006; 83 pp.; In English

Report No.(s): PB2008-102338; No Copyright; Avail.: National Technical Information Service (NTIS)

The former Zonolite facility in Easthampton, Massachusetts, was an exfoliation plant operated by W.R. Grace & Company (WRG). The facility received asbestos-contaminated vermiculite from Libby, Montana, from 1963 to 1984, for the production of Zonolite attic insulation and Monokote fireproofing material. The facility continued production using vermiculite from other sources until 1992. The site, including a former rail line that abuts and passes through the southeastern property boundary, is located in a mixed residential and commercial area. It is one of 28 Phase 1 sites being evaluated by the federal Agency for Toxic Substances and Disease Registry (ATSDR) National Asbestos Exposure Review.

NTIS

Health; Vermiculite; Contamination; Asbestos; Fireproofing

20080035093 Bruckner (John), P.C, Austin, TX, USA

Individually Electrically Addressable Carbon Nanofibers on Insulating Substrates

Guillorn, M. A., Inventor; McKnight, T. E., Inventor; Merkulov, V. I., Inventor; Melechko, A. V., Inventor; Simpson, M. L., Inventor; 7 Nov 05; 14 pp.; In English

Patent Info.: Filed Filed 7 Nov 05; US-Patent-Appl-SN-11-268 061

Report No.(s): PB2008-102129; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Systems and methods are described for individually electrically addressable carbon nanofibers on insulating substrates. A method includes forming an electrically conductive interconnect on at least a part of an insulating surface on a substrate; and growing at least one fiber that is coupled to the electrically conductive interconnect.

NTIS

Carbon; Carbon Fibers; Insulation; Patent Applications; Substrates

20080035107 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Eindhoven, Netherlands

Dynamic Comfort of Clothing

Kaasjager, A. D. J.; November 2007; 53 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): Order 872.2653.0912.11

Report No.(s): TNO MT-RAP-2007-03835/ms; TD2006-0630; Copyright; Avail.: Other Sources

A device is developed which measures the dynamic behavior of water and vapor transport through textiles. A wetted fabric above a heated plate of 35 C simulates the sweating skin. The textile under investigation is placed above this with an air gap in between. The evaporation and absorption of both fabrics on this abrupt change of conditions is measured by microbalances. Hygroscopic material can maintain a higher level of evaporation from the skin during the first couple of minutes after the start of sweating due to the absorption of water. This effect disappears at higher humidity due to the decreased regain shift of the fabric. This might explain partially why cotton is preferable to polyester in certain parts of the world. The mass increase in time of the upper fabric matches an exponential relationship strongly suggests a mass diffusion which depends only on the concentration gradient between upper and lower fabric. The test apparatus provides a means to study the humidity in clothing when the relevant regain curve is known. It measures also the static evaporation through a garment when the water content of the upper fabric is constant and therefore is an alternative to ASTM E96.

Author

Clothing; Comfort; Dynamic Characteristics; Fabrics; Textiles; Water Vapor; Measuring Instruments; Evaporation

20080035180 Alabama Univ., Tuscaloosa, AL USA

Electrodeposited Mn-Sn-X Alloys for Corrosion Protection Coatings

Zangari, Giovanni; Sep 30, 2002; 16 pp.; In English

Contract(s)/Grant(s): Proj-SERDP-PP-1150

Report No.(s): AD-A480970; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480970>

This project seeks to develop novel, low cost, and environmentally benign electrodeposition processes for the production of alloy coatings based on Mn and/or Sn, which combine high corrosion protection performance, good tribological behavior, and suitable mechanical properties, that would thus constitute realistic alternatives to cadmium. On the basis of the discussion

in section 1, we are seeking in particular to study in detail the electrodeposition of Sn-Mn and Cu-Mn binary alloys. The microstructure, chemical, electrochemical and physical properties, tribological and mechanical characteristics, as well as corrosion resistance of these coatings are also investigated.

DTIC

Alloys; Corrosion Prevention; Electrodeposition; Manganese Alloys; Protective Coatings

20080035356 Army Research Lab., Aberdeen Proving Ground, MD USA

Nanotexturing of High-Performance Woven Fabrics for Novel Composite Applications

Pappas, D D; Kosik, W E; Bujanda, A; Demaree, J D; Hirvonen, J K; Orlicki, J A; Jensen, R E; McKnight, S H; Nov 29, 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481298; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nanotechnology offers the ability to create new material systems as well as dramatically improve the performance of existing systems through the introduction of new physical mechanisms not found in the original material. Nanomaterial modification of fibers and textiles has been used to increase fabric performance in areas ranging from biocidal capability to stain resistance and water repellency. In this study we use scalable methods to modify nanoscale features on organic materials to probe the potential for increased impact energy absorption and mechanical properties in composite applications. Specifically atmospheric plasma treatment and wetchemistry methods were utilized to create nanoscale chemical scaffolding and surface textures on model polyethylene films and fibers. This approach was successful at modifying the surfaces of these fibers and scaling to high speed web manufacturing is easily envisioned.

DTIC

Fabrics; Nanotechnology; Plasmas (Physics); Polyethylenes; Polymeric Films; Surface Treatment; Woven Composites

20080035593 Executive Office of the President, Washington, DC USA

The National Nanotechnology Initiative: Second Assessment and Recommendations of the National Nanotechnology Advisory Panel

Marburger, III, John H; Kvamme, E F; Apr 2008; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481269; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The National Nanotechnology Advisory Panel (NNAP) was created by the USA Congress in the 21st Century Nanotechnology Research and Development Act (P.L. 108-153), signed by President Bush on December 3, 2003. The Act required the President to establish or designate an NNAP to review the Federal nanotechnology research and development program. On July 23, 2004, President Bush formally designated the President's Council of Advisors on Science and Technology (PCAST) to act as the NNAP. The Act that created the NNAP calls for this advisory body to conduct a review of the NNI and report its findings to the President. The Act calls upon the NNAP to assess the trends and developments in nanotechnology, and the strategic direction of the NNI, particularly as it relates to maintaining U.S. leadership in nanotechnology research. The Act also requires comment on NNI program activities, management, coordination, implementation, and whether the program is adequately addressing societal, ethical, legal, environmental, and workforce issues. The Act calls for the NNAP to report on its assessments and to make recommendations for ways to improve the program at least every two years. The Director of the Office of Science and Technology Policy is to transmit a copy of the NNAP report to Congress. This is the second report of the NNAP under the Act. Since the first report, increasing attention has been focused on the potential risks of nanotechnology, especially the possible harm to human health and the environment from nanomaterials. In this second assessment, the NNAP paid special attention to the NNI efforts in these areas.

DTIC

Nanotechnology; Technology Assessment

20080035599 National Science and Technology Council, Washington, DC USA

The National Nanotechnology Initiative: Research and Development Leading to a Revolution in Technology and Industry. Supplement to the President's FY 2008 Budget

Russell, Richard; Cresanti, Robert; Boehm, Jason; Carim, Altaf; Teague, Clayton; Merzbacher, Celia; Holdridge, Geoffrey; Jul 31, 2007; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481232; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document is a supplement to the President's 2008 Budget Request submitted to Congress on February 5, 2007. It gives a description of the activities underway in 2007 and planned for 2008 by the Federal Government agencies participating in the National Nanotechnology Initiative (NNI), primarily from a programmatic and budgetary perspective. It is based on the

NNI Strategic Plan released in December 2004 and reports estimated investments for 2007 and requested investments for 2008 by program component area (PCA), as called for under the provisions of the 21st Century Nanotechnology Research and Development Act (Public Law 108-153).

DTIC

Budgeting; Federal Budgets; Industries; Nanotechnology

20080035611 Baker Botts, LLP, Houston, TX, USA

Peptide-Modified Polyurethane Composites and Associated Methods

West, J. L., Inventor; Jun, H. W., Inventor; Taite, L. J., Inventor; 16 May 05; 102 pp.; In English

Contract(s)/Grant(s): NSF-0114264; NSF-HRD-9817555

Patent Info.: Filed Filed 16 May 05; US-Patent-Appl-SN-11-129 941

Report No.(s): PB2008-102032; No Copyright; Avail.: CASI: [A06](#), Hardcopy

Peptide-modified polyurethanes comprising the reaction product of an isocyanate, a chain extender, and a peptide are provided. Also provided processes for making a peptide-modified polyurethane comprising: providing an isocyanate; providing a chain extender; providing a peptide; and allowing the isocyanate, chain extender, and peptide to react thereby forming the peptide-modified polyurethane, as well as methods for treating a subject comprising: providing a peptide-modified polyurethane that comprises the reaction product of an isocyanate, a chain extender, and a peptide; and administering the peptide-modified polyurethane to the subject.

NTIS

Patent Applications; Peptides; Polyurethane Resins

20080036122 Medlen and Carroll, L.L.P., San Francisco, CA, USA; Northwestern Univ., Evanston, IL USA

Sparsely Cross-Linked Nanogels: A Novel Polymer Structure for Microchannel DNA Sequencing

Barron, A., Inventor; Doherty, E., Inventor; 18 Jan 05; 43 pp.; In English

Contract(s)/Grant(s): NIH-R01HG019770-01

Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-037 561

Report No.(s): PB2008-102108; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention is generally directed to novel polymeric materials for use in the electrophoretic separation of nucleic acids. In particular, the novel polymer materials are sparsely crosslinked nanogels, dissolved in an aqueous buffer to form solutions with moderate to high viscosity. The present invention further provides methods for generating such novel polymers, and related methods of their use.

NTIS

Crosslinking; Deoxyribonucleic Acid; Gels; Patent Applications; Sequencing

20080036202 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Nighttime OCIO in the Winter Arctic Vortex

Canty, T.; Riviere, E. D.; Salawitch, R. J.; Berthet, G.; Renard, J. -B.; Pfeilsticker, K.; Dorf, M.; Butz, A.; Bosch, H.; Stimpfle, R. M.; Wilmouth, D. M.; Richard, E. C.; Fahey, D. W.; Popp, P. J.; Schoeberl, M. R.; Lait, L. R.; Bui, T. P.; Journal Of Geophysical Research; January 4, 2005; Volume 110; 13 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40921>; <http://dx.doi.org/10.1029/2004JD005035>

We show that a nighttime profile of OCIO in the Arctic vortex during the winter of 2000 is overestimated, by nearly a factor of 2, using an isentropic trajectory model constrained by observed profiles of ClOx (ClO + 2 X ClOOCl) and BrO. Calculated abundances of nighttime OCIO are shown to be sensitive to the abundance of BrOx (BrO + BrCl), details of the air parcel history during the most recent sunrise/sunset transitions, and the BrCl yield from the reaction BrO + ClO. Many uncertainties are considered, and the discrepancy between measured and modeled nighttime OCIO appears to be robust. This discrepancy suggests that production of OCIO occurs more slowly than implied by standard photochemistry. If the yield of BrCl from the reaction of BrO + ClO is increased from 7% (JPL 2002 value) to 11% (near the upper limit of the uncertainty), good agreement is found between measured and modeled nighttime OCIO. This study highlights the importance of accurate knowledge of BrO + ClO reaction kinetics as well as air parcel trajectories for proper interpretation of nighttime OCIO. These factors have a considerably smaller impact on the interpretation of OCIO observations obtained during twilight (90(deg) <= SZA <= 92(deg)), when photolytic processes are still active.

Author

Photochemical Reactions; Reaction Kinetics; Bromine Compounds; Photolysis

20080036223 Edwards and Angell, LLP, Boston, MA, USA

Dilute Solutions of Lyotropic Liquid Crystalline Polymers, Methods of Making Same and Compositions Prepared from Same

Ofer, D., Inventor; Nair, B. R., Inventor; Larouco, J. D., Inventor; Stevenson, W. A., Inventor; Rubin, L. S., Inventor; 20 May 05; 13 pp.; In English

Contract(s)/Grant(s): F33615-01-C-2112

Patent Info.: Filed 20 May 05; US-Patent-Appl-SN-11-134 583

Report No.(s): PB2008-100695; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The invention features dilute solutions of rigid rod or extended rod lyotropic liquid crystalline polymers prepared from high concentration polymerization mixtures. The invention also features methods of preparing such dilute solutions which utilize high mechanical shear to induce mix the high concentration solution with a diluent. The invention further provides articles of manufacture, including films and fibers, having a porous microstructure which are prepared from the dilute homogeneous solutions of the invention.

NTIS

Crystallinity; Patent Applications

20080036296 Army Research Lab., Aberdeen Proving Ground, MD USA

The Estimation of Properties Employed to Predict the Environmental Fate and Transport of Hydrazine-Alternative Hypergols

McQuaid, M J; Nov 1, 2006; 9 pp.; In English

Report No.(s): AD-A481578; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481578>

Under a program to design and develop hydrazine-alternative hypergols, assessments of the risks candidates pose to human health and the environment are to be made and considered along with traditional engine performance criteria throughout the selection and development process. Seeking to base assessments for the earliest stages of the process on quantitative structure property relationships (QSPRs), published QSPRs for 6 physical properties commonly employed as input for fate, transport and effect modeling were identified and evaluated. The evaluation focused on the reliability of the identified QSPRs estimates for the two classes of compounds considered to have the best prospects for replacing hydrazine-based hypergols: saturated, tertiary multiamines (STMs) and ethanamine azides (EAs). The study indicates that QSPRs contained in a program provided by the US Environmental Protection Agency yield reasonable estimates for STM normal boiling points, (ambient) vapor pressures, octanol-water partition coefficients, water solubilities and air-water partition coefficients. The program s estimates for EAs, on the other hand, proved poor or there was insufficient data with which to validate them. Alternate methods for estimating EA normal boiling points and vapor pressures are recommended. Gaps that remain in the desired protocol are identified, and approaches to filling them are proposed.

DTIC

Environmental Transport; Hydrazines

20080036337 Army Research Lab., Aberdeen Proving Ground, MD USA

Improved Paintball Design and Alternative Payloads

La Scala, John J; Maher, Michael; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481645; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481645>

Gelatin paintballs of various shapes and sizes have been prepared to improve the range and accuracy of standard paintball guns for military prison and other military applications. These different marker shapes have been fired successfully, and the effect of shape on range and accuracy is in the process of being determined using computer simulation. Alternative payloads have been incorporated into these more aerodynamic markers and standard paintballs. Commercially available infrared (IR) and ultraviolet (UV) chemicals were used as unobtrusive markers. Anti-traction payloads, including plant oil, propylene glycol, and silicon oil, were found to be qualitatively effective in reducing traction. Obscurant payloads that are opaque pigmented liquids that cure upon exposure to the moisture in air were developed, preventing simple removal of the obscurant. In addition, foaming obscurants are being developed for paintball applications.

DTIC

Chemical Attack; Computerized Simulation; Gelatins; Paints; Payloads

20080036354 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Development of a Broad-Spectrum Oxime for the Treatment of Nerve Agent Toxicity

Luo, C; Chambers, C; Tong, M; Tipparaju, P; Doctor, B P; Saxena, A; Brecht, K; Maxwell, D M; Nov 2006; 8 pp.; In English
Report No.(s): AD-A481673; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481673>

Inhibition of synaptic acetylcholinesterase (AChE) by organophosphate (OP) nerve agents is the main reason for their toxicity. Oximes are used as antidotes to reactivate nerve agent-inhibited AChE. To understand the mechanism of oxime-induced reactivation, we generated several mutant AChEs. Reactivation studies conducted with wild-type and mutant AChEs revealed that the peripheral anionic site of AChE plays a critical role in the reactivation of nerve agent-inhibited AChE by bis-pyridinium oximes, and not by mono-pyridinium oximes. Results showed that Y124 is an important determinant for the enhanced reactivation potency of HI-6 and HLo-7. Results also suggest that both the second pyridinium structure and the ether oxygen of HI-6 and HLo-7 are involved in interactions with the peripheral anionic site of AChE. These interactions are important considerations for the development of a next generation broad-spectrum oxime.

DTIC

Acetyl Compounds; Biochemistry; Cholinesterase; Mutations; Nerves; Range (Extremes); Reactivity; Spectra; Toxicity

20080036374 Army Soldier and Biological Chemical Command, Natick, MA USA

Water-Repellent Treatment on Military Uniform Fabrics: Physiological and Comfort Implications

Gibson, Phil; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481712; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481712>

Cost-effective nanotechnology-based water-repellent treatments for clothing fabrics are now commercially available. The effectiveness of these durable water repellent (DWR) fabric treatments were evaluated for application to military uniforms. The addition of a non-wicking finish to clothing fabric negatively impacts comfort in hot and humid environments. Clothing comfort may be improved by refining the DWR fabric treatment process to retain wicking properties on the fabric inner surface.

DTIC

Comfort; Physiology; Water; Water Treatment

20080036435 Army Research Lab., Aberdeen Proving Ground, MD USA

Nano-Engineered Additives for Active Coatings

Rawlett, Adam M; Orlicki, Joshua A; La Scala, John J; Piehler, Lars T; Zander, Nicole; Smith, Pauline M; Demaree, J D; Kosik, Wendy E; McKnight, Steven H; Rice, Norman; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481824; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481824>

Novel additives for polymeric coatings have been developed based on modified hyperbranched polymers (HBP). The additives are polyfunctional, and have been prepared to spontaneously segregate to the surface of the polymer in which they are dispersed. They have been used to install 'active' sites in polymeric films, with little or no change in the formulation, bulk properties, or application of the coating.

DTIC

Additives; Coatings; Dendrimers; Polymeric Films

20080036440 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Mitigation of Critical Single Point Failure (SPF) Material - Laminac 4116 Binder Replacement Program for Parachute and Cluster Stars Illuminant Compositions for Hand Held Signals

Lakshminarayanan, G R; Chen, Gary; Ames, Richard; Lee, Wai T; Wejsa, James L; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481835; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481835>

Laminac 4116 binder has been identified as a single point failure (SPF) material since it is being produced by only one company and there is a possibility that the company may discontinue production due to low product demand. In addition, other issues involved with the use of Laminac include limited shelf life, environmental and health hazardous concerns. An investigation was conducted to develop alternate and environmentally compatible binder materials to replace Laminac in

illuminant compositions for Hand Held Signals (HHS). Several vinyl alcohol acetate resins (VAAR) produced by different companies were investigated. Based on the static burn test results, vinyl alcohol acetate resins (by UC and McGean Inc. and 3V Inc. (trade name, Polivic-S202) were selected and optimized for illuminant compositions. Qualification tests for the full-up signals were conducted with the new binders in illuminant compositions at hot, ambient and cold temperatures per First Article Testing (FAT) protocol. This report discusses the test data and the evaluation criteria of the binders for hand held signals. The results indicate that the signals with the new binders met or exceeded the performance requirement and the data are comparable to the current Laminac signals. No critical failure was observed for any signal in the function tests conducted. Overall the data clearly demonstrated that both VAAR (by UC and McGean Inc.) and VAAR (by 3V Inc., Trade name Polivic S202) binder materials can be used to replace laminac 4116 binder in the illuminant compositions for HHS without compromising performance. This accomplishment has assured continued supply of reliable hand held signals (HHS) to our ground troop without interruption in the event of discontinued supply of Laminac 4116.

DTIC

Acetates; Alcohols; Binders (Materials); Critical Point; Failure; Parachutes; Replacing; Superplastic Forming

20080036454 Engineer Research and Development Center, Alexandria, VA USA

Synthetic Biomimetic Fluorophores for Micro/Nanosensor

Smith, C B; Anderson, J E; Gillevet, P M; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481868; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481868>

Proteins common in nature provide a rich source of potential fluorophores that can be used as taggant materials. Many of these fluorophores have been demonstrated to be effective molecular probes (e.g., green fluorescent protein (GFP)). The objective of this research is to find, isolate, sequence, and synthetically produce (from a natural source) synthetic fluorophores extracted from reef coral or rcGFP. From this investigation we discovered two novel clones with unique sequences for rcGFP and rcCFP. This research provided a better understanding of rcGFP's suitability for incorporation into micro or nano-sensory devices. Once synthetically created, these fluorophores are meant for design as triggering and signaling devices. These optical switches will possess far greater environmental stability and survivability than their natural analogs. Micro and nano-sensory devices are envisioned as helping the soldier to better understand the battlespace environment by providing remotely sensed, geospatial awareness.

DTIC

Biomimetics; Optical Switching; Remote Sensors

20080036652 M and P Technologies, Inc., Marietta, GA USA

VARTM Processing of High Temperature Polymer Matrix Composites

Criss, Jr, Jim M; May 7, 2008; 19 pp.; In English

Contract(s)/Grant(s): FA9550-07-C-0075

Report No.(s): AD-A482183; RPT-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall technical objective of the Phase 1 effort was to extend and advance the state the-art in high temperature composite fabrication techniques by developing a High Tempera Vacuum Assisted Resin Transfer Molding (VARTM) process for polyimide resins. This was accomplished by drawing on M&P Technologies' past 'small-scale' fabrication successes, do selecting the best practices/methods, and ultimately demonstrating equivalent properties Resin Transfer Molded Polymer Matrix Composites (PMCs). Specific objectives included 1) develop optimized process parameters for VARTM with scalability in mind, 2) down select the best candidate resins and determine equivalency to RTM panels, and 3) determine application for Phase 2 sub-component demonstrations.

DTIC

Composite Materials; High Temperature; Polyimide Resins; Polymer Matrix Composites; Resin Transfer Molding; Vacuum

20080036654 Naval Academy, Annapolis, MD USA

Solubility of 3,4-Dinitrotoluene in Pure Water and Seawater

Luning Prak, Dianne J; Moran, Paul J; Jan 2008; 4 pp.; In English

Contract(s)/Grant(s): MIPR-N0001407WR20102

Report No.(s): AD-A482185; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The solubility of 3,4-dinitrotoluene (3,4-DNT) in natural filtered seawater with ionic strength = (0.1662, 0.3352, 0.5071, and 0.6820) mol/L and pure water was measured at temperatures ranging between (277 and 314) K. The solubility in seawater

was lower than that in pure water. The average salting-out coefficient for 3,4-DNT was 0.13 L/mol, which is consistent with measurements for other isomers of dinitrotoluene. The salting-out coefficient did not show any significant variation with temperature over the range examined.

DTIC

Explosives; Fresh Water; Sea Water; Solubility; Water

20080036655 Naval Academy, Annapolis, MD USA

Solubility of 4-Nitrotoluene, 2,6-Dinitrotoluene, 2,3-Dinitrotoluene, and 1,3,5-Trinitrobenzene in Pure Water and Seawater

Luning Prak, Dianne J; O'Sullivan, Daniel W; Jan 2007; 6 pp.; In English

Contract(s)/Grant(s): MIPR-N0001407WR20102

Report No.(s): AD-A482186; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The solubility of 2,6-dinitrotoluene (2,6-DNT), 2,3-dinitrotoluene (2,3-DNT), 4-nitrotoluene (NT) and 1,3,5-trinitrobenzene (TNB) was measured in seawater with ionic strength = (0.1662, 0.3352, 0.5071, and 0.6820) mol/L and pure water at temperatures between (277 and 314) K. The pure water solubility values compare well with values reported previously. The solubility in seawater was lower than that in pure water. The average salting-out coefficients for NT, 2,6-DNT, 2,3-DNT, and TNB were (0.15, 0.12, 0.13, and 0.09) L/mol, respectively, which are consistent with measurements for other nitroaromatic compounds. The salting-out coefficients did not show any significant variation with temperature over the range examined.

DTIC

Explosives; Fresh Water; Nitrobenzenes; Sea Water; Solubility; Toluene; Water

20080036662 Army Research Lab., Aberdeen Proving Ground, MD USA

Effect Of Substituents On UV-Vis Spectra And RSA Properties Of Phthalocyanine Compounds

Andzelm, Jan; Rawlett, Adam; Orlicki, Joshua; Snyder, James; Baldrige, Kim; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482198; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The use of optically transparent materials to modulate or impede laser light in a real time setting is significant. This goal stimulates an interest in metalloporphyrins, phthalocyanines, naphthalocyanines and their derivatives. The most desired derivatives would be optically transparent, absorb laser light and also be soluble in water. Phthalocyanines (PC) with their stable, planar square structure and highly delocalized pi-electron system, are being used in numerous technological applications, such as pigments, in chemical sensors, and more recently as photosensitizers for photodynamic therapy. The nonlinear optical properties (NLO) of these compounds are of particular importance. Using quantum chemistry methods we study both visual and NLO properties of phthalocyanines complexes with Si as a central atom. The effect of hydrophilic axial substituents of the material on their optical properties is examined. We are mainly interested in the PEG poly(ethylene oxide) as an axial substituent because it is used in our laboratory to synthesize soluble PC complexes.

DTIC

Optical Properties; Phthalocyanin; Ultraviolet Spectra

20080036672 Army Armament Research, Development and Engineering Center, Watervliet, NY USA

Tri-Service Green Gun Barrel (PP 1074)

Rusch, Lawrence F; Mar 31, 2003; 40 pp.; In English

Report No.(s): AD-A482209; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report summarizes the activities performed during the Strategic Environmental Research and Development Program's (SERDP's) PP 1074 Tri-Service Green Gun Barrel. The program's goal was to develop an environmentally friendly process for depositing wear and erosion resistant materials onto gun bores replacing the current hazardous aqueous electro-deposition process of chrome plating. Moreover, this replacement process would not have an adverse effect on the current wear life levels for the respective weapon platform. Currently, all of the defense services utilize the chrome plating process as a wear enhancer for various weapons (see figure 1). Therefore, all services will benefit from the development of a novel, non-toxic coating process. These benefits will manifest themselves through considerable expense reductions in the form of waste disposal cost savings and through compliance to government regulatory mandates. In addition, a range of materials other than chromium can be utilized with this new process.

DTIC

Coatings; Guns (Ordnance); Plating; Waste Disposal

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20080034743 Connecticut Univ., Storrs, CT, USA

Basalt Fiber Reinforced Polymer Composites

Parnas, R.; Aug. 2007; 1 pp.; In English

Report No.(s): PB2008-100785; NETCR-63; No Copyright; Avail.: CASI: [A01](#), Hardcopy

The objective of the research was to determine if basalt fiber reinforced polymer composites are feasible, practical, and a beneficial material alternative for transportation applications. No significant differences in stiffness and strength were found between basalt fabric reinforced polymer composites and glass composites reinforced by a fabric of similar weave pattern. Aging results indicate that the interfacial region in basalt composites may be more vulnerable to environmental damage than in glass composites. However, the basalt/epoxy interface may also be more durable than the glass/epoxy interface in tension-tension fatigue because the fatigue life of basalt composites is longer. A wide disagreement between the literature properties of basalt fibers and the properties measured in this study renders any further consideration of basalt reinforced composites highly problematical. Composites manufacturing issues with basalt fabric were also investigated. The measurement results of the in-plane permeability for basalt twill 3x1 fabric materials showed that a high correlation exists between the two principal permeability values for this fabric. This is in contrast to the lack of correlation found in other weave patterns, and may point to an important material selection criteria for mass production of composites by liquid molding.

NTIS

Basalt; Fiber Composites; Polymers; Composite Materials; Mechanical Properties

20080034746 Virginia Univ., Charlottesville, VA, USA

Blast and Ballistic Protection Systems and Method of Making the Same

Terry, M. M., Inventor; Waldley, H. N. G., Inventor; 3 Sep 03; 8 pp.; In English

Contract(s)/Grant(s): DARPA-N00014-1-1051

Patent Info.: Filed Filed 3 Sep 03; US-Patent-Appl-SN-10-526 416

Report No.(s): PB2008-100777; No Copyright; Avail.: CASI: [A02](#), Hardcopy

An embodiment provides a protection structure comprising: open cell core structure; a top face sheet coupled to said core structure; a bottom face sheet coupled to said core structure distal from said top face sheet; a projectile arresting layer coupled to said top face sheet distal from said core structure; and a fragment catching layer couple to said bottom face sheet distal from said core.

NTIS

Ballistics; Explosions; Protection; Tolerances (Mechanics); High Strength; Mechanical Properties

20080034785 McLeod and Moyne, P.C., Okeemos, MI, USA

Biocomposites Sheet Molding and Methods of Making Those

Drzal, L. T., Inventor; Mehta, G., Inventor; Misra, M., Inventor; Mohanty, A. K., Inventor; Thayer, K., Inventor; 15 Oct 04; 33 pp.; In English

Contract(s)/Grant(s): 0122108

Patent Info.: Filed Filed 15 Oct 04; US-Patent-Appl-SN-10-966 988

Report No.(s): PB2008-101154; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A Sheet Molding Compound (SMC) as prepregs and cured compositions with naturally derived fibers which have been dried for at least three hours is described. The SMC process combines polyester polymer or resin with the fibers preferably continuously. The molded products are useful for a variety of purposes where glass fiber filled polyester polymers are conventionally used.

NTIS

Castings; Patent Applications; Sheet Molding Compounds

20080034796 Sonnenschein Nath and Rosenthal. LLP, Chicago, IL, USA

Synthesis of Boron Carbide Nanoparticles

Ren, Z., Inventor; Wen, J. G., Inventor; Lao, J. Y., Inventor; Li, W., Inventor; Chen, S., Inventor; 24 Mar 05; 35 pp.; In English

Contract(s)/Grant(s): DAAD-16-00-C-92227; DE-FG02-00ER-45805

Patent Info.: Filed 24 Mar 05; US-Patent-Appl-SN-11-088 527

Report No.(s): PB2008-101179; No Copyright; Avail.: CASI: A03, Hardcopy

The present invention relates generally to reinforced carbon nanotubes, and more particularly to reinforced carbon nanotubes having a plurality of microparticulate carbide or oxide materials formed substantially on the surface of such reinforced carbon nanotubes composite materials. In particular, the present invention provides reinforced carbon nanotubes (CNTs) having a plurality of boron carbide nanolumps formed substantially on a surface of the reinforced CNTs to reinforce the CNTs, enabling their use as effective reinforcing fillers for matrix materials to give high-strength composites. The present invention also provides methods for producing carbide reinforced CNTs.

NTIS

Boron Carbides; Carbon Nanotubes; Nanoparticles; Patent Applications

20080034820 NASA Glenn Research Center, Cleveland, OH, USA

Multi-Functional Composite Fatigue

Minnetyan, Levon; Chamis, Christos C.; September 09, 2008; 13 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): WBS 526282.03.02.02.04; Copyright; Avail.: CASI: A03, Hardcopy

Damage and fracture of composites subjected to monotonically increasing static, tension-tension cyclic, pressurization, and flexural cyclic loading are evaluated via a recently developed composite mechanics code that allows the user to focus on composite response at infinitely small scales. Constituent material properties, stress and strain limits are scaled up to the laminate level to evaluate the overall damage and durability. Results show the number of cycles to failure at different temperatures. A procedure is outlined for use of computational simulation data in the assessment of damage tolerance, determination of sensitive parameters affecting fracture, and interpretation of results with insight for design decisions.

Author

Composite Materials; Fatigue (Materials); Fractures (Materials); Aerospace Engineering; Mechanical Properties; Computerized Simulation

20080034934 Idaho National Engineering Lab., Idaho Falls, ID, USA

Conceptual Design Report for the NNGP Tensile Test Vehicle

Windes, W. W.; Sep. 2006; 26 pp.; In English

Report No.(s): DE2007-911730; INL/EXT-06-11951; No Copyright; Avail.: National Technical Information Service (NTIS)

A conceptual design was performed to determine the feasibility of irradiating silicon carbide fiber reinforced /silicon carbide (SiCf/SiC) and carbon fiber reinforced /carbon (Cf/C) tensile test specimens for the Next Generation Nuclear Production (NNGP) program. The design was based on the Flux Trap, Large and Small B irradiation positions in the Advanced Test Reactor. The Test Specimens investigated were 50% SiCf/SiC composites and 50% Cf/C composites. The specimens geometry were either tapered or fillet type dog bone shape, 25 to 35 mm long with a gauge length of 20 mm, width 6 mm, and 3 mm thick. The width of the support end of the specimens was 10-12 mm. The test specimens require finite temperature control from 600 to 1,000 oC. Due to the high temperatures required for the test specimens, the adjacent components will need to be fabricated from composite or graphitic materials. One-third to one-half of the specimens will be unloaded but will have the same geometry and irradiation conditions as the tensile specimens. The desired specimen irradiations damage was 9 dpa and the desired tensile stress limits were from 10 to 30 MPa. One of the design objectives was to load the test train so that single or multiple specimen failures would not compromise the entire test train. This need was realized from previous irradiations where the specimens were all loaded through a single load path. Any specimen failure along the load path resulted in the entire test train to become unloaded. Another design objective was to determine the best irradiation position that would maximize the target space but still provide the neutron flux needed to complete the irradiations in a reasonable amount of time. A rough order of magnitude cost estimate and schedule was completed based on previous experiments. The corresponding risk assessment was performed to identify possible items that may affect the overall project success. Depending upon how the risks are mitigated, the cost and schedules may be impacted.

NTIS

Advanced Test Reactors; Silicon Carbides; Composite Materials

20080034944 Swanson and Bratschun, LLC, Highlands Ranch, CO, USA

Surface Enhanced Spectrometry-Active Composite Nanoparticles

Natan, M. J., Inventor; Penn, S. G., Inventor; Freeman, R. G., Inventor; Chakarova, G., Inventor; Doering, W. E., Inventor; 25 Apr 05; 35 pp.; In English

Contract(s)/Grant(s): 1R43CA111752-01; 70NAB1H3028

Patent Info.: Filed Filed 25 Apr 05; US-Patent-Appl-SN-11-113 601

Report No.(s): PB2008-101248; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Submicron-sized particles or labels that can be covalently or non-covalently affixed to entities of interest for the purpose of quantification, location, identification, tracking, and diagnosis, are described.

NTIS

Marking; Microparticles; Nanoparticles; Patent Applications; Spectrometers

20080034981 Dinsmore and Shohl, Dayton, OH, USA

Nanocomposite Permanent Magnets

Liu, S., Inventor; Lee, D., Inventor; 29 Dec 04; 34 pp.; In English

Contract(s)/Grant(s): 03-S53000030-01-C1; W911NF-04-1-0355

Patent Info.: Filed Filed 29 Dec 04; US-Patent-Appl-SN-11-024 590

Report No.(s): PB2008-101247; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A nanocomposite, rare earth permanent magnet comprising at least two rare earth- or yttrium-transition metal compounds. The nanocomposite, rare earth permanent magnet can be used at operating temperatures of about 130 to about 300 degrees C. and exhibits improved thermal stability when compared with Nd(sub 2)Fe(sub 14)B-based magnets. Methods of making the nanocomposite, rare earth permanent magnets are also shown.

NTIS

Nanocomposites; Patent Applications; Permanent Magnets

20080034993 Sonnenschein Nath and Rosenthal. LLP, Chicago, IL, USA

Reinforced Carbon Nanotubes

Ren, Z., Inventor; Wen, J. G., Inventor; Lao, J. Y., Inventor; Li, W., Inventor; 12 Nov 04; 24 pp.; In English

Contract(s)/Grant(s): ARMY-16-00-C-9227; DE-FG02-00ER45805

Patent Info.: Filed Filed 12 Nov 04; US-Patent-Appl-SN-10-987 257

Report No.(s): PB2008-100764; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention relates generally to reinforced carbon nanotubes, and more particularly to reinforced carbon nanotubes having a plurality of microparticulate carbide or oxide materials formed substantially on the surface of such reinforced carbon nanotubes composite materials. In particular, the present invention provides reinforced carbon nanotubes (CNTs) having a plurality of boron carbide nanolumps formed substantially on a surface of the reinforced CNTs that provide a reinforcing effect on CNTs, enabling their use as effective reinforcing fillers for matrix materials to give high-strength composites. The present invention also provides methods for producing such carbide reinforced CNTs.

NTIS

Carbon Nanotubes; Patent Applications

20080035200 Army Research Lab., Aberdeen Proving Ground, MD USA

Hybridized Thermoplastic Aramids: Enabling Material Technology For Future Force Headgear

Walsh, Shawn M; Scott, Brian R; Spagnuolo, David M; Wolbert, James P; Nov 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481016; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481016>

U.S. Army ballistic helmet manufacturing has not changed significantly in nearly 30 years. Advances in U.S. helmet technology have been largely in shell design, improved aramid fibers, and helmet liner and suspension systems. The Army is currently replacing its first composite ballistic helmet, Personnel Armor System Ground Troops (PASGT), with the Advanced Combat Helmet (ACH). ACH has undergone ballistic testing and system analysis with improvements to weapons and body armor interfacing issues. Still, ACH uses some of the same materials (butyl rubber toughened phenolic resin with aramid fabric reinforcements) and the same process technology as its 30 year old PASGT predecessor. The current research effort has focused on identifying and resolving technology barriers that limit a new and improved generation of ballistic materials from being considered for use in future helmet systems. Both historical and contemporary perspectives of ballistic helmet technology are provided as rationale for the development of alternative helmet materials and their associated processes. The primary technology barriers are four-fold: structural durability (static and dynamic deformation), contiguous preform construction (less cutting of the reinforcement without wrinkling), hybridization of dissimilar fibers and resins, and low cost manufacturing (rapid heating, consolidation, and cooling of tools and parts). Flat plates and full helmet shells were molded

to quantify the performance and benefits of hybridized materials to meet current and future demands for increased ballistic mass efficiency.

DTIC

Helmets; Plastics; Polyamide Resins; Protective Clothing; Thermoplasticity

20080035219 Army Armament Research, Development and Engineering Center, Watervliet, NY USA

Prestressed Carbon Fiber Composite Overwrapped Gun Tube

Littlefield, Andrew; Hyland, Edward; Nov 2006; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481065; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481065>

The emphasis on lightweight large caliber weapons systems has placed the focus on the use of advanced composite materials. Using composite materials not only directly removes weight from the gun tube but, by better balancing the tube, allows the use of smaller drive systems, thus further enhancing the system weight loss. Additionally the use of high stiffness composites helps with pointing accuracy and to alleviate the dynamic strain phenomenon encountered with high velocity projectiles. Traditionally there were two issues with composite jackets: the coefficient of thermal expansion mismatch between the steel substrate and the composite jacket causing a gap, and the lack of favorable prestress in the jacket. Dealing with these issues greatly complicated the manufacturing process to the point where mass-producing the barrels would have been problematic at best. By using a thermoplastic resin, a 'cure on the fly' process and winding under tension the manufacturability of the barrels has been greatly improved, the gap has been eliminated, and a favorable prestress has been achieved. This paper will present the design, manufacture and testing of a 120mm barrel utilizing this process with IM7 carbon fibers in a polyetheretherketone (PEEK) matrix.

DTIC

Carbon Fibers; Composite Structures; Composite Wrapping; Fiber Composites; Filament Winding; Guns (Ordnance); Peek; Pipes (Tubes); Prestressing; Thermoplastic Resins

20080035224 Army Research Lab., Aberdeen Proving Ground, MD USA

Improved Low-Cost Multi-Hit Transparent Armor

Patel, Parimal J; Hsieh, Alex J; Gilde, Gary A; Nov 1, 2006; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481074>

Operation Iraqi Freedom has clearly demonstrated the criticality of transparent armor in many Army systems. As the threats have escalated and become more varied, the challenges for rapidly developing optimized threat specific transparent armor packages have become extremely complex. The current industry methodology is to add more glass layers to increase the thickness and thus weight to achieve new protection requirements. ARL began a program to develop a transparent armor using a materials by design approach whereby materials were selected based on the role they play in a ballistic event. The outcome of this approach was a new ARL Multi-Hit Transparent Armor design (patent pending, Patel et al., 2005) based on prior success in ceramic/all-plastic systems, which exploits the synergy of glass and polymers, particularly a rigid poly(methyl methacrylate), PMMA, and has produced a lighter window that can defeat four impacts in a 1 sq ft panel. The impacts were spaced in two adjacent 120 mm triangles. The weight of this new system offers a 30 percent weight reduction while using materials that are commercially available and are comparable in cost to what is being fielded today. In this paper, the role of materials influence including both glass and polymers on the impact efficiency and overall mode of failure is discussed.

DTIC

Armor; Glass; Laminates; Low Cost; Polymers; Transparency; Weight Reduction

20080035642 Maryland Univ., Frostburg, MD, USA

Flame Retardant Mechanism of the Nanotubes-Based Nanocomposites. Final Report

Kashiwagi, T.; Sep. 2007; 69 pp.; In English

Report No.(s): PB2008-101885; No Copyright; Avail.: National Technical Information Service (NTIS)

One weak aspect of synthetic polymer materials compared with steel and other metals is that these materials are combustible under certain conditions. Thus, the majority of polymer-containing end products must pass some type of regulatory test to assure public safety from fire. Although halogenated flame retardants are highly effective for reducing heat release rates of commodity polymers, the future use of some of these retardants is becoming highly questionable in Europe and possibly worldwide. Therefore, new, highly effective flame retardants are urgently needed as a possible alternative to

conventional halogenated flame retardants. The main objective is to determine the flame retardant (FR) effectiveness of various polymer/nanotube nanocomposites and to understand their FR mechanisms.

NTIS

Flame Retardants; Nanocomposites; Nanotubes

20080036121 Myers (Peacock), P.C., Albuquerque, NM, USA; TPL, Inc., Albuquerque, NM, USA

Moldable High Dielectric Constant Nano-Composites

Slenes, K. M., Inventor; Labanowski, C., Inventor; 20 Dec 04; 15 pp.; In English

Contract(s)/Grant(s): N00178-04-C-01013

Patent Info.: Filed 20 Dec 04; US-Patent-Appl-SN-11-019 810

Report No.(s): PB2008-102107; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention comprises the use of high dielectric constant composite materials comprising a high particle loading to form molded structures comprising three dimensional shapes. The composite material comprises ceramic dielectric particles, preferably nano-sized particles, and a thermoset polymer system. The composite material exhibits a high energy density.

NTIS

Composite Materials; Dielectric Properties; Patent Applications; Permittivity

20080036352 Army Research Office, Research Triangle Park, NC USA

Modeling Damage Modes in 3-D Woven Armor Composite Systems

Valisetty, R; Rajendran, A M; Grove, D; Namburu, R; Bahei-El-Din, Y; Hody, A; Seever, L; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481671; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481671>

In this paper a computationally intensive, multi-scale model exhibiting progressive damage in a 3D-woven composite is considered. It is based on evolving some fundamental damage modes in a representative volume element (RVE) of the composite's actual woven architecture. The evolving damage modes affect the local stresses in the composite micro-structure and eventually the overall stresses in the composite. This effect is considered in the RVE via a transformation field analysis (TFA). Since the model is computationally intensive, its numerical requirements in modeling the local microstructure, e.g. the mesh size, are to be understood before it can successfully be used in armor lay-up design studies or in conjunction with Lagrangian impact codes such as DYNA3D. This is a convergence issue which has not been studied before in RVE-TFA theories which use separate meshes at local and global levels. This paper examines the effect of the local micro-mesh size on modeling the weave-level damage progression in the 3D woven composites.

DTIC

Armor; Composite Materials; Damage; Three Dimensional Composites; Woven Composites

20080036378 Army Research Lab., Aberdeen Proving Ground, MD USA

Flexible Composite Membranes for Selective Permeability

Crawford, Dawn M; Napadensky, Gene; Sloan, Jim; Harris, Donovan; Kapur, Vivek; Samuelson, Vaughn; Perrotto, Joe; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481723; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481723>

This research effort focuses on the development of a novel composite membrane with multidimensional structural features and multifunctional capability. Two independently proven technologies are integrated creating a new membrane that can be engineered for selectively permeable performance to mutually facilitate water vapor transport and provide chemical agent resistance. Marrying the two technologies expands performance capabilities by allowing numerous variations in material selection for DuPont's microporous matrix, core and sheath polymers, and chemical functionalities that will provide a substrate for specialized features such as agent deactivation. ARL's nanostructured membrane is incorporated as the 'filler' for the pores and has been investigated as both a post-process to the microporous membrane fabrication and as a fiber core polymer manufactured as a component of the microporous membrane. Our results have demonstrated that at least one

formulation of ARL's nanostructured membrane exceeds the military threshold requirement against live chemical agents HD and GD according to Army test specification, and exhibits water vapor transport equivalent to the top commercial candidate alternative to the current JSLIST system.

DTIC

Composite Materials; Membranes; Permeability

20080036428 Tokyo Inst. of Tech., Tokyo, Japan

Long Life Durability of Electrodes of Electrical Resistance Change Method for Damage Monitoring of CFRP Composite Structures

Todoroki, Akira; Mar 2008; 16 pp.; In English

Contract(s)/Grant(s): FA4869-07-1-4039

Report No.(s): AD-A481816; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481816>

Investigated the applicability of the electrical resistance change method through experiments of CFRP laminates [16-18]. Instead of using two or four electrodes, this research adopted multiple electrodes mounted on the surface of the target structure to identify delamination location and dimension. Orthotropic electric conductivity was also measured experimentally for three types of fiber volume fractions, and the paper revealed that electric conductivity in thickness direction of CFRP was approximately one thousandth of conductivity of fiber direction. The large difference brings difficulty of identifications of delamination location from the measured electrical resistance changes. For these studies, a response surface method was adopted as a tool to solve inverse problems delamination location and dimension were obtained from measured electric resistance changes of multiple segments between electrodes. The previous study [20] used FEM analyses of various delamination lengths and locations of beam-type specimens to investigate the reason of the large estimation errors of delamination locations; furthermore an improvement to obtain higher estimation performance was proposed, which used the data normalization method before making response surfaces. The normalized method provides highly precise estimations of location and size: 7mm error in size and 10mm error in location experimentally for CFRP laminates. Other researchers attached electrodes on the edges of the specimens [1-15]. The method does not cause damages of the electrical contact at the electrodes during loading. The method, however, does not monitor the location of the damages instead. The important point is to mount multiple electrodes on the surface of the target CFRP structure in our method although mounting electrodes on the surface may cause degradation of electrical contact during loading. In

DTIC

Carbon Fiber Reinforced Plastics; Composite Structures; Damage; Delaminating; Electrical Resistance; Electrical Resistivity; Electrodes; Life (Durability); Reinforced Plastics

20080036576 Defence Science and Technology Organisation, Victoria, Australia

The Effects of Hole-size and Environment on the Mechanical Behaviour of a Quasi-isotropic AS4/3501-6 Laminate in Tension, Compression and Bending

Callus, Paul J; Nov 2007; 82 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481995; AR-014-060; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the results of open-hole-tension (OHT), open-hole-compression (OHC) and open-hole-four-point-bend (OHB) tests conducted on AS4/3501-6 quasi-isotropic [45/0/- 45/90]_{2s} laminates in the room temperature dry (RTD) and elevated temperature wet (ETW) condition. Specimens were 38.1 mm wide with central through-holes ranging in diameter from 0.00 (unnotched) to 9.55 mm. The strain distribution near the hole in an OHT specimen was measured and found to agree well with that predicted for an infinite orthotropic plate subject to uniform remote stress. A simple modification of this model predicted well the strains near the hole on the tensile face of OHB specimens. OHT and OHC strength fell rapidly as hole size increased for small holes and less so for larger holes. This effect was much less pronounced in OHB specimens. The ETW environment had little effect on OHT properties but produced significant, and similar, reductions in OHC and OHB strength. OHT and OHC strength was predicted very well, and OHB strength moderately well, by the Whitney-Nuismer Average and Point Stress Criteria when using the strain distribution for that specimen type. OHC strength was also predicted very well by the Budiansky-Soutis-Fleck Cohesive Zone Model. However, each of these models requires experimental data in addition to the strength of the unnotched laminate and thus they are limited to applications where this data can be generated.

DTIC

Bending; Hole Geometry (Mechanics); Holes (Mechanics); Isotropy; Laminates

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use of inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see category *34 Fluid Dynamics and Thermodynamics*. For astrochemistry see category *90 Astrophysics*.

20080034716 Savannah River National Lab., Aiken, SC, USA

Zeolite Characterization

Jacobs, W. D.; Nigg, H. L.; Sep. 13, 2007; 5 pp.; In English

Contract(s)/Grant(s): DE-AC09-96SR18500

Report No.(s): DE2007-915114; WSRC-STI-2007-00495; No Copyright; Avail.: Department of Energy Information Bridge

The Savannah River Site isolates tritium from its process streams for eventual recycling. This is done by catalyzing the formation of tritiated water (from process streams) and then sorbing that water on a 3A zeolite (molsieve) bed. The tritium is recovered by regenerating the saturated bed into a Mg-based water cracking unit. The process described has been in use for about 15 years. Recently chloride stress corrosion cracking (SCC) was noted in the system piping. This has resulted in the need to replace the corroded piping and associated molecular sieve beds. The source of chlorine has been debated and one possible source is the zeolite itself. Since new materials are being purchased for recently fabricated beds, a more comprehensive analysis protocol for characterizing zeolite has been developed. Tests on archived samples indicate the potential for mobile chloride species to be generated in the zeolite beds.

NTIS

Characterization; Chlorides; Corrosion; Grasslands; Nuclear Reactors; Rivers; Zeolites

20080034751 Praxair, Inc., Danbury, CT, USA

Catalytic Reactor

Aaron, T. M., Inventor; Shah, M. M., Inventor; Jibb, R. J., Inventor; 1 Sep 04; 13 pp.; In English

Contract(s)/Grant(s): DE-FC3601GO11004

Patent Info.: Filed 1 Sep 04; US-Patent-Appl-SN-10-931 066

Report No.(s): PB2008-100771; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A catalytic reactor is provided with one or more reaction zones each formed of set(s) of reaction tubes containing a catalyst to promote chemical reaction within a feed stream. The reaction tubes are of helical configuration and are arranged in a substantially coaxial relationship to form a coil-like structure. Heat exchangers and steam generators can be formed by similar tube arrangements. In such manner, the reaction zone(s) and hence, the reactor is compact and the pressure drop through components is minimized. The resultant compact form has improved heat transfer characteristics and is far easier to thermally insulate than prior art compact reactor designs. Various chemical reactions are contemplated within such coil-like structures such that as steam methane reforming followed by water-gas shift. The coil-like structures can be housed within annular chambers of a cylindrical housing that also provide flow paths for various heat exchange fluids to heat and cool components.

NTIS

Catalysts; Chemical Reactors; Chemical Engineering

20080034762 Woodcock Washburn, LLP, Philadelphia, PA, USA

Contiguous Capillary Electrospray Sources and Analytical Devices

Janini, G., Inventor; Issaq, H. J., Inventor; Veenstra, T. D., Inventor; Conrads, T. P., Inventor; 20 Oct 03; 28 pp.; In English

Contract(s)/Grant(s): NCI-NO1-CO-12400

Patent Info.: Filed 20 Oct 03; US-Patent-Appl-SN-10-529 967

Report No.(s): PB2008-101199; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Contiguous capillaries useful for separating and electrospraying a fluid comprising analyte and electrolyte are provided. The contiguous capillaries have spray tips at one end of the capillaries and electrically conductive portions in proximity to the spray tips. Methods for making the contiguous capillaries and their use as electrospray sources are also disclosed. Apparatus and methods for conveying analyte ions from the capillaries into analytical instruments, such as a mass spectrometer, are also disclosed. The disclosed contiguous capillaries may be used to carryout electrophoresis separation and electrospray ionization

of analytes. Methods for obtaining the mass spectra of macromolecular analytes at concentrations lower than previously possibly are provided using the apparatus and procedures described herein.

NTIS

Electrophoresis; Capillary Tubes

20080034764 Foley and Lardner, LLP, Washington, DC, USA

Method and System for Processing Nanoparticles Using a Self Assembly Mechanism to Form Combined Species

Tai, Y. C., Inventor; Shih, C. Y., Inventor; Zheng, S., Inventor; 9 Nov 04; 17 pp.; In English

Patent Info.: Filed 9 Nov 04; US-Patent-Appl-SN-10-985 841

Report No.(s): PB2008-101197; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for processing nanoparticles using a self assembly mechanism. The method includes flowing a first reactant species through a first channel region, which has a predetermined dimension including a first width and a first depth. The method includes flowing a second reactant species through a second channel region, which also has a predetermined dimension including a second width and a second depth. The method includes outputting the first reactant species through a first orifice exiting the first channel region and outputting the second reactant species through a second orifice exiting the second channel region. Additionally, the method forms an interface region along a first predetermined length in a third channel, which couples the first orifice to the second orifice at the interface region. The method contacts one or more of the first reactant species with one or more of the second reactant species at the interface region to form a combined species of the one or more first reactant species and the one or more second reactant species. The method also transfers the combined species of the one or more first reactant and the one or more second reactant species from the first predetermined length to a second predetermined length of the third channel region.

NTIS

Nanoparticles; Self Assembly

20080034771 Brookhaven National Lab., Upton, NY, USA

Role of C and P Sites on the Chemical Activity of Metal Carbide and Phosphides: From Clusters to Single-Crystal Surfaces

Rodriguez, J. A.; Vines, F.; Lin, P.; Illas, F.; Jul. 2007; 26 pp.; In English

Report No.(s): DE2007-915430; BNL-79248-2007-BC; No Copyright; Avail.: National Technical Information Service

(NTIS)

Transition metal carbides and phosphides have shown tremendous potential as highly active catalysts. At a microscopic level, it is not well understood how these new catalysts work. Their high activity is usually attributed to ligand or/and ensemble effects. Here, we review recent studies that examine the chemical activity of metal carbide and phosphides as a function of size, from clusters to extended surfaces, and metal/carbon or metal/phosphorous ratio. These studies reveal that the C and P sites in these compounds cannot be considered as simple spectators. They moderate the reactivity of the metal centers and provide bonding sites for adsorbates.

NTIS

Carbides; Catalysts; Chemical Reactions; Crystal Surfaces; Metal Clusters; Metals; Phosphides; Single Crystals

20080034778 Wolf Greenfield and Sacks, P.C., Boston, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA

Methods and Products Related to the Improved Analysis of Carbohydrates

Bosques, C., Inventor; Keiser, N., Inventor; Srinivasan, A., Inventor; Sasisekharan, R., Inventor; Gandhe, P., Inventor; 15 Apr 05; 82 pp.; In English

Contract(s)/Grant(s): NIH-GM57073

Patent Info.: Filed 15 Apr 05; US-Patent-Appl-SN-11-107 982

Report No.(s): PB2008-101160; No Copyright; Avail.: CASI: [A05](#), Hardcopy

The invention relates, in part, to the improved analysis of carbohydrates. In particular, the invention relates to the analysis of carbohydrates, such as N-glycans and O-glycans found on proteins. Improved methods, therefore, for the study of glycosylation patterns on cells, tissue and body fluids are also provided. Information regarding the analysis of glycans, such as the glycosylation patterns on cells, tissues and in body fluids, can be used in diagnostic and treatment methods as well as for facilitating the study of the effects of glycosylation/altered glycosylation on protein function. Such methods are also

provided. Methods are also provided to assess protein production processes, to assess the purity of proteins produced, and to select proteins with the desired glycosylation.

NTIS

Carbohydrates; Patent Applications; Body Fluids

20080034779 Vosen (Steven R), Berkeley, CA, USA

Hydrogen Storage and Integrated Fuel Cell Assembly

Gross, K. J., Inventor; 3 Sep 04; 27 pp.; In English

Contract(s)/Grant(s): DE-AC04-94AL85000

Patent Info.: Filed Filed 3 Sep 04; US-Patent-Appl-SN-10-934 340

Report No.(s): PB2008-101159; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Hydrogen is stored in materials that absorb and desorb hydrogen with temperature dependent rates. A housing is provided that allows for the storage of one or more types of hydrogen-storage materials in close thermal proximity to a fuel cell stack. This arrangement, which includes alternating fuel cell stack and hydrogen-storage units, allows for close thermal matching of the hydrogen storage material and the fuel cell stack. Also, the present invention allows for tailoring of the hydrogen delivery by mixing different materials in one unit. Thermal insulation alternatively allows for a highly efficient unit. Individual power modules including one fuel cell stack surrounded by a pair of hydrogen-storage units allows for distribution of power throughout a vehicle or other electric power consuming devices.

NTIS

Fuel Cells; Hydrogen; Hydrogen Fuels; Patent Applications

20080034794 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA

Determination of the Hydrogen Storage Capacity of Novel Sepiolite-Derived Carbonaceous Materials

Sandi-Tapia, G., Inventor; Gregar, K. C., Inventor; 23 Mar 05; 15 pp.; In English

Contract(s)/Grant(s): DE-W-31-109-ENG-38

Patent Info.: Filed Filed 23 Mar 05; US-Patent-Appl-SN-11-088 606

Report No.(s): PB2008-101181; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Carbonaceous nanofibers derived from a one dimensional channeled material having hydrogen adsorbed on the surfaces thereof are disclosed as a well as a method of storing hydrogen in which a plurality of carbonaceous nanofibers derived from a one dimensional channeled material are provided, and the nanofibers are contacted with hydrogen at a temperature and pressure for a time sufficient to adsorb hydrogen thereon.

NTIS

Carbonaceous Materials; Hydrogen; Patent Applications

20080034795 California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA

Method for Scavenging Mercury

Chang, S., Inventor; Liu, S., Inventor; Liu, Z., Inventor; Yan, N., Inventor; 7 Apr 05; 12 pp.; In English

Contract(s)/Grant(s): DE-AC03-76SF00098

Patent Info.: Filed Filed 7 Apr 05; US-Patent-Appl-SN-11-101 713

Report No.(s): PB2008-101180; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Disclosed herein is a method for removing mercury from a gas stream comprising contacting the gas stream with a getter composition comprising bromine, bromochloride, sulphur bromide, sulphur dichloride or sulphur monochloride and mixtures thereof. In one preferred embodiment the getter composition is adsorbed onto a sorbent. The sorbent may be selected from the group consisting of flyash, limestone, lime, calcium sulphate, calcium sulfite, activated carbon, charcoal, silicate, alumina and mixtures thereof. Preferred is flyash, activated carbon and silica.

NTIS

Patent Applications; Scavenging

20080034799 Lawrence Livermore National Lab., Livermore, CA USA

Chemical Microreactor and Method Thereof

Morse, J. D., Inventor; Jankowski, A., Inventor; 2 Aug 05; 10 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed Filed 2 Aug 05; US-Patent-Appl-SN-11-196 634

Report No.(s): PB2008-101176; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Disclosed is a chemical microreactor that provides a means to generate hydrogen fuel from liquid sources such as ammonia, methanol, and butane through steam reforming processes when mixed with an appropriate amount of water. The microreactor contains capillary microchannels with integrated resistive heaters to facilitate the occurrence of catalytic steam reforming reactions. Two distinct embodiment styles are discussed. One embodiment style employs a packed catalyst capillary microchannel and at least one porous membrane. Another embodiment style employs a porous membrane with a large surface area or a porous membrane support structure containing a plurality of porous membranes having a large surface area in the aggregate, i.e., greater than about $1 \text{ m}^2/\text{cm}^3$. Various methods to form packed catalyst capillary microchannels, porous membranes and porous membrane support structures are also disclosed.

NTIS

Chemical Analysis; Hydrogen Fuels; Patent Applications

20080034814 Colburn (Cantor), LLP, Bloomfield, CT, USA

Manganese Oxide Nanowires, Films, and Membranes and Methods of Making

Suib, S. L., Inventor; Yuan, J., Inventor; 6 Sep 05; 14 pp.; In English

Contract(s)/Grant(s): DE-FG02-86ER-13662-A0000

Patent Info.: Filed Filed 6 Sep 05; US-Patent-Appl-SN-11-220 340

Report No.(s): PB2008-101086; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Nanowires, films, and membranes comprising ordered porous manganese oxide-based octahedral molecular sieves, and methods of making, are disclosed. A single crystal ultra-long nanowire includes an ordered porous manganese oxide-based octahedral molecular sieve, and has an average length greater than about 10 micrometers and an average diameter of about 5 nanometers to about 100 nanometers. A film comprises a microporous network comprising a plurality of single crystal nanowires in the form of a layer, wherein a plurality of layers is stacked on a surface of a substrate, wherein the nanowires of each layer are substantially axially aligned. A free standing membrane comprises a microporous network comprising a plurality of single crystal nanowires in the form of a layer, wherein a plurality of layers is aggregately stacked, and wherein the nanowires of each layer are substantially axially aligned.

NTIS

Manganese Oxides; Membranes; Nanowires; Oxide Films; Patent Applications

20080034822 Mullinax (J. Bennett), LLC, Greenville, SC, USA; Westinghouse Savannah River Co., Aiken, SC, USA

Catalyzed Borohydrides for Hydrogen Storage

Au, M., Inventor; 17 May 05; 9 pp.; In English

Contract(s)/Grant(s): DE-AC0996-SR18500

Patent Info.: Filed Filed 17 May 05; US-Patent-Appl-SN-11-130 750

Report No.(s): PB2008-101114; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A hydrogen storage material and process is provided in which alkali borohydride materials are created which contain effective amounts of catalyst(s) which include transition metal oxides, halides, and chlorides of titanium, zirconium, tin, and combinations of the various catalysts. When the catalysts are added to an alkali borohydride such as a lithium borohydride, the initial hydrogen release point of the resulting mixture is substantially lowered. Additionally, the hydrogen storage material may be rehydrided with weight percent values of hydrogen at least about 9 percent.

NTIS

Alkalies; Borohydrides; Catalysis; Hydrogen; Patent Applications

20080034826 Brookhaven National Lab., Upton, NY USA

Quantitative Determination of Atmospheric Hydroperoxyl Radical

Springston, S. R., Inventor; Lloyd, J., Inventor; Zheng, J., Inventor; 30 Aug 04; 13 pp.; In English

Contract(s)/Grant(s): DE-AC02-98CH10886

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-930 587

Report No.(s): PB2008-101108; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for the quantitative determination of atmospheric hydroperoxyl radical comprising: (a) contacting a liquid phase atmospheric sample with a chemiluminescent compound which luminesces on contact with hydroperoxyl radical; (b) determining luminescence intensity from the liquid phase atmospheric sample; and (c) comparing said luminescence intensity

from the liquid phase atmospheric sample to a standard luminescence intensity for hydroperoxyl radical. An apparatus for automating the method is also included.

NTIS

Hydroxyl Radicals; Patent Applications; Radicals

20080034845 Float (Kenneth W.), Braselton, GA, USA

Micromachines Acoustic Sensors for Monitoring Electrochemical Deposition

Williams, F. R., Inventor; May, G. S., Inventor; 8 Aug 05; 6 pp.; In English

Contract(s)/Grant(s): NSF-EEC-9402723

Patent Info.: Filed Filed 8 Aug 05; US-Patent-Appl-SN-11-199 102

Report No.(s): PB2008-101101; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Disclosed are micromachined acoustic sensors for monitoring electrochemical deposition, methods for fabricating such sensors, and methods for in-situ monitoring of electrochemical deposition processes using such sensors. An exemplary acoustic sensor comprises a deformable silicon membrane, an encapsulated piezoelectric layer formed on the silicon membrane, and surface electrodes formed on the piezoelectric layer. The sensor and a loudspeaker may be used to calibrate an electrochemical deposition process. The acoustic response of the sensor is monitored over time with respect to plating thickness during electroplating of a sample to generate a predictive model defining the plating process. The predictive model may be used to monitor the plating thickness of other samples in real time.

NTIS

Acoustics; Deposition; Microelectromechanical Systems; Patent Applications; Signal Detectors

20080034852 Los Alamos National Lab., NM USA

Method and System for Hydrogen Evolution and Storage

Thorn, D. L., Inventor; Tumas, W., Inventor; Hay, P. J., Inventor; Schwarz, D. E., Inventor; Cameron, T. M., Inventor; 10 Jun 05; 18 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 10 Jun 05; US-Patent-Appl-SN-11-152 525

Report No.(s): PB2008-101093; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method and system for storing and evolving hydrogen employ chemical compounds that can be hydrogenated to store hydrogen and dehydrogenated to evolve hydrogen. A catalyst lowers the energy required for storing and evolving hydrogen. The method and system can provide hydrogen for devices that consume hydrogen as fuel.

NTIS

Gas Evolution; Hydrogen; Patent Applications

20080034862 California Univ., Riverside, CA, USA

Development of the SAPRC-07 Chemical Mechanism and Updated Ozone Reactivity Scales

Carter, W. P. L.; Aug. 31, 2007; 367 pp.; In English

Report No.(s): PB2008-101767; No Copyright; Avail.: National Technical Information Service (NTIS)

A completely updated version of the SAPRC-99 chemical mechanism, designated SAPRC-07, has been developed and is documented in this report. This includes a complete update of the rate constants and reactions based on current data and evaluations, reformulated and less parameterized aromatics mechanisms, a representation of chlorine chemistry, a reformulated method to represent peroxy reactions that is more appropriate for modeling secondary organic aerosol formation, and improved representations for many types of VOCs. This mechanism was evaluated against the result of approx. 2400 environmental chamber experiments carried out in 11 different environmental chambers, including experiments to test mechanisms for over 120 types of VOCs. The performance of the mechanism in simulating the chamber data was comparable to SAPRC-99, with generally satisfactory results for most types of VOCs but some increases in biases in simulations of some mixture experiments. The mechanism was used to derive an update to the MIR and other ozone reactivity scales for almost 1100 types of VOCs. The average changes in relative MIR values was about 10%, with >90% of the VOCs having changes less than 30%, but with larger changes for some types of VOCs, including halogenated compounds. Recommendations are given for future mechanism development research.

NTIS

Air Pollution; Ozone; Reaction Kinetics; Reactivity; Volatile Organic Compounds

20080034866 Quarles and Brady Streich Lang, Tucson, AZ, USA

Tea Polyphenols Bioavailability Enhancement Method

Chow, H. H. S., Inventor; 12 Sep 05; 10 pp.; In English

Contract(s)/Grant(s): NCI-NO1-CN-25119

Patent Info.: Filed Filed 12 Sep 05; US-Patent-Appl-SN-11-224 427

Report No.(s): PB2008-101188; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Methods for increasing tea polyphenol bioavailability. Dosing conditions, such as fasting for defined periods, result in greater oral bioavailability of free catechins.

NTIS

Augmentation; Patent Applications; Phenols; Tea Lasers

20080034933 Idaho National Engineering Lab., Idaho Falls, ID, USA

Actinide Targets for Neutron Cross Section Measurements

Baker, J. D.; McGrath, C. A.; Oct. 2006; 24 pp.; In English

Report No.(s): DE2007-911731; INL/EXT-06-11834; No Copyright; Avail.: Department of Energy Information Bridge

The Advanced Fuel Cycle Initiative (AFCI) and the Generation IV Reactor Initiative have demonstrated a lack of detailed neutron cross-sections for certain 'minor' actinides, those other than the most common (235U, 238U, and 239Pu). For some closed-fuel-cycle reactor designs more than 50% of reactivity will, at some point, be derived from 'minor' actinides that currently have poorly known or in some cases not measured (n,y) and (n,f) cross sections. A program of measurements under AFCI has begun to correct this. One of the initial hurdles has been to produce well-characterized, highly isotopically enriched, and chemically pure actinide targets on thin backings. Using a combination of resurrected techniques and new developments, we have made a series of targets including highly enriched 239Pu, 240Pu, and 242Pu. Thus far, we have electrodeposited these actinide targets. In the future, we plan to study reductive distillation to achieve homogeneous, adherent targets on thin metal foils and polymer backings. As we move forward, separated isotopes become scarcer, and safety concerns become greater. The chemical purification and electrodeposition techniques will be described.

NTIS

Actinide Series; Neutron Cross Sections; Neutrons; Targets

20080034941 Idaho National Engineering Lab., Idaho Falls, ID, USA

Initial Assessment of Sulfur-Iodine Process Safety Issues and How They May Affect Pilot Plant Design and Operation

Cherry, R. S.; Sep. 2006; 15 pp.; In English

Report No.(s): DE2007-911684; INL/EXT-06-1176; No Copyright; Avail.: Department of Energy Information Bridge

The sulfur-iodine process to make hydrogen by the thermochemical splitting of water is under active development as part of a U.S. Department of Energy program. An integrated lab scale system is currently being designed and built. The next planned stage of development is a pilot plant with a thermal input of about 500 kW, equivalent to about 30,000 standard liters per hour of hydrogen production. The sulfur-iodine process contains a variety of hazards, including temperatures up to 850 oC and hazardous chemical species including SO₂, H₂SO₄, HI, I₂, and of course H₂. The siting and design of a pilot plant must consider these and other hazards. This report presents an initial analysis of the hazards that might affect pilot plant design and should be considered in the initial planning. The general hazards that have been identified include reactivity, flammability, toxicity, pressure, electrical hazards, and industrial hazards such as lifting and rotating equipment. Personnel exposure to these hazards could occur during normal operations, which includes not only running the process at the design conditions but also initial inventory loading, heatup, startup, shutdown, and system flushing before equipment maintenance. Because of the complexity and severity of the process, these ancillary operations are expected to be performed frequently. In addition, personnel could be exposed to the hazards during various abnormal situations which could include unplanned phase changes of liquids or solids, leaks of process fluids or cooling water into other process streams, unintentional introduction of foreign species into the process, and unexpected side reactions. Design of a pilot plant will also be affected by various codes and regulations such as the International Building Code, the International Fire Code, various National Fire Protection Association Codes, and the Emergency Planning and Community Right-to-Know Act.

NTIS

Hydrogen Production; Iodine; Pilot Plants; Plant Design; Sulfur; Thermochemistry

20080034989 Tiffany and Bosco, Phoenix, AZ, USA

Microreactor with Controllable Pressure and Temperature for in Situ Material Investigations

McKelvy, M. J., Inventor; Diefenbacher, J., Inventor; Wolf, G. H., Inventor; Chizmeshya, A. V., Inventor; 25 Jul 03; 11 pp.; In English

Contract(s)/Grant(s): DE-IF-01262

Patent Info.: Filed 25 Jul 03; US-Patent-Appl-SN-10-523 233

Report No.(s): PB2008-100769; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A microreactor for investigation of material reactions and properties includes a core body defining a chamber adapted to contain one or more sample materials and having a fluid passageway from the chamber to the exterior of the core body. The chamber is in fluid communication with an external manifold whereby gases, liquids or fluids can be injected and their activities can be controlled externally from ambient conditions to 400 degrees Celsius and 4,500 psi. Transparent windows in the core body permit continuous visual access to the chamber, allow direct probe beam interaction with sample during a reaction or observation, and external detection of the probe beam to investigate in situ reaction processes.

NTIS

Chemical Reactors; Patent Applications

20080035017 Idaho Univ., Moscow, ID, USA

Catalytic Ignition Temperatures of Propane-Oxygen-Nitrogen Mixtures Over Platinum

Lounsbury, R.; Leichliter, K.; Steckiak, J.; Beyerlein, S.; Sep. 2007; 52 pp.; In English

Contract(s)/Grant(s): DTRS98-G-0027

Report No.(s): PB2008-100797; NIATT-N07-08; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The A platinum (Pt) wire was used to study surface reactions with fuel-lean mixtures of propane and oxygen in a plug flow reactor under low Re flow regimes. The average wire temperature, catalytic ignition temperature, power at ignition, and heat generation were determined by measuring the voltage of current supplied to 127 μm and 203 μm 'seasoned' Pt wires. The average wire temperature and catalytic ignition temperature are reported with a 3 percent error, while the average power and power at ignition are reported with an 8.5 percent error. A one-step surface reaction model was used to find values of the ratios of the sticking coefficients $\text{SO}_2/\text{O}/\text{SF}_6/\text{O} = 5.25$ plus or minus 12%, the pre-exponential constant for oxygen desorption, $\text{AO}_2/\text{D} = 1.99\text{E}12$ plus or minus 165% (1/s), and the activation energy for oxygen desorption, $\text{EO}_2/\text{D} = 47$ plus or minus 17% kJ/kmol, for propane-oxygen mixtures on Pt. These values were within the uncertainty reported for other hydrocarbon fuels. The model predicted the ignition temperature to within 1%. However, predicted rates of heat generation were as much as two orders of magnitude higher than measured. The results will assist the design and modeling of catalytic igniters used in engines burning under fuel-lean conditions. Future research will introduce water and use aqueous ethanol.

NTIS

Fuels; Gas Mixtures; Ignition; Nitrogen; Oxygen; Platinum; Plugs; Propane; Wire

20080035099 Adam K. Sacharoff, Much, Shelist, Freed, Denenberg Ament and Rubenstein, Chicago, IL, USA

Method, System and Apparatus for an Enhanced Electrically Pumped Oxygen Iodine Laser

Carroll, D. L., Inventor; Verdeyen, J. T., Inventor; Solomon, W. C., Inventor; King, D. M., Inventor; 14 Mar 05; 48 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0357; DASG60-03-0098

Patent Info.: Filed 14 Mar 05; US-Patent-Appl-SN-11-079 751

Report No.(s): PB2008-102137; No Copyright; Avail.: CASI: [A03](#), Hardcopy

In one embodiment of the present invention an oxygen iodine laser includes a gas mixing section. Ground state oxygen and a carrier gas are introduced into the first gas mixing section, sometimes separately. The laser includes a discharge region to generate at least said excited oxygen from the flow of the first gas mixing section. A sensitizer gas having a lower ionization threshold than ground state oxygen is also introduced into the first gas mixing section, such that electrons are more easily produced in the electrical generator. The laser system includes introducing a source of iodine into the excited singlet delta oxygen flow to generate a laser-active gas. In another embodiment a conditioner is placed into the gas mixing section to help mix the flow and/or introduce one or more of the aforementioned gases.

NTIS

Chemical Lasers; Chemical Oxygen-Iodine Lasers; Patent Applications

20080035184 Princeton Univ., NJ USA

Thick Film Metastable Materials via Laser Processing

Arnold, Craig B; Apr 18, 2008; 7 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0406

Report No.(s): AD-A480981; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480981>

Over course of this project, the objective has evolved based on the results obtained. In the original proposal, our objective was basically to study the interaction between the incident laser and the multiphase materials that are used in laser direct write deposition in order to produce metastable phases of materials for improved performance in a variety of applications such as energy storage and corrosion resistant systems. Based on our results described below, we extended this study in two significant ways. In the first modification, we have begun to develop a method based on a thick polymer absorbing layer to isolate the effects of mechanical and thermal stress on the transferred materials. In the second extension, we have developed methods to rapidly shape the intensity profile of the incident laser and begun preliminary studies on the effects of shape on the material response. Both of these important extensions were supported in part by AFOSR and will be continued in future studies.

DTIC

Lasers; Metastable State; Thick Films

20080035207 Army Research Lab., Aberdeen Proving Ground, MD USA

Global Mechanical Response and its Relation to Deformation and Failure Modes at Various Length Scales under Shock Impact in Alumina AD995 Armor Ceramic

Dandekar, D P; McCauley, J W; Green, W H; Bourne, N K; Chen, M W; Nov 1, 2006; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481040; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481040>

Polycrystalline aluminum oxide (Al₂O₃) based materials have both personnel and ground vehicle armor applications. However, as their ballistic performance can vary significantly it is important to identify the fundamental macro and micro mechanisms of deformation and failure in the ballistic event. This has proven elusive over the years. Using a newly developed soft recovery plate impact experiment, a multidisciplinary, multi-national collaboration has, for the first time, determined micro and macro deformation and damage mechanism maps relating the experimentally measured global mechanical response of a material through matured shock wave diagnostics to the nature of concurrent deformation and damage generated at varying length scales under shock wave loading.

DTIC

Aluminum Oxides; Armor; Ceramics; Deformation; Failure Modes; Mechanical Properties; Polycrystals

20080035214 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Electrical Activation Studies of Silicon Implanted Aluminum Gallium Nitride with High Aluminum Mole Fraction

Moore, Elizabeth A; Dec 2007; 311 pp.; In English

Report No.(s): AD-A481055; AFIT/DS/ENP/08-D01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481055>

This research demonstrates a method for producing highly conductive Si-implanted n-type aluminum gallium nitride (Al_xGa_{1-x}N) alloys, and represents a comprehensive analysis of the resulting material's electrical and optical properties as a function of Al mole fraction, anneal temperature, anneal time, and implantation dose. Highly conductive alloys are critical to the fabrication of devices operating in deep UV, high-temperature, high-power, and high-frequency environments, and thus this research is significant in regard to the application of such devices. The Al_xGa_{1-x}N wafers of this study, with Al concentrations of 10 to 50%, were implanted at room temperature with silicon ions at energies of 200 keV with doses of 1x10¹⁴, 5x10¹⁴, and 1x10¹⁵ cm⁻² and annealed from 1100 to 1350 C for 20 to 40 minutes in flowing nitrogen. Excellent activation was achieved for each of the implanted silicon doses for all of the five Al mole fractions studied, with most activation efficiencies above 90%. These activation efficiencies are the highest reported activations, to the best of my knowledge. The mobilities were found to decrease as the Al concentration of the Al_xGa_{1-x}N was increased from 10 to 50% and also as the implanted silicon dose was increased. Typical mobilities ranged from 101 cm²/V s for the Al_{0.1}Ga_{0.9}N implanted with 1x10¹⁴ cm⁻² silicon ions to 35 cm²/V s obtained for the Al_{0.5}Ga_{0.5}N implanted with 1x10¹⁵ cm⁻² silicon ions. The cathodoluminescence results support the electrical results in determining the optimal annealing conditions.

DTIC

Aluminum; Aluminum Nitrides; Electrical Properties; Gallium Nitrides; Silicon; Silicon Nitrides

20080035236 New Prague High School, NM USA

Propellantless Propulsion: The Role of Drift Transport in Asymmetrical Capacitor Thrust Production

Trettel, Steve J; Nov 1, 2006; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481114>

CONCLUSION: Thrust dependent primarily on the current applied; * Polarity was not a major factor in thrust magnitude or direction; * Results of experimentation pointed towards an ionic model for thrust.

DTIC

Asymmetry; Capacitors; Propellants; Propulsion; Propulsion System Configurations; Propulsion System Performance

20080035241 Naval Research Lab., Washington, DC USA

Surface Passivation of InAs(001) With Thioacetamide

Petrovykh, D Y; Long, J P; Whitman, L J; Jan 2005; 4 pp.; In English

Report No.(s): AD-A481123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481123>

We describe the passivation of InAs(001) surfaces with thioacetamide (CH₃CSNH₂ or TAM) as an alternative to the standard sulfur passivation using inorganic sulfide (NH₄)₂Sx. Quantitative comparison using x-ray photoelectron spectroscopy (XPS) demonstrates that TAM passivation dramatically improves the stability against reoxidation in air compared with the inorganic sulfide, with little to no etching during the treatment. We find that TAM passivation preserves the intrinsic surface charge accumulation layer, as directly confirmed with laser-induced photoemission. Overall, TAM appears to provide superior passivation for electronic device and sensing applications.

DTIC

Acetic Acid; Amides; Indium Arsenides; Passivity

20080035247 Naval Research Lab., Washington, DC USA

Very-Loong Wave Ternary Antimonide Superlattice Photodiode With 21 Micrometers Cutoff

Aifer, E H; Jackson, E M; Boishin, G; Whitman, L J; Vurgaftman, I; Meyer, J R; Culbertson, J C; Bennett, B R; Jun 23, 2003; 4 pp.; In English

Report No.(s): AD-A481131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481131>

We describe a ternary antimonide superlattice photodiode with a 21 micrometers cutoff wavelength. The active region consists of 150 periods of 10 monolayers (MLs) of In_{0.07}Ga_{0.93}Sb and 19 MLs of InAs with InSb-like interfacial bonds. The device has a detectivity of $3 * 10^{(exp 9)}$ cm/Hz/W, dynamic impedance-area product of 0.18 ω sq cm, and peak external quantum efficiency of 3% at 40 K. X-ray diffraction and cross-sectional scanning tunneling microscopy show the structure to have a high degree of order with abrupt interfaces. A simulation of the absorption spectrum effectively reproduces the observed spectrum.

DTIC

Antimonides; Photodiodes; Superlattices

20080035248 Naval Research Lab., Washington, DC USA

Engineering Electron and Hole Tunneling With Asymmetric InAs Quantum Dot Molecules

Bracker, A S; Scheibner, M; Doty, M F; Stinaff, E A; Ponomarev, I V; Kim, J C; Whitman, L J; Reinecke, T L; Gammon, D; Jan 2006; 4 pp.; In English

Report No.(s): AD-A481134; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481134>

Most self-assembled quantum dot molecules are intrinsically asymmetric with inequivalent dots resulting from imperfect control of crystal growth. The authors have grown vertically aligned pairs of InAs/GaAs quantum dots by molecular beam epitaxy, introducing intentional asymmetry that limits the influence of intrinsic growth fluctuations and allows selective tunneling of electrons or holes. They present a systemic investigation of tunneling energies over a wide range of interdot barrier thickness. The concepts discussed here provide an important tool for the systematic design and characterization of more complicated quantum dot nanostructures.

DTIC

Asymmetry; Electron Tunneling; Gallium Arsenides; Molecules; Quantum Dots

20080035250 Naval Research Lab., Washington, DC USA

Thermal Conductivity of AlAs(0.07)Sb(0.93) and Al(0.9)Ga(0.1)As(0.07)Sb(0.93) Alloys and (AlAs)₁/(AlSb)₁₁ Digital-Alloy Superlattices

Borca-Tasciuc, T; Song, D W; Meyer, J R; Vurgaftman, I; Yang, M J; Nosh, B Z; Whitman, L J; Lee, H; Martinelli, R U; Turner, G W; Nov 1, 2002; 6 pp.; In English

Report No.(s): AD-A481139; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481139>

A differential 3 omega technique is employed to determine the thermal conductivity of the AlAs_{0.07}Sb_{0.93} ternary alloy, the Al_{0.9}Ga_{0.1}As_{0.07}Sb_{0.93} quaternary alloy, and an (AlAs)₁/(AlSb)₁₁ digital-alloy superlattice. Between 80 and 300 K, the thermal conductivities for all three samples are relatively insensitive to temperature. The thermal conductivity of the (AlAs)₁/(AlSb)₁₁ superlattice is smaller than that of the AlAs_{0.07}Sb_{0.93} ternary alloy, but much larger than the predictions of a model for phonon transport across the superlattice interfaces.

DTIC

Alloys; Aluminum Alloys; Aluminum Arsenides; Aluminum Gallium Arsenides; Antimony; Superlattices; Thermal Conductivity

20080035251 Naval Research Lab., Washington, DC USA

Ferromagnetic GaSb/Mn Digital Alloys

Luo, H; Kim, G B; Cheon, M; Chen, X; Na, M; Wang, S; McCombe, B D; Liu, X; Sasaki, Y; Wojtowicz, T; Jan 2004; 9 pp.; In English

Contract(s)/Grant(s): N00014-00-1-0951

Report No.(s): AD-A481140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481140>

In order to realize spintronic devices in narrow-gap semiconductors, we have carried out studies on the well-known InAs/GaSb-based materials and structures. As a key component to such devices, GaSb/Mn digital alloys were successfully grown by molecular beam epitaxy. Good crystal quality was observed with transmission electron microscopy showing well-resolved Mn-containing layers and no evidence of 3D MnSb precipitates in as-grown samples. Ferromagnetism was observed in GaSb/Mn digital alloys with temperature-dependent hysteresis loops in magnetization up to 400 K (limited by the experimental setup). Magnetotransport studies were also carried out, both in the conventional Hall-bar configuration, and on gated Hall-bar structures. Both anomalous Hall effect and tunable ferromagnetism with applied gate bias were investigated. Annealing studies of the digital alloys reveal evidence of migration of Mn atoms at elevated temperatures.

DTIC

Ferromagnetic Materials; Ferromagnetism; Gallium Antimonides; Magnesium Alloys; Manganese Alloys

20080035252 Naval Research Lab., Washington, DC USA

Evolution of GaSb epitaxy on GaAs(001)-c(4 x 4)

Thibado, P M; Bennett, B R; Twigg, M E; Shanabrook, B V; Whitman, L J; Jan 22, 1996; 6 pp.; In English

Report No.(s): AD-A481141; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481141>

The growth of GaSb films by molecular beam epitaxy on GaAs(001)-c(434) at 490 C has been studied in situ with scanning tunneling microscopy and ex situ with transmission electron microscopy. As the film is deposited, four distinct growth regimes are observed: the first two monolayers grow layer by layer with platelet-like two-dimensional (2D) islands; the next monolayer forms coherently strained three-dimensional (3D) quantum dots; further deposition induces film relaxation and rough 3D growth; for film thicknesses .100 nm the growth is again 2D, proceeding via spiral growth around emerging threading dislocations. The atomic-scale mechanisms inherent in the transitions between the growth regimes are discussed. Variations in growth procedures aimed at improving the quantum dot uniformity and reducing the dislocation density are proposed.

DTIC

Electron Microscopy; Epitaxy; Gallium Antimonides; Molecular Beam Epitaxy

20080035253 National Inst. of Standards and Technology, Gaithersburg, MD USA

Base-Dependent Competitive Adsorption of Single-Stranded DNA on Gold

Kimura-Suda, Hiromi; Petrovykh, Dmitri Y; Tarlov, Michael J; Whitman, Llyod J; Jan 2003; 3 pp.; In English

Report No.(s): AD-A481143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481143>

Single-stranded DNA probes (ssDNA) immobilized on gold surfaces are a common element in many biotechnology and nanotechnology applications. Although recent studies have shown that different DNA bases and homo-oligonucleotides interact differently with Au surfaces, competitive interactions among the bases, which will occur in most practical applications, have not been systematically addressed. Here, we examine room-temperature adsorption of homo-oligonucleotides onto polycrystalline Au films, including competitive adsorption between all possible pairs of such unmodified oligomers. Homo-oligonucleotides serve as a model system that allows us to systematically study the base- and length dependence of ssDNA-Au interactions, while maintaining most properties of practical ssDNA probes. We characterize the adsorption ex-situ using Fourier transform infrared (FTIR) spectroscopy and X-ray photoelectron spectroscopy (XPS), two methods that together provide unambiguous spectral signatures of the different bases and allow absolute surface densities to be determined.

DTIC

Adsorption; Deoxyribonucleic Acid; Gold

20080035272 Northwestern Univ., Evanston, IL USA

Structure of GaSb Digitally Doped With Mn

Boishin, G I; Sullivan, J M; Whitman, L J; May 31, 2005; 5 pp.; In English

Contract(s)/Grant(s): N00014-00-1-0951

Report No.(s): AD-A481205; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481205>

Cross-sectional scanning tunneling microscopy (XSTM) and density functional theory have been used to characterize the structure of GaSb digitally doped with Mn. The Mn dopants are found in both isolated substitutional form as well as in large clusters of zinc-blende MnSb commensurate with the surrounding GaSb matrix. Theoretical calculations predict that these two forms of Mn in the digitally doped layers will have a very different appearance in XSTM images. Substitutional Mn enhances the local density of states near the surface, thus appearing higher in a filled-state image. In contrast, MnSb clusters induce substantial structural relaxation at the {110} surface, and therefore appear as localized depressed regions with negligible perturbation of the surrounding GaSb.

DTIC

Additives; Doped Crystals; Electron Microscopy; Gallium Antimonides

20080035329 Army Engineer Research and Development Center, Vicksburg, MS USA

Molecular Structure Determines Chemical Reactivities and, Thus, Transformation Pathways

Qasim, Mohammad; Honea, Patricia; Gorb, Leonard; Leszczynski, Jerzy; Nov 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481237; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Structural reactivities of a nitroaromatic and heterocyclic nitramines were compared under selected reaction conditions, with 2,4,6- trinitrotoluene (TNT) as the exemplar of nitroaromatic; hexahydro-1,4,5-trinitro-1,3,5- triazine (RDX) and octahydro-1,3,5-tetranitro- 1,3,5,7-tetrazocine (HMX) exemplifying the heterocyclic nitramine; and 2,4,6,8,10,12-hexanitrohexaazoisowurtzitane representing cage heterocyclic nitramine explosives. The hypothesis that molecular structure determines chemical reactivities and transformations was supported through a combination of computational chemistry (CC) and spectroscopic techniques. This combination of predictive and analytical tools addresses the DoD need for fast and accurate techniques to assess environmental transport and impact of toxicity.

DTIC

Chemical Reactions; Molecular Orbitals; Molecular Structure; Reaction Kinetics

20080035335 Naval Research Lab., Washington, DC USA

Origins of Interfacial Disorder in GaSb/InAs Superlattices

Thibado, P M; Bennett, B R; Twigg, M E; Shanabrook, B V; Whitman, L J; Dec 11, 1995; 4 pp.; In English

Report No.(s): AD-A481245; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The interface surfaces of short-period GaSb/InAs superlattices grown by molecular beam epitaxy have been studied in situ

with scanning tunneling microscopy. Migration enhanced epitaxy was used at the interfaces in order to control bond type. Interfaces on GaSb(001) are found to be smoother than those on strained InAs(001), and the InSb-like interfaces are smoother than GaAs-like ones. The primary source of disorder at these interfaces appears to be the kinetically determined topography of the growth surfaces, with intermixing playing a secondary role.

DTIC

Gallium Antimonides; Indium Arsenides; Indium Gallium Arsenides; Molecular Beam Epitaxy; Superlattices

20080035337 Naval Research Lab., Washington, DC USA

Interfacial Disorder in InAs/GaSb Superlattices

Twigg, M E; Bennett, B R; Thibado, P M; Shanabrook, B V; Whitman, L J; Jan 1998; 25 pp.; In English

Report No.(s): AD-A481247; XB-NRL/MR/6100; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have addressed the question of interfacial disorder in InAs/GaSb superlattices (SLs) grown by molecular-beam epitaxy using high-resolution transmission electron microscopy, Raman spectroscopy, X-ray diffraction, and in-situ scanning tunnelling microscopy (STM). Our analysis indicates that InSblike interfaces have a roughness of 1 monolayer (ML), for a SL grown on a GaSb buffer layer. For GaAs-like interfaces, however, the interface roughness is found to be 2 ML when the SL is grown on a GaSb buffer. For SLs grown on an InAs buffer, the roughness of GaAs-like interfaces (3ML) is also greater than that of InSb-like interfaces (2ML). These results suggest two general observations. The first is that GaAs-like interfaces are rougher than InSb-like interfaces. This difference may be due to the high surface energy of GaAs compared with InSb or to differences in surface kinetics. These observations are supported by in-situ STM results showing that the growth front surface morphology, for both GaSb and InAs layers, is rougher for GaAs-like interfaces than for InSb-like interfaces. We have also found that interface roughness is greater for an InAs/GaSb SL grown on an InAs buffer layer than for the same SL grown on a GaSb buffer layer. This difference in interface roughness may arise because InAs SL layers are in tension when grown on a GaSb buffer layer, whereas GaSb SL layers are under compression when grown on an InAs buffer layer.

DTIC

Epitaxy; Gallium Antimonides; Indium Arsenides; Molecular Beam Epitaxy; Superlattices

20080035339 Naval Research Lab., Washington, DC USA

Step Structure and Surface Morphology of Hydrogen-Terminated Silicon: (001) to (114)

Laracuate, A R; Whitman, L J; Jan 2003; 16 pp.; In English

Report No.(s): AD-A481249; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have determined the equilibrium step structures and surface morphology for the whole range of monohydride-terminated (0 0 1) -terrace-plus-step silicon surfaces using scanning tunneling microscopy. The transformation in the equilibrium Si surface morphology caused by H-termination can be categorized into three different regimes delineated by the types of steps present on the clean surfaces. On nominal Si(0 0 1), the single-layer height B-type steps (SB) are mostly non-rebonded and rougher after H passivation. On surfaces dominated by double-layer height B-type steps (DB), such as Si(1 1 1 1), the non-rebonded DB and SB steps show a lower formation energy. Measurements on post-annealed surfaces indicate that the DB step formation energies strongly depend on H chemical potential. Smoother morphologies are observed following H-termination of surfaces oriented approximately between (1 1 7) and (1 1 4). This effect is quite apparent on Si(1 1 5), where the monohydride surface exhibits large (1 1 5)-(2 2) domains, a structure not observed on the clean surface. All of these structural modifications result directly from a change in the relative energies of the possible single- and double-layer step configurations.

DTIC

Electron Microscopy; Hydrogen; Morphology; Scanning Tunneling Microscopy; Silicon; Surface Properties

20080035345 Naval Research Lab., Washington, DC USA

Arsenic Cross-Contamination in GaSb/InAs Superlattices

Jackson, E M; Boishin, G I; Aifer, E H; Bennett, B R; Whitman, L J; Aug 2004; 9 pp.; In English

Report No.(s): AD-A481264; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have investigated the cross-contamination of As in GaSb/InAs superlattices. We demonstrate a method of varying the lattice constant of the superlattice. By controlling the As background pressure in the growth chamber, the strain can be

controlled to about 0:01%, corresponding to As cross-incorporation variations of about +/-1%. The distribution of As is investigated by X-ray diffraction and cross-sectional scanning tunneling microscopy, and the critical thickness is obtained.
DTIC

Arsenic; Contamination; Crystal Lattices; Gallium Antimonides; Superlattices

20080035354 Missouri Univ., Columbia, MO USA

Nanostructured Energetic Materials

Shende, R V; Subramanian, S; Hasan, S; Apperson, S; Gangopadhyay, K; Gangopadhyay, S; Redner, P; Kapoor and, D; Nicolich, S; Nov 2006; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481290; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper reports synthesis of metastable intermolecular composite (MIC) containing CuO nanorods, nanowires combined with aluminum nanoparticles. These composites were prepared using ultrasonic mixing and self-assembly approach. The combustion wave speed as high as 2300 100 m/s was achieved for the MIC composites. We also report that the combustion wave speed can be easily tuned from 1 m/s to 2300 m/s for the nanoenergetic composites prepared using mesoporous Fe₂O₃ gel, nanoparticles of WO₃, MoO₃, Bi₂O₃, and CuO mixed with Al-nanoparticles and addition of other chemicals in nanoscale. Tunable combustion speed is found to depend not only on the type of oxidizer but also on the nanostructural arrangement present in the energetic composites.

DTIC

Combustion; Composite Materials; Explosives; Nanostructures (Devices)

20080035368 Montana State Univ., Bozeman, MT USA

Dynamics of Hyperthermal Collisions of O(3P) with CO (Preprint)

Brunsvold, Amy L; Upadhyaya, Hari P; Zhang, Jianming; Cooper, Russell; Minton, Timothy K; Braunstein, Matthew; Duff, James W; Jul 17, 2007; 59 pp.; In English

Contract(s)/Grant(s): F04611-03-C-0015; HQ0006-05-2-0001; Proj-BMSB

Report No.(s): AD-A481341; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The dynamics of O(3P) + CO collisions at a hyperthermal collision energy of 83 kcal mol⁻¹ have been studied with a crossed molecular beams experiment and with quasiclassical trajectory calculations on computed potential energy surfaces. In the experiment, a rotatable mass spectrometer detector was used to monitor inelastically and reactively scattered products as a function of velocity and scattering angle. From these data, center-of-mass (c.m.) translational energy and angular distributions were derived for the inelastic and reactive channels. Isotopically labeled C¹⁸O was used to distinguish the reactive channel (16O + C¹⁸O -> 16OC + 18O) from the inelastic channel (16O + C¹⁸O -> 16O + C¹⁸O). The reactive 16OC molecules scattered predominantly in the forward direction-i.e., in the same direction as the velocity vector of the reagent O atoms in the c.m. frame. The c.m. translational energy distribution of the reactively scattered 16OC and 18O was very broad, indicating that 16OC is formed with a wide range of internal energies, with an average internal excitation of 60 percent of the available energy. The c.m. translational energy distribution of the inelastically scattered C¹⁸O and 16O products indicated that an average of 15 percent of the collision energy went into internal excitation of C¹⁸O, although a small fraction of the collisions transferred nearly all the collision energy into internal excitation of C¹⁸O. The theoretical calculations, which extend previously published results on this system, predict c.m. translational and angular distributions that are in near quantitative agreement with the experimentally derived distributions. The theoretical calculations, thus validated by the experimental results, have been used to derive internal state distributions of scattered CO products and to probe in detail the interactions that lead to the observed dynamical behavior.

DTIC

Chemical Reactions; Collisions; Oxygen; Upper Atmosphere

20080035390 Army Tank-Automotive and Armaments Command, Warren, MI USA

Wide Bandgap Superlattice Power Devices for Army Hybrid Electric Power Systems

Burke, T; Khalil, G; White, J; Wang, C G; Donegan, K; Weidenheimer, D; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481406; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The size, eight, performance and thermal management of hybrid-electric power systems are limited by the performance of available silicon power devices. Potential improvements afforded by wide bandgap silicon carbide devices have been confirmed in Army programs, but the commercially available material severely limits performances. Superlattice silicon

carbide material addresses the key limitations of this material; quality, size, cost, and incompatibility with silicon processing. Wide bandgap superlattice silicon carbide material has recently been grown on 4-inch diameter silicon substrates by NanoDynamics-88, Inc/C9 Corp.

DTIC

Electric Power Supplies; Energy Gaps (Solid State); Superlattices

20080035436 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Carbon Fiber Obscurant: Enhancing Warfighter Effectiveness While Meeting Environmental Regulations

Phillips, Carlton T; Checkai, Ronald T; Kuperman, Roman G; Simini, Michael; Chester, Nancy A; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481498; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although the battlefield scenario has changed over the last decade, the need still exists for an obscurant capable of countering enemy weapon strikes. A millimeter-wave (MMW) material obscuring in the 9-96 GMz range of the electromagnetic spectrum has become critical for the modern Warfighter in order to minimize radar detection by hostile forces, thus saving lives and equipment. To meet this end, the Warfighter must be highly trained in all tasks across the spectrum of military operations. These Warfighters will need demanding, highly realistic training to obtain this capability. This increased training will lead to increased releases into the environment of obscurants at training sites. An uncoated carbon fiber obscurant (CFO) has been developed for a new module of the M56E1 smoke generation system. In order to field this new capability in 2008, we investigated the potential for environmental impacts of CFO in soil thereby supporting thorough environmental analysis and documentation with the goals of: 1) minimal restrictions on troop testing and training, and 2) sustainable range use.

DTIC

Carbon Fibers; Countermeasures; Electromagnetic Spectra; Occultation; Regulations

20080035474 National Inst. of Standards and Technology, Gaithersburg, MD USA

Structure and Extinction of Low Strain Rate Non-Premixed Flames by an Agent in Microgravity

Hamins, A.; Bundy, M.; Oh, C. B.; Fuss, S. P.; Logue, J.; Sep. 2007; 182 pp.; In English

Report No.(s): PB2008-101882; NISTIR-7445; No Copyright; Avail.: National Technical Information Service (NTIS)

This final report describes the study that has been supported through the National Aeronautics and Space Administration (NASA) microgravity grants program from February 2004 through March 2007. This work was a continuation of a NASA microgravity grant that was active from February 1999 through September 2003. The work has used computations and measurements to investigate the structure and suppression of low strain rate non-premixed flames. This final report, on the latest grant, includes a summary of the work done on the contract and a list of publications.

NTIS

Diffusion Flames; Extinction; Microgravity; Premixed Flames; Strain Rate

20080035475 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Nanosensors Based on Functionalized Nanoparticles and Surface Enhanced Raman Scattering

Talley, C. E., Inventor; Huser, T. R., Inventor; Hollars, C. W., Inventor; Lane, S. M., Inventor; Satcher, J. H., Inventor; 7 Sep 04; 14 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed Filed 7 Sep 04; US-Patent-Appl-SN-10-935 783

Report No.(s): PB2008-101687; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Surface-Enhanced Raman Spectroscopy (SERS) is a vibrational spectroscopic technique that utilizes metal surfaces to provide enhanced signals of several orders of magnitude. When molecules of interest are attached to designed metal nanoparticles, a SERS signal is attainable with single molecule detection limits. This provides an ultrasensitive means of detecting the presence of molecules. By using selective chemistries, metal nanoparticles can be functionalized to provide a unique signal upon analyte binding. Moreover, by using measurement techniques, such as, ratiometric received SERS spectra, such metal nanoparticles can be used to monitor dynamic processes in addition to static binding events. Accordingly, such nanoparticles can be used as nanosensors for a wide range of chemicals in fluid, gaseous and solid form, environmental sensors for pH, ion concentration, temperature, etc., and biological sensors for proteins, DNA, RNA, etc.

NTIS

Infrared Spectroscopy; Nanoparticles; Patent Applications; Raman Spectra; Surface Properties

20080035490 Environmental Protection Agency, Cincinnati, OH, USA

Electrochemical Remediation Technologies (ECRTs) - In Situ Remediation of Contaminated Marine Sediments

Jun. 2007; 74 pp.; In English

Report No.(s): PB2008-101564; EPA/540/R-04/507; No Copyright; Avail.: National Technical Information Service (NTIS)

This Innovative Technology Evaluation Report summarizes the results of the evaluation of the Electrochemical Remediation Technologies (ECRTs) process, developed by P2-Soil Remediation, Inc. (in partnership with Weiss Associates and Electro-Petroleum, Inc.). This evaluation was conducted between August 2002 and March 2003 in cooperation with the Washington State Department of Ecology (Ecology). The ECRTs demonstration consisted of an evaluation of ECRTs process to utilize a DC/AC current passed between an electrode pair (anode and cathode) in sediment in order to mineralize organic contaminants through an ElectroChemicalGeoOxidation(ECGO)process, orcomplex,mobilize,and remove metal contaminants deposited at the electrodes through the Induced Complexation (IC) process. The demonstration of the ECRTs process was conducted at the Georgia Pacific, Inc. (G-P) Log Pond located along the Whatcom Waterway in Bellingham Bay, Bellingham, Washington. This demonstration was designed to assess and evaluate the ability of the ECRTs process to reduce concentrations of mercury, PAHs, and phenolic compounds.

NTIS

Contamination; Sediments; Electrochemistry; Ecology

20080035491 EnDyna, Inc., McLean, VA, USA; Science Applications International Corp., Reston, VA, USA

QSAR/VFAR Workshop, Summary Report

Siddhanti, S.; Baier-Anderson, C.; Aug. 2007; 100 pp.; In English

Report No.(s): PB2008-101566; EPA/600/R-07/095; No Copyright; Avail.: CASI: [A05](#), Hardcopy

The overarching goal of this workshop was to evaluate the potential uses of QSAR and VFAR to advance the rapid and efficient evaluation of chemicals and microbes of potential concern. To achieve this goal, the QSAR/VFAR workshop convened toxicologists, microbiologists, chemists, engineers, biostatisticians, pharmacologists, biochemists, and risk assessment scientists to discuss the state of the science, opportunities for advancement, and practical applications. Expert panel members included researchers with expertise ranging from microbial genomics to computational toxicology and risk assessment. The workshop also included EPA scientists with expertise in the development and application of QSAR and VFAR. To facilitate discussion at the workshop, a list of charge questions was made available to the expert panel and the workshop participants.

NTIS

Toxicology; Risk Assessment

20080035496 Army Research Lab., Adelphi, MD USA

A Vertically Integrated Power & Energy CTA Effort to Insert a SiC JBS Diode into an FCS Inverter Circuit

Jones, K A; Zheleva, T S; Chow, T P; Khanishian, E; Richmond, J; Vispute, R D; Nov 1, 2006; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481038; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481038>

SiC JBS diodes were developed to replace silicon diodes in a 600A/1200V module integrated into a 3-phase inverter. The module was tested using both types of diodes, and it was shown that the module with the SiC diodes were more efficient. The diodes were developed using modeling techniques, and the procedures for fabricating the diodes were improved by optimizing the ion implant doses and the procedures for activating them.

DTIC

Avalanche Diodes; Circuits; Combat; Diodes; Direct Current; Inserts; Inverters; Silicon; Systems Integration

20080035502 Belgrade Univ., Macedonia

Multiphysics Modeling of Electric-Swing Adsorption System with In-Vessel Condensation (POSTPRINT)

Petkovska, Menka; Antov-Bozalo, Danijela; Markovic, Ana; Sullivan, Patrick D; Apr 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA4819-07-D-0001; Proj-4918

Report No.(s): AD-A481071; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481071>

Mathematical modeling of an Electric-Swing Adsorption (ESA) system (adsorption cycle with electrothermal desorption)

step, performed by direct heating of the adsorbent particles by passing electric current through them), with annular, radial-flow, cartridge-type fixed-bed and in-vessel condensation, is performed by using Comsol Multiphysics software. Three multiphysics models are built, in order to describe three stages of a complete ESA cycle: adsorption, electrothermal desorption before the start of condensation and electrothermal desorption with in-vessel condensation. In order to describe the complete ESA cycle the models for the three stages are integrated, by using a combination of Comsol Multiphysics and Matlab. The models were successfully used for simulation of separate stages of the process and of the complete ESA cycles, as well as for investigation of the influences of the main operational parameters on the process performance.

DTIC

Adsorption; Electric Current; European Space Agency; Mathematical Models

20080035555 Army Communications-Electronics Command, Fort Belvoir, VA USA

Numerical 3D Model for Thermal Integration of 20W Methanol Reformer

Blackwell, N E; Palo, D R; Nov 1, 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481392; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Collaborative U. S - Army and U. S. Department of Energy efforts have developed advanced methanol reforming capabilities to enhance production of hydrogen for soldier portable fuel cell systems. Application of advanced numerical techniques combined with empirical data from iterative breadboard measurements has provided the US Army with an 8.5x2x0.8 cm 20W methanol reformer for Future Force Warrior and Future Combat Systems. Fuel cell technology development is being pursued around the world to provide electric power in many potential applications in the military and commercial sector. These applications range in size from milli-watts to mega-watts. Major investments are being made to develop fuel cell systems for mobile use and for stand-by power applications. Near-term Future Combat System (FCS) mobile platforms, Future Force Warrior and commercial automotive use are predominantly focused on the Proton Exchange Membrane (PEM) fuel cell technology. For the stand-by/residential power applications, investments are being made in both PEM and Solid Oxide Fuel Cell (SOFC) technologies. However, the closest to market for the military, commercial and residential/standby power applications is judged to be PEM technology.

DTIC

Fuel Cells; Hydrogen; Mathematical Models; Methyl Alcohol; Three Dimensional Models

20080035607 Greenlee Winner and Sullivan, P.C., Boulder, CA, USA

Monitoring Signal-To-Noise Ratio in X-ray Diffraction Data

Wang, B. C., Inventor; Fu, Z. Q., Inventor; Rose, J. P., Inventor; 14 Jul 03; 14 pp.; In English

Contract(s)/Grant(s): NIH-P50GM06240703

Patent Info.: Filed Filed 14 Jul 03; US-Patent-Appl-SN-10-520 777

Report No.(s): PB2008-102025; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention relates to methods of diffractometrically determining the structures of materials by characterizing their electron density distributions. More particularly, the present invention relates to methods of collecting, processing and interpreting X-ray diffraction data, which allow real time evaluation of the signal-to-noise ratio in crystal diffraction experiments. The present methods related to the derivation of statistical indices for monitoring and evaluating signal-to-noise ratios in diffraction experiments. In addition, the present invention provides methods of determining the electron density distributions of crystals using anomalous scattering signals corrected for noise. Further, the present invention provides methods of increasing the signal-to-noise ratios in X-ray diffraction data.

NTIS

Density Distribution; Electron Density (Concentration); Patent Applications; Signal to Noise Ratios; X Ray Diffraction

20080035610 Wilmer Cutler Pickering Hale and Dorr, LLP, New York, NY, USA; Research Triangle Inst., Durham, NC, USA

Attrition Resistant, Zinc Titanate-Containing, Reduced Sorbents and Methods of Use Thereof (PAT-APPL-10-790 920)

Vierheilig, A. A., Inventor; Gupta, R. P., Inventor; Turk, B. S., Inventor; 2 Mar 04; 17 pp.; In English

Contract(s)/Grant(s): DE-FG02-96ER82189

Patent Info.: Filed Filed 2 Mar 04; US-Patent-Appl-SN-10-790 920

Report No.(s): PB2008-102031; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Reduced sulfur gas species (e.g., H(sub 2)S, COS and CS(sub 2)) are removed from a gas stream by compositions wherein a zinc titanate ingredient is associated with a metal oxide-aluminate phase material in the same particle species. Nonlimiting

examples of metal oxides comprising the compositions include magnesium oxide, zinc oxide, calcium oxide, nickel oxide, etc.
NTIS

Cleaning; Coal Gasification; Desulfurizing; Gas Composition; High Temperature Gases; Patent Applications; Sorbents; Sulfur; Titanates; Zinc; Zinc Compounds

20080035614 UT-Battelle, LLC, Oak Ridge, TN, USA

Thermal Electrochemical Synthesis Method for Production of Stable Colloids of ‘Naked’ Metal Nanocrystals

Hu, M. Z., Inventor; Easterly, C. E., Inventor; 16 Jun 05; 23 pp.; In English

Contract(s)/Grant(s): DE-AC05-000R22725

Patent Info.: Filed Filed 16 Jun 05; US-Patent-Appl-SN-11-154 973

Report No.(s): PB2008-102041; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of making a colloiddally stable suspension of naked metal nanocrystals includes the steps of: at least partly immersing a metallic sacrificial anode and a cathode into a body of essentially contaminant-free water, the metallic sacrificial anode that includes an essentially contaminant-free metal starting material for making nanocrystals; and applying a voltage potential across the anode and the cathode to form a colloiddally stable suspension of naked metal nanocrystals composed essentially of metal from the metallic sacrificial anode.

NTIS

Colloids; Electrochemical Synthesis; Nanocrystals; Patent Applications; Synthesis (Chemistry)

20080035645 Hoffmann and Baron, LLP, Syosset, NY, USA

Multifunctional Biosensor Based on ZnO Nanostructures (PAT-APPL-11-119 475)

Lu, Y.; Zhang, Z.; Emanetoglu, N. W.; Inouye, M.; Mirochnitchenko, O.; [2008]; 13 pp.; In English

Contract(s)/Grant(s): NSF CCR-0103096; NSF ECS-0088549

Report No.(s): PB2008-101686; PAT-APP-11-119 475; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention provides the multifunctional biological and biochemical sensor technology based on ZnO nanostructures. The ZnO nanotips serve as strong DNA or protein molecule binding sites to enhance the immobilization. Patterned ZnO nanotips are used to provide conductivity-based biosensors. Patterned ZnO nanotips are also used as the gate for field-effect transistor (FET) type sensors. Patterned ZnO nanotips are integrated with SAW or BAW based biosensors. These ZnO nanotip based devices operate in multimodal operation combining electrical, acoustic and optical sensing mechanisms. The multifunctional biosensors can be arrayed and combined into one biochip, which will enhance the sensitivity and accuracy of biological and biochemical detection due to strong immobilization and multimodal operation capability. Such biological and biochemical sensor technology are useful in detection of RNA-DNA, DNA-DNA, protein-protein, protein-DNA and protein-small molecules interaction. It can be further applied for drug discovery, and for environmental monitoring and protection.

NTIS

Bioinstrumentation; Nanostructures (Devices); Patent Applications; Zinc Oxides

20080036053 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Technology Review of Detection Equipment for Chemical Agents and Toxic Industrial Chemicals

Boone, C. M.; June 2008; 90 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 014.17717

Report No.(s): TNO-DV 2008 P107; TD2008-0040; Copyright; Avail.: Other Sources

This report was written for the EU project IMPACT (Innovative Measures for the Protection Against CBRN Terrorism) in 2005, and is now delivered (unchanged) in the V502 project Residual Contamination Risk. The report presents a review and evaluation of commercially available equipment for detection of classical chemical warfare agents and toxic industrial chemicals. Nine detection technologies are described. Each chapter gives a short overview over the basic principles of the detection technology relevant for the detection of chemical agents, followed by a description of the specific characteristics of commercially available detection equipment employing that technology. In the chapters, the described detection technology is assessed with respect to their suitability as well as their limitations towards detection of classical chemical warfare agents and toxic industrial chemicals. For each detector, technical specifications and characteristics are described.

Author

Chemical Warfare; Detection; Terrorism; Toxicity

20080036088 Army Tank-Automotive Research and Development Command, Warren, MI USA

Modeling JP-8 Fuel Effects on Diesel Combustion Systems

Schihl, Peter; Hoogterp, Laura; Pangilinan, Harold; Schwarz, Ernest; Bryzik, Walter; Nov 1, 2006; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481082; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481082>

The U.S. Army currently utilizes Jet Propulsion 8 (JP-8) and Diesel Fuel number 2 (DF-2) as the two prime fuels for ground mobility applications. These two fuels have significant physicochemical property differences (such as density, distillation curve, and cetane number) that may result in fuel-affected varying combustion behavior in diesel engines under various operating conditions. Since engine manufacturers rely solely on DF-2 for commercial vehicle applications most domestic industry, university, and national laboratory led diesel engine combustion system research activities have not encompassed JP fuels. Instead, much effort has been spent exploring DF-2 evaporation behavior, pre-ignition kinetics, high pressure spray formation and subsequent energy release processes, particulate matter formation and oxidation, and nitrous oxide formation pathways under diesel relevant pressures and temperatures. To date, there is little information published on the topic of JP-8 spray combustion though some activities have recently begun to address specific sub-processes including low temperature chemistry, ignition chemistry, and turbulent flame speed, but at thermodynamic conditions near the lower end of typical diesel combustion conditions.

DTIC

Combustion; Diesel Fuels; Fuel Combustion; Jet Engine Fuels; JP-8 Jet Fuel

20080036126 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Charlotte Middle School Mercury Incident, Charlotte, Eaton County, Michigan

January 2007; 9 pp.; In English

Report No.(s): PB2008-102314; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The Michigan Department of Community Health (MDCH) was asked by the Barry-Eaton District Health Department to determine if a health hazard existed and to provide assistance with a school mercury spill. This health consultation documents the actions taken by the MDCH, and the recommendations made for cleanup activities.

NTIS

Health; Michigan; Schools; Spilling; Hazards

20080036130 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: Bay Harbor Cement Kiln Dust Seep Discharge, Bay Harbor, Emmet County, Michigan

Apr. 04, 2005; 18 pp.; In English

Report No.(s): PB2008-102317; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The Federal Agency for Toxic Substances and Disease Registry (ATSDR) and the Michigan Department of Community Health (MDCH) have a cooperative agreement to conduct public health assessments of potential health hazards at sites of environmental chemical contamination within the State of Michigan. In 2004, the USA Environmental Protection Agency (EPA) requested the assistance of the MDCH to complement their activities focused on the contamination seeping into Lake Michigan in the lakeshore area near a former Penn-Dixie cement plant operation. The EPA was initiating an investigation of the impact of the cement kiln dust (CKD) leachate on the community and environment and asked MDCH to provide support in conjunction with ATSDR and local health agency representatives. This Public Health Consultation addresses the potential human health hazard associated with exposure to the contamination seeping onto the beach and into the water in the Bay Harbor area approximately seven miles west of the city of Petoskey.

NTIS

Cements; Contamination; Dust; Harbors; Hazards; Health; Lake Michigan; Michigan; Public Health; Toxic Diseases

20080036133 Fulbright and Jaworski, LLP, Austin, TX, USA

Cyclic Peptides and Antibodies Thereof

Tam, J. P., Inventor; Pool, C., Inventor; Zhang, Y., Inventor; Sadler, K., Inventor; 19 Aug 05; 27 pp.; In English

Contract(s)/Grant(s): NIH-AI46164

Patent Info.: Filed Filed 19 Aug 05; US-Patent-Appl-SN-11-207 573

Report No.(s): PB2008-100113; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention provides methods of preparing and identifying antibodies against a loop domain of a protein, such

as an extracellular loop (ECL) domain of a transmembrane protein. Cyclic and end-to-end cyclized peptides corresponding to loop domains are employed in the present invention. Transmembrane proteins contemplated by the invention include the G-coupled protein receptor or a viral envelope protein.

NTIS

Antibodies; Patent Applications; Peptides

20080036134 Fulbright and Jaworski, LLP, Houston, TX, USA

Method of Producing a DNA Library Using Positional Amplification

Langmore, J. P., Inventor; Makarov, V. L., Inventor; 11 Mar 04; 223 pp.; In English

Contract(s)/Grant(s): MCB-9514196

Patent Info.: Filed 11 Mar 04; US-Patent-Appl-SN-10-798 025

Report No.(s): PB2008-100109; No Copyright; Avail.: CASI: [A10](#), Hardcopy

The disclosed invention relates to general and specific methods to use the Primer Extension/Nick Translation (PENT) reaction to create an amplifiable DNA strand, called a PENTamer. A PENTamer can be made for the purpose of amplifying a controlled length of DNA located at a controlled position within a DNA molecule, a process referred to as Positional Amplification by Nick Translation (PANT). In contrast to PCR, which amplifies DNA between two specific sequences, PANT can amplify DNA between two specific positions. PENTamers can be created to amplify very large regions of DNA (up to 500,000 bp) as random mixtures (unordered positional libraries), or as molecules sorted according to position (ordered positional libraries). PANT is fast and economical, because PENTamer preparation can be multiplexed. A single PENTamer preparation can include very complex mixtures of DNA such as hundreds of large-insert clones, complete genomes, or cDNA libraries. Subsequent PCR amplification of the preparation using a single specific primer can positionally amplify contiguous regions along a specific clone, along a specific genomic region, or along a specific expressed sequence.

NTIS

Amplification; Deoxyribonucleic Acid; Libraries; Patent Applications; Translating

20080036284 Army Engineer Research and Development Center, Vicksburg, MS USA

Speciation and Geochemistry of Tungsten in Soil

Bednar, A J; Mirecki, J E; Inouye, L S; Winfield, L E; Larson, S L; Ringelberg, D B; Nov 1, 2006; 7 pp.; In English

Report No.(s): AD-A481554; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481554>

In order to limit the dispersive use of lead on small arms firing ranges, 5.56-mm bullets with tungsten-nylon composite material cores have been fired at a number of Army training ranges. Tungsten in bullet residues oxidizes when exposed to the atmosphere, yielding an amorphous tungsten oxide (WO₃) coating. This coating rapidly dissolves to yield the tungstate anion (WO₄²⁻), which can migrate in saturated subsurface and surface water environments. The environmental geochemistry of dissolved tungsten species is complex, and consequently is not well characterized. Tungsten exists in most environmental matrices as the soluble and mobile tungstate anion, which can polymerize with itself and other anions, such as molybdate and phosphate, making determination of tungsten compounds important. Since the geochemical and toxicological properties of these polymer species may vary from monomeric tungstate, determination of tungstate is as critical as determination of total dissolved tungsten concentration.

DTIC

Geochemistry; Soils; Tungsten; Tungsten Compounds

20080036290 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

Aluminum / Silicon Carbide Matrix Material Machining for Targeting Systems

Jul 21, 2006; 2 pp.; In English

Contract(s)/Grant(s): Proj-06-0081-02

Report No.(s): AD-A481563; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481563>

Lockheed Martin Missiles and Fire Control (LMMFC) of Orlando, FL, is currently in the process of producing components using Metal Matrix Composite (MMC) materials. This material is most desirable in high performance applications due to the improved material properties over monolithic metals. The most common (MMC) is cast aluminum reinforced with various amounts of silicon carbide. (LMMFC) is currently machining very high precision components for targeting systems made from cast aluminum/silicon carbide (AlSiC) matrix material (with a very high SiC content) and is

experiencing difficulty achieving the accuracy required due to excessive tool wear and failure from the properties of this material. Due to the increased demand for the manufacturing of targeting system components made from AISiC matrix material, (LMMFC) called upon the National Center for Defense Manufacturing and Machining (NCDMM) to research and provide a more efficient solution to produce these components to specifications required by (LMMFC).

DTIC

Aluminum; Aluminum Carbides; Machining; Matrix Materials; Metal Matrix Composites; Silicon Carbides

20080036294 Army Construction Engineering Research Lab., Champaign, IL USA

Electro-Osmotic Pulse Technology: A Novel Solution to Severe Water Intrusion Problems in Earth Covered Magazines
Marshall, Jr , Orange S; McInerney, Michael K; Morefield, Sean; Hock, Vincent F; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481574; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481574>

The earth covered magazines (ECMs) at many Army installations have severe moisture intrusion problems. This water intrusion causes deterioration and corrosion of ammunition and equipment within the ECMs, making many types of ordinance unusable, including sensitive munitions with sophisticated electronic fusing and missiles. The Engineer Research and Development Center Construction Engineering Laboratory (ERDC-CERL) was contacted by the Ft. A.P. Hill DPW to assist in solving the severe water intrusion problem in steel arch ECMs at that location. To address the problem ERDC-CERL recommended installing Electro- Osmotic Pulse (EOP). Prior to installing the EOP system in an ECM, several safety concerns needed to be addressed, such as the interaction of the EOP system with the ECM lightning protection system, the potential for hydrogen gas generation by the EOP system, and the effects on munitions. To evaluate those concerns, ERDC-CERL performed laboratory testing of a model steel arch ECM with an EOP system installed in it. Scale model results were positive and testing in a full scale ECM at Fort A.P. Hill is proceeding.

DTIC

Ammunition; Damage; Intrusion; Osmosis; Water

20080036309 Naval Research Lab., Washington, DC USA

Strain Relaxation in InAs/GaSb Heterostructures

Bennett, Brian R; Dec 21, 1998; 4 pp.; In English

Report No.(s): AD-A481597; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481597>

Lattice strain relaxation in InAs/GaSb heterostructures was investigated by x-ray diffraction. Two types of structures, grown by molecular beam epitaxy, are compared. In the first, GaSb buffer layers were grown on GaAs substrates, followed by 0.05 1.0 mm thick InAs layers. In the second, InAs layers were grown directly on GaSb substrates. For a given thickness, the InAs layers retain significantly more strain when grown on GaSb substrates, reflecting the lower threading dislocation density in the GaSb substrates relative to the GaSb buffer layers grown on GaAs.

DTIC

Gallium Antimonides; Gallium Arsenides; Heterogeneity; Indium Arsenides; Molecular Beam Epitaxy; X Ray Diffraction

20080036321 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Nonlinear Properties in Langasite Isomorphs for Advanced Frequency Control Devices and Clocks

Kim, Yoonkee; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481616; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481616>

Precision oscillators are an enabling technology for precision-guided munitions, slow-moving target detection and identification from moving platforms, and rapid signal acquisition in jamming environments. Quartz has been exclusively used for resonators, which are essential components in such oscillators. Most recently, langasite and its isomorphs (LGX) have been advanced as potential substitutes for quartz, owing to their extremely high quality (Q) factors. A higher Q value, by at least 2.5 times, than that of quartz has been reported. A high Q value translates into a potentially greater stability. In order to make such materials practical, the environmental sensitivities must be addressed. In this paper, some of the nonlinear properties we have characterized over the past years are summarized.

DTIC

Clocks; Control Equipment; Frequency Control; Gallium; Lanthanum; Lanthanum Compounds; Nonlinearity; Oscillators; Resonators; Silicates

20080036322 Army Research Lab., Aberdeen Proving Ground, MD USA

Self-Assembled, Ultra-Hydrophobic Micro/Nano-Textured Surfaces

Rawlett, Adam M; Orlicki, Joshua A; Zander, Nicole; Karikari, Afia; Long, Tim; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481617; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481617>

The formation of hierarchically ordered arrays of spherical cavities on polymer films is of interest due to potential applications in the preparation of photonic bandgap materials, environmental sensors, and patterned light emitting diodes (LED). While many methods are known for the preparation of these porous materials, the breath figure approach has received significant scrutiny because of the simple and robust mechanism of pattern formation. Breath figures are patterned arrays of micrometer-sized defects in a polymer film, formed when water droplets condensed onto a polymer solution surface during film drying. By controlling variables such as relative humidity and solvent, the feature size and uniformity of the resultant pattern can be controlled. The breath figure approach is valuable because it provides the advantages of large area ordering in the nano and micrometer regime, is versatile, and inexpensive.

DTIC

Hydrophobicity; Nanotechnology

20080036342 IAP Research, Inc., Dayton, OH USA

High Rate Manufacturing Process for Silicon Carbide Tiles

Chelluri, Bhanu; Knoth, Edward; Schumaker, Edward; Barber, John; Franks, Lisa P; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481657; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481657>

Silicon carbide (SiC) ceramic armor is typically hot pressed to obtain full density and superior performance characteristics for demanding applications such as vehicle protection. Hot pressing is however an expensive and slow batch process. This paper describes an alternative, high rate processing approach of Dynamic Magnetic Compaction, which combines a high-density green compaction method with pressure-less sintering. The resulting close to full density material is produced at high throughput and delivers high quality material in near net shape form with a cost advantage. Dynamic Magnetic Compaction has already been successfully applied to process metals, composites, and nano powder products. The successes in these sectors are being translated to the ceramic industry, specifically to process high temperature ceramics such as SiC and BC.

DTIC

Manufacturing; Microstructure; Silicon Carbides; Tiles

20080036343 Princeton Univ., NJ USA

Structure, Bonding, and Adhesion of Materials Interfaces With Density Functional Theory: Cr/Fe, SiC/Fe, MoSi₂/Ni

Johnson, Donald F; Carter, Emily A; Nov 2006; 5 pp.; In English

Report No.(s): AD-A481659; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481659>

SiC/Fe and MoSi₂/Ni interfaces are investigated using first principles calculations in order to determine the structure of the interfaces and calculate ideal adhesion energies. As a baseline for comparison, calculations were also performed on the Cr/Fe interface, which shows strong adhesion, even stronger than the intrinsic adhesion of Fe. Both ceramic/metal interfaces show good adhesion. Evidence of Si-Fe and Si-Ni covalent bonding is seen at the respective interfaces.

DTIC

Adhesion; Bonding; Ceramic Coatings; Molybdenum Compounds; Silicides

20080036353 Army Research Lab., Aberdeen Proving Ground, MD USA

Computational Chemistry Toolkit for Energetic Materials Design

Byrd, Edward F; Hurley, Margaret M; Rice, Betsy M; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481672; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481672>

A computational chemistry toolkit is presented, demonstrating the ability to predict properties related to performance or hazard of these materials. The purpose of this toolkit is to allow the design and assessment of advanced energetic materials

before investing in synthesis. Newly developed methods are presented to treat emerging exotic high-nitrogen systems considered as candidates for insensitive and environmentally-friendly advanced energetic materials.

DTIC

Computational Chemistry; Explosives; Hazardous Materials; Software Development Tools

20080036381 Missouri Univ., Columbia, MO USA

6H Silicon Carbide Photoconductive Switches for High Power Applications

Nunnally, W C; Islam, N; Kelkar, K; Fessler, C; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481727; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481727>

High voltage, high current, low inductance, fast resistive transition, precisely controlled switches as the critical component that can enable fielding the most compact pulse power systems. Presently, the only known switch technology with the potential to fulfill these requirements is photo-conductive switching of bulk semiconductors. This document discusses the additional developments of extrinsic, semi-insulating, Silicon Carbide, photo-conductive switches that are required to bring the photo-SiC switch to technology readiness level 4 or 5. The basic physics rationale for employing extrinsic photo-conductivity has been demonstrated through modeling and first order experiments. The current hurdle is package and base device fabrication followed by increasing the conduction time beyond the material recombination time. The proposed work will investigate methods of extending the structure blocking voltage and the package dependent voltage to a larger fraction of the bulk material dielectric strength (3 MV/cm) and extending the switch conduction time to many times the material recombination time which reduces the optical control energy required for efficient operation.

DTIC

Electric Switches; Photoconductivity; Silicon Carbides; Switches

20080036387 Naval Air Warfare Center, Patuxent River, MD USA

Foreign Object Damage by Steel Ball Projectiles in a SiC/SiC Ceramic Matrix Composite at Ambient and Elevated Temperatures

Choi, Sung R; Alexander, Donald J; Apr 29, 2008; 40 pp.; In English

Report No.(s): AD-A481739; NAWCADPAX/TR-2008/3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481739>

Foreign object damage (FOD) phenomenon of a gas-turbine grade SiC/SiC ceramic matrix composite was determined at 25 deg C and 1316 deg C using impact velocities ranging from 115 to 440 m/sec by 1.59-mm diameter steel ball projectiles. Two types of target-specimen support were employed at each temperature: fully supported and partially supported. For a given temperature, the degree of post-impact strength degradation increased with increasing impact velocity, and was greater in a partially supported configuration than in a fully supported one. The elevated-temperature FOD resistance of the composite, particularly in partial support at higher impact velocities ≥ 350 m/sec, was significantly less than the ambient-temperature counterpart, attributed to a weakening effect of the composite. In full support, frontal contact stress played a major role in generating composite damage; whereas, in partial support, both frontal contact and backside flexure stresses were combined sources of damage generation. Formation of cone cracks initiating from impact site was also one of the key damage aspects. The SiC/SiC composite was able to survive higher energy impacts without complete structural failure, as compared to gas-turbine grade AS800 and SN282 monolithic silicon nitrides.

DTIC

Ambient Temperature; Balls; Ceramic Matrix Composites; Foreign Bodies; High Temperature; Impact Damage; Projectiles; Silicon Carbides

20080036389 Military Academy, West Point, NY USA

Response Surface Optimization of Lead Azide for Explosive Detonators

McCulloh, Ian; Massie, Darrell; Cordaro, Emily; Nov 2006; 9 pp.; In English

Report No.(s): AD-A481744; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481744>

The Armament Research, Development and Engineering Center, Picatinny (ARDEC) has been tasked with developing a new chemical process to produce lead azide, the key explosive ingredient in detonators. The new process is physically smaller than the traditional process, and incorporates newer technologies to improve process safety while reducing the costs of setting

up new production. The new process has been shown to produce lead azide, but the process settings and operations have not yet been fully characterized. Chemical engineers at ARDEC, Picatinny were also unable to produce a lead azide that met military specifications. A shortage of lead azide has placed our country's ability to manufacture detonators in jeopardy, so the timely completion of this effort is important. This research project used a statistically designed experiment and response surface methods to optimize the process settings. The objective is to discover the ideal process settings to produce a lead azide that meets military specifications and is similar to the lead azide produced by the original process. An optimum (minimum) number of process setting trials is required as a single experimental can take over a week to fully analyze. Therefore, sequential and efficient experimentation is critical.

DTIC

Azides (Inorganic); Azides (Organic); Detonators; Explosives

20080036392 Army Engineer Research and Development Center, Vicksburg, MS USA

Development of Cementing Systems and Composites Based on Inorganic Gel-to-Crystal Transitions for Military Applications

Weiss, Jr , Charles A; Sykes, Melvin C; Day, Donna C; Mangual, Mariangelica C; Malone, Philip G; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481747; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481747>

Composite materials (fiberglass, carbon-fiber composites) are considered to be the Army's greatest opportunity to develop a new generation of lighter, stronger materials that will be the basis of new shelters, vehicles and weaponry. While a great deal of effort has gone into examining and refining the reinforcing material (metal, carbon and glass fibers) very little attention has been paid to the cement that will be employed in bonding the elements together. Largely it is assumed that organic resins will be the solution to the bonding problem and often the drawbacks related to combustibility, catastrophic loss of strength at elevated temperatures, embrittlement due to depolymerization, degradation due to exposure to sunlight or ozone are largely ignored. The Army cannot effectively reinforce buildings or develop structural components for vehicles or weapons with materials that will melt, burn and generate toxic gases if the materials going into the structure can be set afire during an attack. In order for the Army to use composites, it will be necessary to produce durable, heat-resistant and fireproof composites made with inorganic cements. Investigators have shown that the key to developing inorganic cements lies in learning to tailor the microstructure to provide the highest strength and the best bonding possible.

DTIC

Cements; Composite Materials; Crystals; Gels; Military Technology

20080036395 Army Soldier Systems Command, Natick, MA USA

Application of Nanofiber Technology to Nonwoven Thermal Insulation

Gibson, Phil; Lee, Calvin; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481751; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481751>

Nanofiber technology (fiber diameter less than 1 micrometer) is under development for future Army lightweight protective clothing systems. Nanofiber applications for ballistic and chemical/biological protection are being actively investigated, but the thermal properties of nanofibers and their potential protection against cold environments are relatively unknown. Previous studies have shown that radiative heat transfer in fibrous battings is minimized at fiber diameters between 5 and 10 micrometers. However, the radiative heat transfer mechanism of extremely small diameter fibers of less than 1 micrometer diameter is not well known. Previous studies were limited to glass fibers, which have a unique set of thermal radiation properties governed by the thermal emissivity properties of glass. The authors are investigating the thermal transfer properties of high loft nanofiber battings composed of carbon fiber and various polymeric fibers such as polyacrylonitrile, nylon, and polyurethane. Thermal insulation battings incorporating nanofibers could decrease the weight and bulk of current thermal protective clothing, and increase mobility for soldiers in the battlefield.

DTIC

Acrylonitriles; Carbon Fibers; Heat Transfer; Nanotechnology; Nitrogen Polymers; Polyesters; Thermal Insulation

20080036458 Army Natick Research and Development Command, MA USA

Self-Assembled, Perforated Monolayers for Enhanced Permselectivity in Membranes

Wilusz, Eugene; Truong, Quoc; McCullough, III, Donald H; Li, Junwei; Regen, Steven L; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD16-02-C-0051

Report No.(s): AD-A481876; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481876>

One of the Army's primary research aims is to improve the survivability of soldiers in combat zones. One area of concern is the possibility of attack by chemical warfare agents. Current protective gear, while providing excellent protection, is heavy, bulky, and reduces the combat effectiveness of the wearer. Ideally, the next generation of protective gear will be no more cumbersome than the standard-issue Battle Dress Uniform (BDU) while maintaining its protective properties. One approach is to create a membrane that can be manufactured into a BDU, which would not allow chemical warfare agents to permeate while still allowing water (perspiration) to pass. With this goal in mind, we have been developing an ultra-thin membrane capable of blocking chemical agents, utilizing Langmuir-Blodgett (LB) films. Here, we show how ionic cross-linking of multiply-charged surfactants (a process that we have termed, 'gluing') can yield LB films on the order of 6 nm thick having extraordinary barrier properties, high flux, and stability.

DTIC

Chemical Warfare; Membranes

20080036460 Army Engineer Research and Development Center, Vicksburg, MS USA

Potential Super-Toughness Behavior of Chiral (10,5) Carbon Nanotubes

Welch, C R; Haskins, R W; Majure, D L; Ebeling, R M; Marsh, C P; Bednar, A J; Maier, R S; Barker, B C; Wu, David T; Simeon, T M; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481882; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481882>

Improvements in construction materials have been evolutionary and not revolutionary. We are attempting to change this paradigm by exploiting the extreme properties of carbon nanotubes, and by designing materials at the molecular level using molecular-based predictive rheology. As an initial step, we have modeled pristine and defective (5,5) carbon nanotubes and a defective (10,5) carbon nanotube using Tight-Binding Molecular Dynamics. The (5,5) carbon nanotubes exhibited extraordinary tensile strengths and brittle failures in agreement with the findings of other researchers. Their strengths and Young's moduli were degraded by the molecular flaws. By contrast, the defective (10,5) carbon nanotube exhibited lower, but still extraordinary, tensile strength and post-yield toughness behavior many times greater than toughened 4340 Steel. Such toughness behavior is an important and beneficial material characteristic for construction materials.

DTIC

Carbon Nanotubes; Chirality; Defects; Predictions; Rheology; Stress-Strain Relationships; Tensile Strength; Toughness

20080036461 Army Research Lab., Aberdeen Proving Ground, MD USA

Burn-Rate Modeling and Combustion Diagnostics for Environmentally Friendly, Solid Rocket Propellants

Sausa, R C; Anderson, W R; Nov 1, 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481883; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481883>

Advanced, burn-rate, propellant modeling is critical for developing new rocket missile and gun propellants for Future Combat Systems and for providing a fundamental screening tool that can result in substantial cost savings compared to missile and gun firings. In this paper, we report the detailed chemical kinetics and burn rate prediction of tri-aminoguanidinium azotetrazolate (TAGzT) and nitrocellulose (NC).

DTIC

Burning Rate; Cellulose Nitrate; Combustion; Diagnosis; Models; Solid Rocket Propellants

20080036465 Army Research Lab., Aberdeen Proving Ground, MD USA

Molecular Simulations of Gold Nanoparticles Coated With Self-Assembled Alkanethiolate Monolayers

Henz, Brian J; Fischer, James W; Zachariah, Michael R; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481901; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481901>

In order to utilize the novel electrical, magnetic, optical, and physical properties of coated metal nanoparticles, one must

be able to efficiently predict the nanoparticle size-dependent properties and to fabricate consistently sized nanoparticles. Both of these goals can be obtained through the use of numerical simulation. In this work the gold nanoparticle and nanoparticle/self-assembled monolayer systems have been analyzed with a physically accurate and computationally efficient numerical simulation. The simulation model and method are described in the following paper.

DTIC

Coatings; Gold; Molecular Dynamics; Nanoparticles; Simulation; Substrates

20080036483 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Effects of Nano-sized Energetic Ingredients in High Performance Solid Gun Propellants

Manning, T G; Masoud, N M; Thompson, D P; Luman, R; Wehrman, B; Kuo, K K; Yetter, R A; Bruck, H A; Nov 2006; 9 pp.; In English

Report No.(s): AD-A481943; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481943>

Unique propellant configurations, such as fast-core designs, require a layered propellant with tailored burn rate. The use of these layered propellants is expected to improve the energy management during the ballistic cycle and hence increase the muzzle velocity. These new propellants under development have different thermochemistry from that of traditional nitrocellulose-based propellants. The layered propellant is typically stacked as laminated disks in the cartridge chamber. Layered propellants (also called fast-core propellants) consist of an inner layer of fast burning high-impetus propellant imbedded in two layers of slower burning low-impetus propellant. Propellant geometries are tightly controlled such that the fast burning inner-core layer does not start burning until the volume available has slightly increased due to the projectile motion. This allows the pressure to be maintained at a high level for a relatively long duration. Advances in energetic materials have been made in all types of composite propellant ingredients, including binders, oxidizers, and metal additives. Special processing techniques of functionally graded energetic materials have also been developed in recent years. The goal of this study is to develop a pair of layered propellants through a 'materials-by-design' approach for use in a fast-core gun propulsion application. A pair of baseline propellants was initially developed and named as ME (moderate energy) propellant with a relatively slow burning rate and HE (high-energy) propellant with a fast burning rate. Modifications of these propellants with different ingredients have been made such that the burning rate ratio between fast and slow burning propellants is suitable for use in applications requiring layered propellants (~ 3:1).

DTIC

Double Base Propellants; Gun Propellants; High Energy Propellants; Solid Propellants

20080036485 Army Research Lab., Aberdeen Proving Ground, MD USA

Advanced Concepts in Nanotexturing of Solid Surfaces for Composite Applications

Robinette, E J; Bujanda, A A; Demaree, J D; Jensen, R E; McKnight, S H; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481945; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481945>

The overall goal of this paper was to determine which factors of silane/silica chemistry most influenced surface coverage and surface roughness of glass surfaces. Nanotexturing of glass fibers has shown the potential to improve impact properties of glass reinforced composites. Previous work by Army researches determined that modifying fiber surfaces using a mixture of silane coupling agents that were both reactive and non-reactive towards the matrix phase, in conjunction with nanoscale colloidal silica, yielded a simultaneously high strength and tough composite. The focus of this work was to ascertain which factors of the silane and silica treatments were most influential in controlling the silica deposition on solid surfaces. The basis of the silane chemistry involves controlling the number of amine-functional groups on the fiber surface. Propyltrimethoxysilane (PTMO) and aminopropyltrimethoxysilane (APS) are silanes that contain a propyl group and a primary amine, respectively. By varying the ratio of these silanes in solution, the concentration of amine groups on the fiber surface can be controlled. The amine groups on the fiber surface act as potential sites for epoxy-amine reactions. Two routes were chosen for affixing silica to the surface using the amine groups. In the first route, a reverse silane reaction is carried out; where the epoxy groups of a non-hydrolyzed glycidylpropyltrimethoxysilane (GPS) react with surface amine groups. Upon hydrolysis, the methoxy groups of the silane are converted to hydroxyl groups that undergo a condensation reaction with the silica. The second route for silica deposition involves the functionalization of the silica. In a separate step, hydrolyzed GPS is reacted with the silica to yield epoxy-functional silica. The epoxy groups on the silica can react with the amine groups on the glass surface.

DTIC

Chemical Reactions; Glass Fibers; Silicon Compounds; Solid Surfaces; Surface Reactions

20080036566 Department of the Navy, Washington, DC USA

Non-Chromate Primer for Painting

Tucker, Wayne C, Inventor; May 14, 2008; 5 pp.; In English

Report No.(s): AD-D020366; No Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/100.2/ADD020366>

The present invention uses titanate compounds to replace chromates in metal primer paints used for corrosion protection on metal substrates. The invention is directed to corrosion protection of stainless steel and aluminum alloys.

DTIC

Aluminum Alloys; Chromates; Corrosion Prevention; Paints; Patent Applications; Stainless Steels; Titanates

20080036568 Department of the Navy, Washington, DC USA

Potentiometric Titration Method for Quantitative Determination of Hydrogen Peroxide

Bessette, Russell R, Inventor; Jul 11, 2005; 16 pp.; In English

Report No.(s): AD-D020368; No Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/100.2/ADD020368>

An electrochemical potentiometric titration method that entails titration of a known volume of a catholyte containing an unknown amount of hydrogen peroxide in a titration cell having two electrodes, a platinum working electrode and a silver/silver chloride reference electrode. A known concentration of a titrant is added to the catholyte in the titration cell. Simultaneously, as the titrant is added the potential between the working electrode and the reference electrode is monitored. The point at which all of the hydrogen peroxide has been consumed is signaled when the cell potential changes abruptly. Since the concentration of the titrant is already known, the amount of titrant added (concentration multiplied by volume) is directly related to the amount of hydrogen peroxide consumed. The concentration of hydrogen peroxide is calculated from the volume of catholyte and the moles of hydrogen peroxide.

DTIC

Hydrogen Peroxide; Titration

20080036624 Naval Research Lab., Washington, DC USA

Stranski-Krastanov Growth of InSb, GaSb, and AlSb on GaAs: Structure of the Wetting Layers

Bennett, B R; Shanabrook, B V; Thibado, P M; Whitman, L J; Magno, R; Jan 1997; 7 pp.; In English

Report No.(s): AD-A482128; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Thin layers of InSb, GaSb and AlSb were grown on GaAs(001) by molecular beam epitaxy and characterized in situ with scanning tunneling microscopy. All three materials exhibit a Stranski-Krastanov growth mode. Distinct wetting layers and self-assembled quantum dots are present after deposition of one to four monolayers of (In,Ga,Al)Sb. The wetting layers consist of anisotropic ribbon-like structures oriented along the [110] direction, with characteristic separations of 40-50 Å. The initial GaAs surface reconstruction affects both the wetting layer structure and the quantum dot density.

DTIC

Gallium Antimonides; Gallium Arsenides; Wetting

20080036625 Naval Research Lab., Washington, DC USA

Epitaxial Growth, Structure, and Composition of Fe Films on GaAs(001)-2x4

Kneedler, E; Thibado, P M; Jonker, B T; Bennett, B R; Shanabrook, B V; Wagner, R J; Whitman, L J; Apr 1, 1996; 7 pp.; In English

Report No.(s): AD-A482130; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The structure and composition of Fe films grown on As-terminated GaAs(001)-2x4 surfaces at 175 C has been studied in situ with scanning tunneling microscopy (STM), photoelectron diffraction (PED), and x-ray photoelectron spectroscopy (XPS). The GaAs surfaces were prepared by molecular beam epitaxy (MBE) and exhibited large atomically well-ordered terraces. We find that the 2x4 reconstruction has a significant impact on the Fe nucleation and growth, with initial nucleation occurring at As-dimer sites. STM reveals that the first half-monolayer of Fe forms small two-dimensional islands along the As-dimer rows before growing onto the adjacent Ga-rich rows, with no evidence of substrate disruption. PED indicates that the growth is predominantly layer by layer, with the growth front for the nth deposited layer limited to the (n + 1)th layer. XPS spectra show that the Fe films include a concentration gradient of Ga and As out-diffused from the interface, with some of the

As segregating to the Fe surface, similar to previous results obtained for growth on non-MBE prepared GaAs surfaces. Possible mechanisms for the film growth and the origins of the intermixing are discussed.

DTIC

Epitaxy; Gallium Arsenides; Thin Films

20080036634 Michigan State Univ., East Lansing, MI USA

Durability Characterization of POSS-Based Polyimides and Carbon-Fiber Composites for Air Force-Related Applications

Lee, Andre; Dec 31, 2007; 16 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0084

Report No.(s): AD-A482151; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The overall objective of this study is to expand the performance space of carbon-fiber reinforced polyimide composites using a synergistic combination of hybrid inorganic-organic, nano-structured chemicals and state-of-the-art oligoimide chemistry. The addition of nano-structured chemicals both retains the light-weight nature of organic polymers and imparts substantially improved erosion resistance to high energy atomic oxygen and vacuum ultraviolet radiation, as well as high temperature mechanical performance and oxidative stability. In particular, this study will formulate hybrid, nano-structured polyimide composites, from the molecular to the macroscopic level, while tailoring their properties to the service durability requirements of Air Force-related applications.

DTIC

Carbon Fibers; Composite Materials; Durability; Polyimide Resins; Polyimides

20080036644 Pennsylvania Univ., Philadelphia, PA USA

Quenching Dynamics of Electronically Excited Hydroxyl Radicals

Lester, Marsha I; May 19, 2008; 6 pp.; In English

Contract(s)/Grant(s): FA9550-07-1-0419

Report No.(s): AD-A482169; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Collisional quenching of electronically excited OH radicals by molecular partners has been investigated over the past 25 years, principally by evaluating the quenching cross sections for partners of aeronautical, atmospheric, and/or combustion relevance. Yet little is known about the outcome of these electronic quenching events, except that they facilitate the efficient removal of OH from the excited $\text{Alpha } 2\text{sigma}^+$ electronic state by introducing nonradiative decay pathways. Most recently, we carried out the first experimental investigation of the nonreactive decay channel with molecular hydrogen by examining the quantum state distribution of the ground state OHX2Pi products. The OHX2Pi product state distribution is highly nonstatistical, with a strongly inverted rotational distribution for $v \approx 1$, demonstrating that a significant torque is applied to OH as purely electronic energy is converted into internal excitation of the OHX2Pi products. The high degree of rotational excitation is a direct manifestation of the forces in the vicinity of the conical intersection region(s) that lead to quenching.

DTIC

Electron Energy; Hydroxyl Radicals

20080036645 Ohio State Univ., Columbus, OH USA

Molecular Modeling of High-Temperature Oxidation of Refractory Borides

Li, Ju; Feb 2008; 9 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0026

Report No.(s): AD-A482170; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Refractory diboride with silicon carbide additive has a unique oxide scale structure with two condensed oxide phases (solid + liquid), and demonstrates oxidation resistance superior to either monolithic diboride or silicon carbide. We rationalize that this is because the silica-rich liquid phase can retreat outward to remove the high SiO gas volatility region, while still holding onto the zirconia skeleton mechanically by capillary forces, to form a 'solid pillars, liquid roof' scale architecture and maintain barrier function. Basic assessment of the oxygen carriers in the borosilicate liquid in oxygen-rich condition is performed based on first-principles calculations. It is estimated from entropy and mobility arguments that above a critical temperature $T_c \sim 1500\text{C}$ the dominant oxygen carriers should be network defects, such as peroxy linkage or oxygen deficient centers, instead of molecular O₂ as in the Deal-Grove model. These network defects will lead to sub-linear dependence of the oxidation rate with external oxygen partial pressure.

DTIC

Borides; High Temperature; Oxidation; Oxidation Resistance; Refractories; Refractory Materials; Silicon Carbides

20080036657 Naval Research Lab., Washington, DC USA

Stoichiometry-Induced Roughness on Antimonide Growth Surfaces

Bracker, A S; Nosh, B Z; Barvosa-Carter, W; Whitman, L J; Bennett, B R; Shanabrook, B V; Culbertson, J C; Apr 23, 2001; 4 pp.; In English

Report No.(s): AD-A482188; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Phase shifts in the intensity oscillation of reflection high-energy electron diffraction spots provide evidence for monolayer island formation on AlSb that is caused by sudden changes in surface stoichiometry. High-resolution scanning tunneling microscopy confirms the interpretation of the phase shift. These results are consistent with a previous structural assignment of the AlSb beta(4 x 3) and alpha(4 x 3) surface reconstructions and provide guidelines for producing smooth interfaces in antimonide-based heterostructures.

DTIC

Antimonides; Stoichiometry; Surface Roughness

20080036658 Naval Research Lab., Washington, DC USA

A RHEED and STM Study of Sb-Rich AlSb and GaSb (0 0 1) Surface Reconstructions

Thibado, P M; Bennett, B R; Shanabrook, B V; Whitman, L J; Jan 1997; 7 pp.; In English

Report No.(s): AD-A482190; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The structure of AlSb and GaSb (0 0 1) surfaces prepared by molecular beam epitaxy has been studied with in-situ reflection high-energy electron diffraction and scanning tunneling microscopy. Under fixed Sb₄ flux, two AlSb reconstructions are observed with increasing temperature (and decreasing surface Sb : Al coverage): c(4 * 4), as observed for InSb, GaAs, AlAs, and InAs, and (1 x 3). In contrast, GaSb reconstructions observed with increasing temperature are: 2 x 5), (1 x 5), c(2 x 6), and (1 x 3). Whereas the (1 x 5), c(2 x 6), and (1 x 3) surfaces are composed primarily of Sb dimer rows on top of an Sb-terminated surface, the (2 x 5) surface is composed of Sb dimer rows on top of two layers of Sb (i.e. the surface is terminated by three Sb layers). We speculate that GaSb is unique in forming the (n x 5) reconstructions due to its excellent lattice match with trigonally bonded elemental Sb.

DTIC

Aluminum; Antimony; Dimers; Electron Diffraction; Gallium Antimonides; Molecular Beam Epitaxy

20080036659 Naval Research Lab., Washington, DC USA

Self-Assembled InSb and GaSb Quantum Dots on GaAs(001)

Bennett, B R; Thibado, P M; Twigg, M E; Glaser, E R; Magno, R; Shanabrook, B V; Whitman, L J; Jun 1996; 5 pp.; In English

Report No.(s): AD-A482191; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Quantum dots of InSb and GaSb were grown on GaAs(001) by molecular-beam epitaxy. In situ scanning tunneling microscopy measurements taken after 1-2 monolayers of InSb or GaSb growth reveal the surface is a network of anisotropic ribbon-like platelets. These platelets are a precursor to quantum dot growth. Transmission electron microscopy measurements indicate that the quantum dots are coherently strained. Quantum dots of InSb and GaSb capped by GaAs exhibit strong luminescence near 1.1 eV.

DTIC

Gallium Antimonides; Gallium Arsenides; Indium Antimonides; Quantum Dots

20080036689 Naval Research Lab., Washington, DC USA

Interpreting Interfacial Structure in Cross-Sectional STM Images of III-V Semiconductor Heterostructures

Nosh, B Z; Barvosa-Carter, W; Yang, M J; Bennett, B R; Whitman, L J; May 2000; 12 pp.; In English

Report No.(s): AD-A482254; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using model GaSb-InAs heterostructures, we have systematically examined how cross-sectional scanning tunneling microscopy (XSTM) can be used for the study of III-V heterostructure interfaces. The interpretation of interfacial structure in XSTM images is impeded by the fact that only every other III or V plane as grown on the (001) substrate is seen in each image. We show how this structural artifact affects spectral analyses of interfacial roughness, preventing an accurate analysis

when interfaces are just a few layers wide. Additional complications arise due to the inequivalence of the (110) and (110) cleavage surfaces and the dependence of interfacial bond orientation on growth order. By taking advantage of the different bond orientations on the two cleavage surfaces, we demonstrate that the contrast observed at the interfacial layers in this system is caused primarily by the geometry of the interfacial bonds, not electronic structure differences. Finally, we illustrate how careful design of model heterostructures can be used to circumvent many limitations of XSTM, and thereby allow one to obtain detailed atomic-scale information about all the growth layers in the structure.

DTIC

Gallium Antimonides; Heterogeneity; Indium Arsenides; Molecular Beam Epitaxy; Semiconductors (Materials)

20080036690 Naval Research Lab., Washington, DC USA

Magnetic Resonance Studies of Mg-Doped GaN Epitaxial Layers Grown by Organometallic Chemical Vapor Deposition

Glaser, E R; Carlos, W E; Braga, G C; Freitas, Jr, J A; Moore, W J; Shanabrook, B V; Henry, R L; Wickenden, A E; Koleske, D D; Obloh, H; Feb 5, 2002; 11 pp.; In English

Report No.(s): AD-A482260; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electron paramagnetic resonance (EPR) and optically detected magnetic resonance (ODMR) experiments have been performed on a set of GaN epitaxial layers doped with Mg from 2.5×10^{18} to 5.0×10^{19} /cu cm. The samples were also characterized by secondary-ion-mass spectroscopy (SIMS), temperature-dependent Hall effect, and low-temperature photoluminescence (PL) measurements. EPR at 9 GHz on the conductive films reveals a single line with $g_{||} \sim 2.1$ and $g_{\perp} \sim 2$ and is assigned to shallow Mg acceptors based on the similarity of the spin density with that found for the number of uncompensated Mg shallow acceptors from Hall effect and the total Mg concentration by SIMS. PL bands of different character are observed from these layers, including shallow-donor shallow-acceptor recombination at 3.27 eV from the lowest doped sample and, in most cases, broad emission bands with peak energy between 2.8 and 3.2 eV from the more heavily doped films. In addition, several of the films exhibit a weak, broad emission band between 1.4 and 1.9 eV. ODMR at 24 GHz on the (blue) PL bands reveals two dominant features. The first is characterized by $g_{||}, g_{\perp} \sim 1.95-1.96$ and is assigned to shallow effective-mass donors. The second line is described by similar g tensors as found by the EPR experiments and, thus, is also attributed to shallow Mg acceptors. Although several groups have related the 2.8 eV PL in heavily Mg-doped GaN with the formation of deep donors, no clear evidence was found from the ODMR on this emission for such centers. However, based on the near-midgap PL energy and the observation of the feature assigned to shallow Mg acceptors, the strongest case from magnetic resonance for the existence of deep donors in these films is the isotropic ODMR signal with $g=2.003$ found on emission <1.9 eV. Possible recombination mechanisms to account for the ODMR on these blue and near-IR PL bands are discussed.

DTIC

Additives; Doped Crystals; Electron Paramagnetic Resonance; Epitaxy; Gallium Nitrides; Magnetic Resonance; Metalorganic Chemical Vapor Deposition; Vapor Deposition

20080036692 Naval Research Lab., Washington, DC USA

Anion Control in Molecular Beam Epitaxy of Mixed As/Sb III-V Heterostructures

Bennett, Brian R; Shanabrook, B V; Twigg, M E; Feb 15, 1999; 6 pp.; In English

Report No.(s): AD-A482262; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Superlattices consisting of As monolayers (MLs) in (In,Ga,Al)Sb and Sb MLs in (In,Ga,Al)As were grown by molecular beam epitaxy and characterized by x-ray diffraction, Raman spectroscopy, and high-resolution transmission electron microscopy. In all cases, well-defined superlattices were formed when the growth temperature was sufficiently low. As temperature increases for the As MLs in antimonides, substantial intermixing occurs. For Sb MLs in arsenides, Sb evaporation from the surface increases with increasing growth temperature. These results are discussed in the context of device heterostructures containing InAs/GaSb and InAs/AlSb heterojunctions.

DTIC

Anions; Gallium Arsenides; Molecular Beam Epitaxy; Raman Spectroscopy; Superlattices; X Ray Diffraction

METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20080034709 Idaho National Engineering Lab., Idaho Falls, ID, USA

Accidental Drop of a Carbon Steel/Lead Shipping Cask at Low Temperatures. 2007 ASME Pressure Vessels and Piping Division Conference

Hawkes, B. D.; Durstine, K. R.; Jul. 2007; 7 pp.; In English

Report No.(s): DE2007-915521; INL/CON-07-12281; No Copyright; Avail.: National Technical Information Service (NTIS)

A shielded cask is used to transport radioactive materials between facilities. The cask was fabricated with an outer and inner shell of hot rolled low carbon steel. Lead was poured in the annular space between the shells to provide radiation shielding. Carbon steel is known to be susceptible to low temperature brittle fracture under impact loading. This paper will present the analysis results representing postulated transportation accidents during on-site transfers of the cask. The accident scenarios were based on a series of cask drops onto a rigid surface from a height of 6 feet assuming brittle failure of the cask shell at subzero temperatures. Finite element models of the cask and its contents were solved and post processed using ABAQUS software. Each model was examined for failure to contain radioactive materials and/or significant loss of radiation shielding. Results of these analyses show that the body of the cask exhibits considerable ruggedness and will remain largely intact after the impact. There will be deformation of the main cask body with localized brittle failure of the cask outer shell and components and but no complete penetration of the cask shielding. The cask payload outer waste can will experience some permanent plastic deformation in each drop, but will not be deformed to the point where it will rupture, thus maintaining confinement of the can contents.

NTIS

Accidents; Barrels (Containers); Carbon Steels; Conferences; Low Temperature; Pressure Vessels

20080034748 Delphi Technologies, Inc., Troy, MI, USA

Low Melting Temperature Silver Braze Alloy

Haltiner, K. J., Inventor; Alexander, G. W., Inventor; Reisdorf, G. F., Inventor; 30 Aug 04; 6 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT41246

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-929 819

Report No.(s): PB2008-100775; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A brazing alloy comprising elemental silver alloyed with elemental silicon in a silver/silicon ratio between about 95/5 and 99/1, preferably about 97/3. Small amounts of silicon alloyed with silver depress the alloy liquidus curve significantly, the liquidus temperature of a silver and silicon eutectic alloy being about 837 degrees C. Brazing alloys in accordance with the invention are useful in bonding ceramics to ceramics, ceramics to metals, and metals to metals. Copper, vanadium, or other oxygen-reactive surface bonding elements may also be included. Silver/silicon alloys are useful in applications such as assembly of components of solid oxide fuel cells. A variety of silver/silicon alloy brazes can be used within the same fuel cell so that subsequent brazing can be performed without reliquifying a previous braze. A brazing alloy comprising elemental silver and ruthenium in a silver/ruthenium ratio between 97/3 and 99/1 is also included.

NTIS

Brazing; Low Temperature; Melting; Silver; Silver Alloys

20080034749 General Motors Corp., Detroit, MI, USA

Aluminum/Magnesium 3D-Printing Rapid Prototyping

Jandeska, W. F., Inventor; Hetzner, J. E., Inventor; 30 Aug 04; 4 pp.; In English

Contract(s)/Grant(s): NIST-3DP/ATP-70NANB7H3030

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-929 273

Report No.(s): PB2008-100774; No Copyright; Avail.: CASI: [A01](#), Hardcopy

A 3D Printing Rapid Prototyping process using Al/Mg particles coated with a metal (i.e. copper, nickel, zinc, or tin) that (1) prevents oxidation of the Al/Mg particles, and (2) either alone, or when alloyed with the aluminum or magnesium core metal, melts below the liquidus temperature of the core.

NTIS

Aluminum; Magnesium; Printing; Prototypes; Rapid Prototyping

20080034881 NASA Glenn Research Center, Cleveland, OH, USA

Effects of Palladium Content, Quaternary Alloying, and Thermomechanical Processing on the Behavior of Ni-Ti-Pd Shape Memory Alloys for Actuator Applications

Bigelow, Glen; July 2008; 100 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 953033.01.03.17

Report No.(s): NASA/TM-2008-214702; E-15903; No Copyright; Avail.: CASI: A05, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080034881>

The need for compact, solid-state actuation systems for use in the aerospace, automotive, and other transportation industries is currently driving research in high-temperature shape memory alloys (HTSMA) having transformation temperatures above 100 C. One of the basic high temperature systems under investigation to fill this need is NiTiPd. Prior work on this alloy system has focused on phase transformations and respective temperatures, no-load shape memory behavior (strain recovery), and tensile behavior for selected alloys. In addition, a few tests have been done to determine the effect of boron additions and thermomechanical treatment on the aforementioned properties. The main properties that affect the performance of a solid state actuator, namely work output, transformation strain, and permanent deformation during thermal cycling under load have mainly been neglected. There is also no consistent data representing the mechanical behavior of this alloy system over a broad range of compositions. For this thesis, ternary NiTiPd alloys containing 15 to 46 at.% palladium were processed and the transformation temperatures, basic tensile properties, and work characteristics determined. However, testing reveals that at higher levels of alloying addition, the benefit of increased transformation temperature begins to be offset by lowered work output and permanent deformation or 'walking' of the alloy during thermal cycling under load. In response to this dilemma, NiTiPd alloys have been further alloyed with gold, platinum, and hafnium additions to solid solution strengthen the martensite and parent austenite phases in order to improve the thermomechanical behavior of these materials. The tensile properties, work behavior, and dimensional stability during repeated thermal cycling under load for the ternary and quaternary alloys were compared and discussed. In addition, the benefits of more advanced thermomechanical processing or training on the dimensional stability of these alloys during repeated actuation were investigated. Finally, the effect of quaternary alloying on the thermal stability of NiTiPdX alloys is determined via thermal cycling of the materials to increasing temperatures under load. It was found that solid solution additions of platinum and gold resulted in about a 30 C increase in upper use temperature compared to the baseline NiTiPd alloy, providing an added measure of over-temperature protection.

Author

Shape Memory Alloys; Heat Resistant Alloys; Martensite; Austenite; Thermomechanical Treatment; Solid Solutions; Alloying; Dimensional Stability; Tensile Properties

20080034935 Idaho National Engineering Lab., Idaho Falls, ID, USA

U-Mo Foil/Cladding Interactions in Friction Stir Welded Monolithic RERTR Fuel Plates

Keiser, D. D.; Jue, J. F.; Clark, C. R.; Oct. 2006; 12 pp.; In English

Report No.(s): DE2007-911729; INL/CON-06-11914; No Copyright; Avail.: National Technical Information Service (NTIS)

Interaction between U-Mo fuel and Al has proven to dramatically impact the overall irradiation performance of RERTR dispersion fuels. It is of interest to better understand how similar interactions may affect the performance of monolithic fuel plates, where a uranium alloy fuel is sandwiched between aluminum alloy cladding. The monolithic fuel plate removes the fuel matrix entirely, which reduces the total surface area of the fuel that is available to react with the aluminum and moves the interface between the fuel and cladding to a colder region of the fuel plate. One of the major fabrication techniques for producing monolithic fuel plates is friction stir welding. This paper will discuss the interactions that can occur between the U-Mo foil and 6061 Al cladding when applying this fabrication technique. It has been determined that the time at high temperatures should be limited as much as is possible during fabrication or any post-fabrication treatment to reduce as much as possible the interactions between the foil and cladding. Without careful control of the fabrication process, significant interaction between the U-Mo foil and Al alloy cladding can result. The reaction layers produced from such interactions can exhibit notably different morphologies vis-a-vis those typically observed for dispersion fuels.

NTIS

Cladding; Friction Stir Welding; Metal Plates; Welded Joints

20080035193 Ohio State Univ., Columbus, OH USA

Fundamental Role of Grain Boundaries: Meso-Scale Simulation and Measurement

Wagoner, Robert H; Adams, Brent L; Mar 31, 2008; 14 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0068; FA9550-05-1-0088

Report No.(s): AD-A481000; GRT8351200/60000956; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481000>

Collaborative Projects FA9550-05-1-0068 and FA9550-05-1-0088 were aimed at solving one of the outstanding problems in the mechanical behavior of metallic materials: understanding, quantifying, and predicting the role of grain size and grain boundary character on strength and ductility. This is an essential component required for the design of high-temperature alloys to resist stresses. Current models for polycrystals address only the grain texture (i.e. the statistical orientation of crystal lattices), not the presence or character of grain boundaries, nor the size of the grains. Novel simulation methods and materials characterization techniques were developed and verified. Noteworthy progress and results may be summarized as follows: * Identification of the underlying physics of grain-size effects in metals and alloys. * First quantitative prediction of Hall-Petch slopes from first principles (without introducing arbitrary length scales). * First comparison of measured and independently predicted lattice curvatures at grain boundaries. (Good agreement was discovered: within 20%.) * First simulations and presentations of dislocation density distributions within grains * Introduction of a new single-crystal constitutive representation that is more accurate and uses fewer parameters than existing equations. (Outstanding agreement was found with measurements.)

DTIC

Ductility; Grain Boundaries; Grain Size; Simulation

20080035271 Texas A&M Univ., College Station, TX USA

Synthesis, Microstructure and Properties of Metallic Materials with Nanoscale Growth Twins

Zhang, X; Misra, A; Hoagland, R G; Nov 2006; 38 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481202; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481202>

We have recently synthesized 330 stainless steel thin films and bulk Cu foils via magnetron sputtering with an average twin spacing of ~ 5 nm. Twin interfaces in both systems are of {III} type and normal to the growth direction. The hardness of sputtered materials is an order of magnitude higher than that of their bulk counterparts. Growth twins with such high twin density and preferred orientation are rarely seen in elemental metals. Sputtered Cu foils exhibited tensile strengths of 1.2 GPa, a factor of 3 higher than that reported earlier for nanocrystalline Cu, average uniform elongation of 1-2% and ductile dimple fracture surfaces. This work provides a new route for the synthesis of ultra-high strength, ductile metals via control of twin spacing and twin orientation in vapor-deposited materials.

DTIC

Ductility; Metals; Microstructure; Sputtering

20080035325 Naval Air Systems Command, Patuxent River, MD USA

Results of Fatigue Tests of Bare AF1410 Steel Unnotched Flat Plates with Surface Corrosion Damage. Engineering Data Report

Rusk, David T; Arocho, Annette; Pierce, Jennifer; Abfalter, Garry; May 8, 2008; 77 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F42600-00-D-0039; 0011

Report No.(s): AD-A481230; NAWCADPAX/EDR-2008/10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The global maritime operating environment of U.S. Naval Aviation assets necessitates their prolonged exposure to severe corrosive environments. The resulting corrosion damage on flight critical structural components has a significant adverse impact on fleet readiness and total ownership costs. To address these issues, NAVAIR has initiated a multi-year research program to investigate and quantify the fatigue life reduction due to corrosion on high-strength steels, and to develop models and metrics to implement actionable maintenance criteria for corrosion damage. In order to develop models that can quantify the severity of corrosion damage with respect to a reduction in fatigue life, a robust set of well-characterized test results on representative test specimens is required. This report documents the results of a set of tests to quantify the fatigue life of bare AF1410 steel unnotched flat plates with various stages of laboratory-induced corrosion damage on the surface. The test data

set includes a detailed characterization of the topology of surface corrosion damage on all test specimens, allowing a quantitative assessment of corrosion severity to be performed, given that an appropriate model is developed.

DTIC

Corrosion; Damage; Fatigue Life; Fatigue Tests; Flat Plates; High Strength Steels; Maintenance; Metal Plates; Steels

20080035466 Ohio State Univ., Columbus, OH USA

Accelerated Metals Development by Computation

Fraser, Hamish L; Mills, Michael J; Buchheit, Rudolph G; Wang, Yunzhi; Ghosh, Somnath; Williams, James C; Frankel, Gerald S; Rollett, Anthony D; Grandt, Alten F; Feb 2008; 212 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F33615-01-2-5225; Proj-4347

Report No.(s): AD-A481042; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481042>

This program was centered upon the formation of the Collaborative Center for Materials Design (CCMD), an entity coupled with Ohio State University's (OSU) Center for the Accelerated Maturation of Materials (CAMP). There are two foci upon which CCMD, established by the Cooperative Agreement F33615-01-2-5225, is based, the first promoting and developing a strong interaction between scientists and technologists at AFRL and faculty, post-doctoral fellows and research students comprising the team centered at the OSU and the second involving research aimed at furthering the ability to accelerate the maturation and insertion of materials, specifically metals and alloys of interest to the Air Force. The overall technical theme, namely accelerated metals development, represents a problem of tremendous interest to the Air Force. The research areas studies were developed and evolved in three phases of effort. In phase 1, four sub-programs were initiated and these have evolved into five tasks, namely Tasks 1, 2, 3, 4 and 8. Phase two involved the initiation of three additional tasks which evolved into Tasks 5, 6, and 7. Phase 3 involved the initiation of the remaining Tasks 9, 10 and 11. All of these tasks make a contribution to the general theme of the accelerated maturation/insertion of materials.

DTIC

Accelerated Life Tests; Alloys; Computation; Metals

20080036249 Lockheed Martin Michoud Space Systems, New Orleans, LA, USA

Friction Stir Weld Restart+Reweld Repair Allowables

Clifton, Andrew; June 23, 2008; 31 pp.; In English; 19th Aero mat Conference and Exposition, 23-26 Jun. 2008, Austin, TX, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS8-00016; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036249>

A friction stir weld (FSW) repair method has been developed and successfully implemented on Al 2195 plate material for the Space Shuttle External Fuel Tank (ET). The method includes restarting the friction stir weld in the termination hole of the original weld followed by two reweld passes. Room temperature and cryogenic temperature mechanical properties exceeded minimum FSW design strength and compared well with the development data. Simulated service test results also compared closely to historical data for initial FSW, confirming no change to the critical flaw size or inspection requirements for the repaired weld. Testing of VPPA fusion/FSW intersection weld specimens exhibited acceptable strength and exceeded the minimum design value. Porosity, when present at the intersection was on the root side toe of the fusion weld, the 'worst case' being 0.7 inch long. While such porosity may be removed by sanding, this 'worst case' porosity condition was tested 'as is' and demonstrated that porosity did not negatively affect the strength of the intersection weld. Large, 15-inch 'wide panels' FSW repair welds were tested to demonstrate strength and evaluate residual stresses using photo stress analysis. All results exceeded design minimums, and photo stress analysis showed no significant stress gradients due to the presence of the restart and multi-pass FSW repair weld.

Author

Friction Stir Welding; External Tanks; Fusion Welding; Stress Analysis; Weld Strength; Welded Joints; Design Analysis

20080036341 North Carolina State Univ., Raleigh, NC USA

Magnetic and Optical Properties of MN Doped GaN

Arkun, F E; El-Masry, N A; Reed, M J; Muth, John; Zhang, Xiyao; Mahrouse, Amr; Bedair, S M; Zavada, J M; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481656; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481656>

Mn:doped GaN films, a dilute magnetic semiconductor material, are grown on (0001) sapphire substrates by metal organic

vapor deposition. Optical properties are investigated by transmission measurements and two absorption bands are found to be dominating the transmission spectra. The first absorption band was at $E_v+1.5$ eV and was attributed to the formation of a Mn related deep level energy band above the valence band of GaN. The second band extended from 2.0 eV to the band edge of GaN. Absorption at these bands scaled with thickness and composition of the films. Co-doping of these films by n-type (Si) and p-type dopants (Mg) also greatly enhanced or reduced the absorption at these bands, indicating a change in the Fermi level in the crystal. The magnitude of the saturation magnetization was also a function of the Fermi level, which was probed by transmission measurements. Therefore, a correlation between optical properties and saturation magnetization has been established.

DTIC

Doped Crystals; Gallium Nitrides; Magnesium; Magnetic Properties; Optical Properties

20080036455 High Performance Technologies, Inc., Aberdeen, MD USA

Three-Dimensional Digital Microstructure

Cornwell, C F; Noack, R W; Abed, E J; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481869; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481869>

We report on a systematic means of generating a finite element (FE) mesh for realistic three-dimensional (3D) microstructure systems that are suitable for FE analysis. The relationship between a materials microstructure and its properties are well documented and drive efforts to model the substructure evolution of textured materials. An accurate 3D computer representation of the microstructure arrangement of a material is essential to modeling the behavior and performance of materials at the microstructure level. We describe a method that uses a combination of experimental and computational techniques to produce an accurate statistical representation of its microstructure arrangement. The experimental results are used to guide the construction of the abstract 3D digital model and to provide a quantitative measure for gauging the accuracy and quality of the model upon completion. Information about the size, shape, and orientation of the grains as well as the crystallographic orientation and mis-orientation between adjacent grains can be reproduced. A 3D advancing front grid-generating technique then uses this information to produce a tetrahedral volume mesh for the material that is suitable for FE analysis.

DTIC

Digital Systems; Microstructure; Polycrystals

20080036475 Brown Univ., Providence, RI USA

Microstructural Evolution during the Dynamic Deformation of High Strength Navy Steels

Kumar, K S; May 19, 2008; 36 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0062

Report No.(s): AD-A481924; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481924>

We have characterized the propensity for adiabatic shear band formation (an associated microstructural evolution) under dynamic deformation conditions in an ultra-high strength (160 Ksi/I 1.1GPa) Fe-10 Ni-0.1C-Cr,Mo,V steel and demonstrated that this steel is highly prone to shear localization and failure. In the as-received condition, the steel has a lath martensite microstructure. During dynamic deformation, shear localization occurs and manifests by an optically visible shear band; the original microstructure is discernible within the band. With progression in severity of localization, there is evidence for a central region within the shear band composed of approx. 300 nm size equiaxed grains constituting austenite, with a low dislocation content, and heavily twinned ferrite. In the extreme situation, a crack 'chases' the shear band, and examination of the resulting fracture surfaces provides evidence for the presence of a thin liquid film layer. We have also observed that lowering the Ni content in the alloy significantly and adding Cu to the alloy, enables improvements in resistance to shear localization, both in terms of initiation and propagation of the shear band.

DTIC

Deformation; High Strength Alloys; High Strength Steels; Microstructure; Navy; Steels

20080036493 Chiba Univ., Chiba, Japan

Fabrication of Ultra Fine Eutectic Structure Using Rapid Quenching Method and Plasma Sintering Technique

Takegawa, Kazuyuki; May 23, 2008; 7 pp.; In English

Contract(s)/Grant(s): FA4869-07-1-0004

Report No.(s): AD-A481972; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481972>

It is well known that cooling a melt of eutectic composition forms a characteristic structure. In this structure two phases entangle each other, which is called eutectic structure. Such structure is due to an alternate switching of crystallizing components from the melt. The size is generally small 'below micrometer'. The structure is self-forming composite, which can be used for many composite materials. Takegawa et al. emphasized the effect of diffusion in liquid phase during the formation of eutectic structure. Diffusion and convection of liquid phase delay the switching rate of crystallizing components. Based on this idea, Takegawa et al. used amorphous phase as a mother phase instead of the melt in GaAlO₃-Al₂O₃ and YAG-Al₂O₃ system and succeeded to make ultra fine eutectic structures. Eutectic structures having a size of several ten nanometers, which is much smaller than that by the ordinary method, could be obtained by this process.

DTIC

Eutectics; Fabrication; Fine Structure; Plasmas (Physics); Rapid Quenching (Metallurgy); Sintering

20080036522 NASA Marshall Space Flight Center, Huntsville, AL, USA

Risk Assessment for Titanium Pressure Vessels Operating Inside the ARES I's Liquid Hydrogen Tank Environment

Lee, Jonathan A.; June 23, 2008; 1 pp.; In English; 2008 National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; No Copyright; Avail.: Other Sources; Abstract Only

Titanium alloy (Ti-6-4) is currently being proposed for the manufacturing of pressure vessels (PV) for storage of compressed helium gas, which are mounted inside the ARES I's liquid hydrogen (LH₂) tank. At cryogenic temperature, titanium alloys usually have the highest strength-to-weight ratio property and have been considered as the metallic materials of choice for lightweight PV operating in LH₂ environment. Titanium PVs are also considered as heritage hardware because they have been used by NASA for the Saturn IV-B rocket's LH₂ tank in the mid 1960s. However, hydrogen embrittlement is possible if Ti-6-4 alloy is exposed to gaseous hydrogen at certain pressure and temperature during the LH₂ tank filling and draining operations on the launch pad, and during the J2X engine burn period for the ARES I's upper stage. Additionally, the fracture toughness and ductility properties of Ti-6-4 are significantly decreased at cryogenic temperature. These factors do not necessarily preclude the use of titanium PV in hydrogen or at cryogenic applications; however, their synergistic effects and the material damage tolerance must be accounted for in the mission life assessment for PVs, which are considered as fracture critical hardware. In this paper, an overview of the risk assessment for Ti-6-4 alloy, strategy to control hydrogen embrittlement and brief metallic material trade study for PV operating in LH₂ tank will be presented.

Author

Titanium Alloys; Risk Assessment; Pressure Vessels; Compressed Gas; Helium; Fracture Strength; Cryogenic Temperature; Liquid Hydrogen; Manufacturing

20080036591 Lockheed Martin Michoud Space Systems, New Orleans, LA, USA

Friction-Stir Welding - Heavy Inclusions in Bi-metallic welds of Al 2219/2195

Rietz, Ward W., Jr.; June 2008; 20 pp.; In English; ASM International, 1-6 Jun. 2008, Pine Mountain, GA, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): NAS8-00016; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036591>

Heavy Inclusions (HI) were detected for the first time by radiographic examination in aluminum alloy 2219forging/2195plate (advancing/retreating side) Friction Stir Welds (FSW) for the Space Shuttle External Tank (ET) Program. Radiographic HI indications appear as either small (approx.0.005'-0.025') individual particles or clusters of small particles. Initial work was performed to verify that the HI was not foreign material or caused by FSW pin tool debris. That and subsequent elemental analysis determined that the HI were large agglomerations of Al₂Cu (theta phase), which is the strengthening precipitate in Al2219. A literature search on that subject determined that the agglomeration of phase has also been found in Al2219 bead on plate FSW [Ref. 1]. Since this was detected in ET space flight hardware, an investigative study of the effect of agglomerated theta phase particles in FSW Al2219f/2195p was performed. Numerous panels of various lengths were welded per ET weld procedures and radiographically inspected to determine if any HI was detected. Areas that had HI were sampled for room temperature and cyclic cryogenic (-423F) tensile testing and determined no significant adverse affect on mechanical properties when compared to test specimens without HI and historical data. Fracture surface examination using

the Scanning Electron Microscope (SEM) revealed smaller phase agglomerations undetectable by radiographic inspection dispersed throughout the Al2219f/2195p FSW. This indicates that phase agglomeration is inherent to the Al2219f/2195p FSW process and only rarely creates agglomerations large enough to be detected by radiography. HI has not been observed in FSW of plate to plate material for either Al2219 or AL2195.

Author

Welded Joints; Friction Stir Welding; Aluminum Alloys; Bimetals; External Tanks; Chemical Analysis

27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.

20080034717 Savannah River National Lab., Aiken, SC, USA

High Level Waste (HLW) Sludge Batch 4 (SB4) Variability Study

Fox, K. M.; Edwards, T. B.; Peeler, D. K.; Best, D. R.; Reamer, I. A.; Oct. 01, 2006; 205 pp.; In English

Contract(s)/Grant(s): DE-AC09-96SR18500

Report No.(s): DE2007-915110; WSRC-STI-2206-00204; No Copyright; Avail.: National Technical Information Service (NTIS)

The Defense Waste Processing Facility (DWPF) is preparing for vitrification of High Level Waste (HLW) Sludge Batch 4 (SB4) in early FY2007. To support this process, the Savannah River National Laboratory (SRNL) has provided a recommendation to utilize Frit 503 for vitrifying this sludge batch, based on the composition projection provided by the Liquid Waste Organization on June 22, 2006. Frit 418 was also recommended for possible use during the transition from SB3 to SB4. A critical step in the SB4 qualification process is to demonstrate the applicability of the durability models, which are used as part of the DWPFs process control strategy, to the glass system of interest via a variability study. A variability study is an experimentally-driven assessment of the predictability and acceptability of the quality of the vitrified waste product that is anticipated from the processing of a sludge batch. At the DWPF, the durability of the vitrified waste product is not directly measured. Instead, the durability is predicted using a set of models that relate the Product Consistency Test (PCT) response of a glass to the chemical composition of that glass. In addition, a glass sample is taken during the processing of that sludge batch, the sample is transmitted to SRNL, and the durability is measured to confirm acceptance. The objective of a variability study is to demonstrate that these models are applicable to the glass composition region anticipated during the processing of the sludge batch in this case the Frit 503 SB4 compositional region. The success of this demonstration allows the DWPF to confidently rely on the predictions of the durability/composition models as they are used in the control of the DWPF process. Early projections of the Sludge Batch 4 (SB4) composition predicted relatively high concentrations of alumina (Al₂O₃, 23.5 wt%) and sulfate (SO₄²⁻, 1.2 wt%) in the sludge. A high concentration of Al₂O₃ in the sludge, combined with Na₂O additions in the frit, raises the potential for nepheline crystallization in the glass. However, strategic frit development efforts at the Savannah River National Laboratory (SRNL) have shown that frits containing a relatively high concentration of B₂O₃ can both suppress nepheline crystallization and improve melt rates.

NTIS

Glass; Sludge; Sulfates; Variability

20080034718 Savannah River National Lab., Aiken, SC, USA

Sulfate Retention in High Level Waste (HLW) Sludge Batch 4 (SB4) Glasses: A Preliminary Assessment

Fox, K. M.; Edwards, T. B.; Peeler, D. K.; Dec. 01, 2006; 95 pp.; In English

Contract(s)/Grant(s): DE-AC09-96SR18500

Report No.(s): DE2007-915109; WSRC-STI-2006-00038; No Copyright; Avail.: National Technical Information Service (NTIS)

Early projections of the Sludge Batch 4 (SB4) composition predicted relatively high concentrations of alumina (Al₂O₃, 23.5 wt%) and sulfate (SO₄²⁻, 1.2 wt%) in the sludge. A high concentration of Al₂O₃ in the sludge, combined with Na₂O additions in the frit, raises the potential for nepheline crystallization in the glass. However, strategic frit development efforts at the Savannah River National Laboratory (SRNL) have shown that frits containing a relatively high concentration of B₂O₃ can both suppress nepheline crystallization and improve melt rates. A high sulfate concentration is a concern to the DWPF as it can lead to the formation of sulfate inclusions in the glass and/or the formation of a molten, sulfate-rich phase atop the melt pool. To avoid these issues, a sulfate concentration limit of 0.4 wt% SO₄²⁻ in glass was originally set in the Product

Composition Control System (PCCS) used at DWPF. It was later shown that this limit could be increased to 0.6 wt% SO₄²⁻ in glass for the Frit 418, Sludge Batch 3 (SB3) system. Two frits have been evaluated for use with the early projections of SB4. Frit 418, which has been used previously with SB3, has been shown to produce glasses with SB4 that have an acceptable and predictable durability. Frit 503, a high boron concentration frit, has also been shown to produce durable glasses with SB4, and has advantages in melt rate over Frit 418. The applicability of the current 0.6 wt% sulfate limit to the SB4/Frit 418 or Frit 503 system, and/or the possibility of increasing the sulfate limit for SB4 are the subjects of this study. Ten glasses were fabricated in the laboratory using the May 2006 SB4 composition projection and Frits 418 and 503 at 38% waste loading.

NTIS

Glass; Sludge; Sulfates

20080034740 Emrich and Dithmar, LLC, Chicago, IL, USA

Chemically Bonded Phosphate Ceramic Sealant Formulations for Oil Field Applications

Wagh, A. S., Inventor; Jeong, S. Y., Inventor; McDaniel, R., Inventor; 24 Aug 05; 12 pp.; In English

Contract(s)/Grant(s): DE-W-3-1-109-ENG-38

Patent Info.: Filed Filed 24 Aug 05; US-Patent-Appl-SN-11-212 087

Report No.(s): PB2008-101081; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A sealant for an oil or geothermal well capable of setting within about 3 to about 6 hours at temperatures less than about 250 degrees F. for shallow wells less than about 10,000 feet and deep wells greater than about 10,000 feet having MgO present in the range of from about 9.9 to about 14.5%, KH(sub 2)PO(sub 4) present in the range of from about 29.7 to about 27.2%, class C fly ash present in the range of from about 19.8 to about 36.3%, class F fly ash present in the range of from about 19.8 to about 0%, boric acid or borax present in the range of from about 0.39 to about 1.45%, and water present in the range of from about 20.3 to about 21.86% by weight of the sealant. A method of sealing wells is disclosed as are compositions for very high temperature wells is disclosed as is a composition for treating oil field wastes.

NTIS

Ceramics; Chemical Bonds; Oil Fields; Phosphates; Sealers; Sealing; Wells

20080034745 Fish and Richardson, P.C., Minneapolis, MN, USA

Crosslinkable Side-Chain Polyimides for NLO Applications

Huang, D., Inventor; 19 Aug 05; 28 pp.; In English

Contract(s)/Grant(s): NRO000-01-0315

Patent Info.: Filed Filed 19 Aug 05; US-Patent-Appl-SN-11-207 303

Report No.(s): PB2008-100778; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Aromatic polyimide polymers and copolymers are described that have pendant side-chain crosslinkable groups. The polymers and copolymers may further include pendant side-chain NLO chromophores. The polymers and copolymers are useful in a variety of NLO applications.

NTIS

Polyimides; Polymers; Copolymers; Crosslinking; Optical Materials

20080034787 Nixon and Vanderhye, P.C., Arlington, VA, USA

Chiral Indole Intermediates and Their Fluorescent Cyanine Dyes Containing Functional Groups

Mujumdar, R. B., Inventor; West, R. M., Inventor; 9 May 03; 36 pp.; In English

Contract(s)/Grant(s): R01-NS-A353; MCB-8920118

Patent Info.: Filed Filed 9 May 03; US-Patent-Appl-SN-10-513 141

Report No.(s): PB2008-101137; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This invention relates to the functionalized cyanine dyes and more particularly, to the synthesis of chiral 3-substituted 2,3'-dymethyl-3H-indole and its derivatives as intermediates for preparation of cyanine dyes, to methods of preparing these dyes and the dyes so prepared.

NTIS

Chirality; Dyes; Fluorescence; Indoles; Patent Applications

20080034797 UT-Battelle, LLC, Oak Ridge, TN, USA

Highly Ordered Porous Carbon Materials Having Well Defined Nanostructures and Method of Synthesis

Dai, S., Inventor; Liang, C., Inventor; 10 Sep 04; 18 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed 10 Sep 04; US-Patent-Appl-SN-10-938 895

Report No.(s): PB2008-101178; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Applicant's present invention comprises a method for fabricating porous carbon materials having highly ordered nanostructures comprising the steps of first, forming a precursor solution comprising a block copolymer template and a carbon precursor; second, forming a self-assembled nanostructured material from the precursor solution; third annealing the nanostructured material thereby forming a highly ordered nanostructured material; fourth, polymerizing the carbon precursor to cure the nanostructured material; and pyrolyzing the nanostructured material wherein the block copolymer template is decomposed to generate ordered carbon nanopores and the nanostructured material is carbonized to form the walls of the carbon nanopores thereby forming a porous carbon material having a highly ordered nanostructure. In addition, the present invention further comprises a porous carbon material comprising a carbon nanostructure having ordered carbon nanopores that have uniform pore sizes ranging from about 4.5 nm up to about 100 nm.

NTIS

Carbon; Fabrication; Nanostructures (Devices); Patent Applications; Porous Materials

20080034848 Jagger (Bruce A.), Los Angeles, CA, USA

Ceramic Impregnated Superabrasives

Radtke, R. P., Inventor; Sherman, A., Inventor; 1 Sep 04; 13 pp.; In English

Contract(s)/Grant(s): DE-FC276-97FT34368

Patent Info.: Filed 1 Sep 04; US-Patent-Appl-SN-10-931 671

Report No.(s): PB2008-101098; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A superabrasive fracture resistant compact is formed by depositing successive layers of ceramic throughout the network of open pores in a thermally stable self-bonded polycrystalline diamond or cubic boron nitride preform. The void volume in the preform is from approximately 2 to 10 percent of the volume of the preform, and the average pore size is below approximately 3000 nanometers. The preform is evacuated and infiltrated under at least about 1500 pounds per square inch pressure with a liquid pre-ceramic polymerizable precursor. The precursor is infiltrated into the preform at or below the boiling point of the precursor. The precursor is polymerized into a solid phase material. The excess is removed from the outside of the preform, and the polymer is pyrolyzed to form a ceramic. The process is repeated at least once more so as to achieve upwards of 90 percent filling of the original void volume. When the remaining void volume drops below about 1 percent the physical properties of the compact, such as fracture resistance, improve substantially. Multiple infiltration cycles result in the deposition of sufficient ceramic to reduce the void volume to below 0.5 percent. The fracture resistance of the compacts in which the pores are lined with formed in situ ceramic is generally at least one and one-half times that of the starting preforms.

NTIS

Abrasives; Ceramics; Patent Applications

20080034883 NASA Glenn Research Center, Cleveland, OH, USA

Microgravity Flame Spread in Exploration Atmospheres: Pressure, Oxygen, and Velocity Effects on Opposed and Concurrent Flame Spread

Olson, Sandra L.; Ruff, Gary A.; Fletcher, J. Miller; August 2008; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 344397.04.01.03

Report No.(s): NASA/TM-2008-215260; Rept-2008-01-2055; E-16527; Copyright; Avail.: CASI: [A03](#), Hardcopy

Microgravity tests of flammability and flame spread were performed in a low-speed flow tunnel to simulate spacecraft ventilation flows. Three thin fuels were tested for flammability (Ultem 1000 (General Electric Company), 10 mil film, Nomex (Dupont) HT90-40, and Mylar G (Dupont) and one fuel for flame spread testing (Kimwipes (Kimberly-Clark Worldwide, Inc.)). The 1g Upward Limiting Oxygen Index (ULOI) and 1g Maximum Oxygen Concentration (MOC) are found to be greater than those in 0g, by up to 4% oxygen mole fraction, meaning that the fuels burned in 0g at lower oxygen concentrations than they did using the NASA Standard 6001 Test 1 protocol. Flame spread tests with Kimwipes were used to develop correlations that capture the effects of flow velocity, oxygen concentration, and pressure on flame spread rate. These correlations were used to determine that over virtually the entire range of spacecraft atmospheres and flow conditions, the opposed spread is faster, especially for normoxic atmospheres. The correlations were also compared with 1g MOC for various materials as a function of pressure and oxygen. The lines of constant opposed flow agreed best with the 1g MOC trends, which indicates that Test 1 limits are essentially dictated by the critical heat flux for ignition. Further evaluation of these and other materials is continuing to better understand the 0g flammability of materials and its effect on the oxygen margin of safety.

Author

Flame Propagation; Microgravity; Pressure Effects; Oxygen; Flammability

20080034982 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA

Microfabricated Elastomeric Valve and Pump System

Unger, M. A., Inventor; Chou, H. P., Inventor; Thorsen, T. A., Inventor; Scherer, A., Inventor; Quake, S. R., Inventor; 20 Apr 05; 101 pp.; In English

Contract(s)/Grant(s): HG-01642-02

Patent Info.: Filed Filed 20 Apr 05; US-Patent-Appl-SN-11-111 264

Report No.(s): PB2008-101243; No Copyright; Avail.: CASI: [A06](#), Hardcopy

A method of fabricating an elastomeric structure, comprising: forming a first elastomeric layer on top of a first micromachined mold, the first micromachined mold having a first raised protrusion which forms a first recess extending along a bottom surface of the first elastomeric layer; forming a second elastomeric layer on top of a second micromachined mold, the second micromachined mold having a second raised protrusion which forms a second recess extending along a bottom surface of the second elastomeric layer; bonding the bottom surface of the second elastomeric layer onto a top surface of the first elastomeric layer such that a control channel forms in the second recess between the first and second elastomeric layers; and positioning the first elastomeric layer on top of a planar substrate such that a flow channel forms in the first recess between the first elastomeric layer and the planar substrate.

NTIS

Elastomers; Micromachining; Patent Applications; Pumps; Valves

20080034999 Jagtiani and Guttag, Fairfax, VA, USA

Ceramic Compositions for Thermal Barrier Coatings with Improved Mechanical Properties

Spitsberg, I., Inventor; Boutwell, B. A., Inventor; 19 Aug 04; 7 pp.; In English

Contract(s)/Grant(s): JSF-N00019-96-C-0176

Patent Info.: Filed Filed 19 Aug 04; US-Patent-Appl-SN-10-921 515

Report No.(s): PB2008-100734; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Zirconia-containing ceramic compositions useful for thermal barrier coatings having improved mechanical properties, especially improved fracture toughness. These compositions comprise: (1) at least about 93 mole % zirconia; (2) a stabilizing amount up to about 5 mole % of a stabilizer metal oxide selected from the group consisting of yttria, calcia, ceria, scandia, magnesia, india, gadolinia, neodymia, samaria, dysprosia, erbia, ytterbia, europia, praseodymia, and mixtures thereof, and a fracture toughness improving amount up to about 2 mole % lanthana. These ceramic compositions can be used to prepare thermal barrier coatings to provide a thermally protected article having a substrate and optionally a bond coat layer adjacent to and overlaying the substrate. The thermal barrier coating can be prepared by depositing the ceramic composition on the bond coat layer or the substrate in the absence of a bond coat layer.

NTIS

Ceramics; Mechanical Properties; Patent Applications; Thermal Control Coatings

20080035003 Foley and Lardner, LLP, Washington, DC, USA; Rensselaer Polytechnic Inst., Troy, NY, USA

Carbon Nanotube Foam and Method of Making and Using Thereof

Ajayan, P., Inventor; Carrillo, A., Inventor; Chakrapani, N., Inventor; Kane, R. S., Inventor; Wei, B., Inventor; 7 Dec 04; 15 pp.; In English

Contract(s)/Grant(s): DMR-0408745

Patent Info.: Filed Filed 7 Dec 04; US-Patent-Appl-SN-11-005 474

Report No.(s): PB2008-102152; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of making a carbon nanotube structure includes providing an array of substantially aligned carbon nanotubes, wetting the array with a liquid, and evaporating the liquid to form the carbon nanotube structure having a pattern in the carbon nanotube array. The structure is preferably a carbon nanotube foam.

NTIS

Carbon Nanotubes; Foams; Patent Applications; Evaporation

20080035090 Foley and Lardner, LLP, Madison, WI, USA

Zirconium-Rich Bulk Metallic Glass Alloys

Chang, Y. A., Inventor; Cao, H., Inventor; Ma, D., Inventor; Ding, L., Inventor; Hsieh, K. C., Inventor; 12 Oct 04; 8 pp.; In English

Patent Info.: Filed 12 Oct 04; US-Patent-Appl-SN-10-963 413

Report No.(s): PB2008-102122; No Copyright; Avail.: CASI: A02, Hardcopy

Zirconium-rich bulk metallic glass alloys include quinary alloys containing zirconium, aluminum, titanium, copper and nickel. The bulk metallic glass alloys may be provided as completely amorphous pieces having cross-sectional diameters of at least about 5 mm or even greater.

NTIS

Metallic Glasses; Patent Applications; Zirconium

20080035327 California Univ., Santa Cruz, CA USA

Peel Zone Model of Tape Peeling Based on the Gecko Adhesive System

Pesika, Noshir S; Tian, Yu; Zhao, Boxin; Rosenberg, Kenny; McGuiggan, Patricia; Autumn, Kellar; Israelachvili, Jacob N; Nov 2006; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-D-0004

Report No.(s): AD-A481235; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A tape peeling model based on the geometry of the peel zone (PZ) is derived to predict the peeling behavior of adhesive tapes at peel angles less than or equal to 90 degrees. The PZ model adds an angle-dependent multiplier to the Kendall equation that takes into account the geometrical changes within the peel zone. The model is compared to experimental measurements of the peel force at different angles for a model tape and two commercial tapes, each with different bending moduli, stretch moduli and adhesive strengths. Good agreement is found for a wide range of peel angles. The PZ model is also applied to the gecko adhesive system and predicts a spatula peel angle of 18.4 degrees to achieve the adhesion forces reported for single setae. The PZ model captures the fact that adhesive forces can be significantly enhanced by peeling at an angle, thereby exploiting high friction forces between the detaching material and the substrate.

DTIC

Adhesives; Mechanical Properties; Peeling

20080035347 Fraunhofer-Inst. for High-Speed Dynamics, Efringen-Kirchen, Germany

High-Speed Transmission Shadowgraphic and Dynamic Photoelasticity Study of Stress Wave and Impact Damage Propagation in Transparent Materials and Laminates using the Edge-On Impact (EOI) Method

Strassburger, Elmar; Steinhauser, Martin O; Patel, Parimal; McCauley, James W; Kovalchick, Christopher; Ramesh, K T; Templeton, Douglas W; Nov 2006; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481267; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Operation Iraqi Freedom has clearly demonstrated the criticality of transparent armor in many army systems. As the threats have escalated and become more varied, the challenges for rapidly developing optimized threat specific transparent armor packages have become extremely complex. In order to accelerate the development of validated design and predictive performance models, the Army Research Laboratory, the U.S. Army Tank Automotive Research Development and Engineering Center, and the Material Center of Excellence at Johns Hopkins University have entered into a collaboration with The Ernst-Mach Institute (EMI) of Efringen-Kirchen, Germany. The unique, fully instrumented Edge-on Impact facility at EMI, modified for dynamic photoelasticity, is being used to quantify stress wave propagation, damage nucleation and propagation during high velocity impacts. Summarized in this paper are a selection of results on monolithic and laminated glass (Starphire[trademark]) and AION, a polycrystalline transparent ceramic. Crack, damage and stress wave velocities have been determined directly. In addition, the stress wave and damage retardation by various thickness bonding interfaces has been measured: for a 5.08 mm interlayer, a delay of 1.7 microsec was determined. A computational model was constructed using ABAQUS Explicit to simulate the elastic wave propagation within AION. The simulations show that the damaged region observed in the experiments corresponds essentially to the region that has observed shear as a result of the wave propagation. These results are a critical tool to corroborate and refine existing materials and transparent armor package models by providing insight and critical data into the role of different materials and interfaces that can eventually guide materials and laminate design.

DTIC

Armor; Ceramics; Glass; High Speed; Impact Damage; Laminates; Photoelasticity; Polycrystals; Shadowgraph Photography; Stress Waves; Transparency; Wave Propagation

20080036013 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Ceramic Inspection System

Werve, M. E., Inventor; 30 Sep 04; 10 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed 30 Sep 04; US-Patent-Appl-SN-10-957 179

Report No.(s): PB2008-102002; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A system for inspecting a ceramic component. The ceramic component is positioned on a first rotary table. The first rotary table rotates the ceramic component. Light is directed toward the first rotary table and the rotating ceramic component. A detector is located on a second rotary table. The second rotary table is operably connected to the first rotary table and the rotating ceramic component. The second rotary table is used to move the detector at an angle to the first rotary table and the rotating ceramic component.

NTIS

Ceramics; Inspection; Patent Applications

20080036017 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Thermal Casting of Polymers in Centrifuge for Producing X-Ray Optics

Hill, R. M., Inventor; Decker, T. A., Inventor; 30 Sep 04; 8 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed 30 Sep 04; US-Patent-Appl-SN-10-956 631

Report No.(s): PB2008-102006; No Copyright; Avail.: CASI: [A02](#), Hardcopy

An optic is produced by the steps of placing a polymer inside a rotateable cylindrical chamber, the rotateable cylindrical chamber having an outside wall, rotating the cylindrical chamber, heating the rotating chamber forcing the polymer to the outside wall of the cylindrical chamber, allowing the rotateable cylindrical chamber to cool while rotating producing an optic substrate with a substrate surface, sizing the optic substrate, and coating the substrate surface of the optic substrate to produce the optic with an optic surface.

NTIS

Casting; Centrifuges; Patent Applications; X Ray Optics

20080036225 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Generiek Materieellogistiek Ketenmodel Defensie (Generic Value Chain Model for Defense Material Organization)

Boots-Theunissen, E A; Hasberg, M P; van Zijderveld, E J; Apr 2008; 29 pp.; In Dutch; In Dutch; In English; Original contains color illustrations

Report No.(s): AD-A481203; TNO-DV-2007-Q449; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481203>

In this report a generic value chain model for the Defense Materiel Organization is presented. This model can be used for ex ante policy analyses.

DTIC

Policies; Defense; Materials

20080036302 Army Engineer Research and Development Center, Vicksburg, MS USA

Innovative Approaches To Improving The Bond Between Concrete and Steel Surfaces

Day, Donna C; Carrasquillo, Mariangelica; Weiss, Jr, Charles A; Sykes, Melvin C; Baugher, Jr, Earl H; Malone, Philip G; Nov 1, 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481587; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481587>

A reactive silicate layer fused onto the surface of reinforcing steel provides a coupling layer that allows a very strong bond to develop between hydrating Portland cement paste and the surface of the steel. The reactive layer eliminates the problem of a weak, low-density hydrated, layer of paste forming on the surface of the steel. Steel enameling techniques are used to bond a low-melting point glass frit onto the steel. A high melting point hydraulically reactive silicate (such as Portland cement) embedded in the bonded glass reacts with the surrounding paste and the paste adheres strongly to the coupling layer. Bench-scale pull-out tests show that the bond can be up to four times that observed with uncoated rods. The porcelain-based coating can potentially provide protection from corrosion for the coated reinforcing elements.

DTIC

Bonding; Cements; Composite Materials; Concretes; Enamels; Joints (Junctions); Metal Surfaces; Steels

20080036314 Army Research Lab., Aberdeen Proving Ground, MD USA

Optically Transparent Nanoporous Glasspolymer Composites

O'Brien, D J; Juliano, T F; Patel, P J; McKnight, S H; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481604; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481604>

Proper design of lightweight laminated composite armor relies on the engineer's ability to specify the acoustic impedance of each layer. In conventional, opaque laminated armor systems, stress waves can be efficiently transmitted throughout the structure with a gradual variation of the acoustic impedance from one layer to the next. In transparent systems, however, the engineer can only choose between monolithic glass, ceramic, or polymer systems, resulting in a large acoustic impedance jump between polymer and ceramic layers. In this work we manufacture a novel transparent polymer-glass composite to be used as an intermediate impedance material. This transparent nanocomposite is created by infiltrating nanoporous glass (Vycor, Corning Inc.) with different polymers. The Vycor pores (4-6 nm) are much smaller than the wavelength of light, thus refractive index matching with the polymer is not necessary for transparency.

DTIC

Armor; Ceramics; Composite Materials; Glass; Polymers; Refractivity; Transparence

20080036324 Sirigen, Inc., Santa Barbara, CA USA

Meeting Threat Detection Needs For The Army: Using Conjugated Polymers To Improve Diagnostics

Sun, ChengJun; Hong, Janice; Fu, Tsu-Ju; Gaylord, Brent; Chi, Chunyan; Mikhailovsky, Alexander; Bazan, Guillermo; Horsmon, Jennifer; Sekowski, Jennifer; Nov 2006; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481619; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481619>

The focus of this work is on the development of an integrated biological detection system that can meet the needs of Army to detect biological threats. This detection system will be based on a heterogeneous microarray format, which allows for the simultaneous detection of multiple threat agents, and cationic conjugated polymers (CCPs), which serve either to enhance microarray systems (both commercially available and custom-printed) by increasing signal output of a reporter dye via Forster resonance energy transfer (FRET) or to provide a means for reporting in label-free microarray systems that could greatly reduce the cost for time and materials. For labeled systems, amplified signal intensities of reporting dyes should translate to either a higher sensitivity or lower requirements for optical specifications. Simplification of the optics would not only reduce the overall cost of testing, but opens the door for the overriding goal of design and development of portable and/or point-of-care testing devices. These types of diagnostic devices would have the potential to perform field-deployable, simple, and cost-effective testing in a timely fashion for bio-threat agents.

DTIC

Biological Effects; Conjugation; Detection; Diagnosis

20080036361 Oak Ridge National Lab., TN USA

Strength and Contact Damage Responses in a Soda-Lime-Silicate and a Borosilicate Glass

Wereszczak, A A; Johanns, K E; Kirkland, T P; Anderson, Jr , C E; Behner, T; Patel, P; Templeton, D W; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481685; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481685>

Although soda-lime-silicate glass is typically used as windows in ground vehicles, borosilicate glass is an interesting alternative because its density is about 10% less and therefore its use could reduce vehicle weight. The US Army RDECOM is characterizing both glasses in a variety of ways to compare their performances and judge if the use of borosilicate glass is a worthy substitute. This study supported that through a series of quasi-static strength and spherical (Hertzian) indentation tests. Their results were then combined to construct 'Damage/Design Maps' which are advocated here to help guide the use of these glasses in ground vehicles. If static strength and indentation responses are translatable to ballistic performance, then this study shows improved ballistic performance of 'float-glasses' can be achieved through appropriate selection of glass based on the thickness and the appropriate orientations of their 'air' and 'tin' sides.

DTIC

Borosilicate Glass; Calcium Oxides; Damage; Evaluation; Flexing; Flexural Strength; Glass; Indentation; Silica Glass; Silicates; System Effectiveness

20080036379 Army Research Lab., Aberdeen Proving Ground, MD USA

Advanced Surface Treatments and Adhesive Bonding Testing Schemes of Ceramic Assemblies

Bujanda, Andres; Forster, Aaron; Kosik, Wendy; Jensen, Robert; McKnight, Steven; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481724; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481724>

Evaluation of bond strength between dissimilar materials such as those in ceramic-metallic systems has to date been qualitative, offering no quantitative comparative results. This was due primarily to the difficulties inherent in handling and machining brittle materials such as ceramics. In this study a testing scheme was developed to circumvent the mechanical property inconsistencies of a metallic-ceramic system and allow quantitative evaluation of bond strength in a titanium/alumina composite system. Using a carefully designed half-wedge configuration, results are compared to a standard full-wedge test and show comparable bond strength and strain energy release rate values. Additionally, the effects of surface treatments on the ceramic-metallic bond strength are also evaluated with the half-wedge configuration as well as the effects of surface treatment on the mechanical integrity of the alumina ceramic.

DTIC

Adhesive Bonding; Ceramics; Surface Finishing; Surface Treatment

20080036386 Massachusetts Inst. of Tech., Cambridge, MA USA

Unraveling Dynamic Mechanical Deformation in Segmented Polyurethanes: From High Strain-Rate Hardening to Complete Fold Recovery

Hsieh, A J; Yi, J; Pate, B D; Boyce, M C; Nov 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-D-0002; N00014-04-1-0469

Report No.(s): AD-A481738; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481738>

In light of the increased threat from terrorist activities in recent years, there is a critical need for lightweight transparent ballistic shield materials that are mechanically robust and have multi-functional properties. Transparent segmented polyurethanes (PU) in particular have shown potential for use as rigid ballistic shields and as lens materials for flexible C/B protective face masks. The performance specifications required for each application are quite different, and the current state-of-the-art PU technology can not completely fulfill the full spectra of materials survivability including the simultaneous mechanical and chemical hardening against the emerging operational threats. ARL is currently engaged in collaboration with the Institute for Soldier Nanotechnologies (ISN) to investigate and exploit new molecular mechanisms for design of novel hierarchical hybrid structures to achieve the desired physical and mechanical properties. This paper presents the experimental findings from recent studies conducted at the ISN whereby the role of molecular structures on the dynamic mechanical deformation of a model set of segmented polyurethanes was determined. The microphase morphology, thermal transitions, molecular relaxation, and mechanical deformation were investigated. The nature of chain extender significantly affected the extent of phase mixing between the hard and soft segments: incorporation of 2,2-dimethyl-1,3-propanediol (DMPD) as the chain extender resulted in a 51 deg. C increase in the soft segment T_g relative to the analogous 1,4-butanediol (BDO)-containing PU samples. Small-angle X-ray scattering data indicated that the structure difference between chain extenders was correlated with a substantial change in interdomain structure. The BDO-containing PU samples exhibited a single, broad scattering peak that is typical of phase-segregated segmented polyurethanes.

DTIC

Deformation; Morphology; Polyurethane Resins; Segments; Thermal Analysis

20080036393 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Development and Performance of High Energy High Performance Co-Layered ETPE Gun Propellant for Future Large Caliber System

Manning, T G; Park, D; Chiu, D; Klingaman, K; Lieb, R; Leadore, M; Homan, B; Liu, E; Soucy, D; Luoma, J; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481748; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481748>

The co-layered propellant configuration, when properly designed, is conducive to higher performance at lower gun chamber pressure. The energetic thermoplastic elastomer (ETPE) was utilized to produce co-layered propellant in the radial

strip configuration. The manufacturing process was developed, and the propellants were fully characterized before the test firing using 60 mm subscale gun. The test firing of 15 shots at hot, ambient, and cold temperatures showed mixed results.
DTIC

Elastomers; Gun Propellants; Thermoplastic Resins; Thermoplasticity

20080036397 Massachusetts Univ., Lowell, MA USA

Effects of Carbon Black Type on Breathable Butyl Rubber Membranes

Threepopnatkul, P; Murphy, D; Mead, J; Zukas, W; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481756; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481756>

This study addresses the formulation effects of carbon black type and carbon black loading on the physical properties of electrospun butyl rubber nonwoven membranes. These membranes are envisioned as a potential breathable barrier layer in chemical and biological (CB) protective garments. The advantages of an electrospun crosslinked elastomer system, when compared to similarly prepared thermoplastics, are increased flexibility, durability, and chemical resistance. The porosity and surface area of these membranes are directly related to the water vapor transmission, air flow resistance, aerosol resistance, and the transport of chemical vapors. The barrier properties will be affected by the ability to control pore sizes, fiber diameter, permeability, and physical properties through formulation and process variables. Experimental results reveal that fiber diameter decreased with decreasing carbon black particle size and increasing carbon black structure. Density of the electrospun mats decreased with smaller particle size and higher structure. Decreasing carbon black particle size and increasing structure showed increased stress at break, ultimate elongation and modulus of the membranes. Good dispersion of smaller carbon black size and higher carbon black structure lead to decreased electrical resistance and increased ultimate strength.

DTIC

Butenes; Carbon; Chemical Warfare; Membranes; Porous Materials; Protective Clothing; Rubber; Warfare

20080036407 Army Research Lab., Aberdeen Proving Ground, MD USA

Fundamental Investigation of High-Velocity Impact of Ductile Projectiles on Confined Ceramic Targets

Leavy, B; Krauthauser, C; Houskamp, J; LaSalvia, J; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481773; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481773>

To aid the Army's transformation into a more mobile, rapidly deployable, and highly survivable force, researchers at the Army Research Laboratory (ARL) have undertaken a program aimed at supporting the development of lighter weight ceramic armors with greater protection capabilities. One goal of this program is to improve the capabilities of computational tools for the design and analysis of ceramic armors, which offer greatly enhanced protection capabilities at reduced weights. Given the multitude of design variables, the development of optimized ceramic armors is a resourceintensive process that relies on predictive simulations. The use of validated computational design tools in conjunction with ballistic experimentation and postmortem system characterization are keys to improving upon this process. This approach has not been widely adopted mainly because of justified concerns with the validity of computational tool predictions. The program at ARL will assess the capabilities of current computational tools by generating benchmark data on the time-dependent response of simplified ceramic armor targets and armor ceramics, and quantify ceramic damage responsible for these responses. The ability for current computational tools to match such data will identify model weaknesses and therefore expedite improvements. The experimental capability for determining the timedependent response of simplified ceramic armor targets and some recent results for an armor-grade silicon carbide are presented. In addition, preliminary efforts examining the validity of a computational tool based on Sandia National Lab's (SNL) GeoModel (Fossum and Brannon, 2004), and implemented into ALEGRA (Carroll et al., 2004) are reported.

DTIC

Armor; Ballistics; Ceramics; Computerized Simulation; Confinement; Ductility; Projectiles; Targets

20080036413 State Univ. of New York, Binghamton, NY USA

Tailoring of Nano- and Microstructure in Biomimetically Synthesized Ceramic Films

Zhang, Guangneng; Cho, Junghyun; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481787; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481787>

A novel ceramic thin film deposition approach through which inorganic materials were deposited on a functionalized

organic matrix from aqueous media at low temperatures was studied. This process is analogous to the natural biomineralization process. Specifically, nanostructured ZrO₂ and TiO₂ thin films were deposited at about 70 C by the hydrolysis of Zr(SO₄)₂ and TiCl₄ aqueous precursor solutions, respectively, on silicon substrates coated with phosphonate-terminated self-assembled monolayers (SAMs). The as-deposited oxide films consisted of nanocrystallites of tetragonal ZrO₂ and anatase phase TiO₂ in size of 5-10 nm, while some amorphous phases existed as well. The principal mechanism for the formation of the films seems to be homogeneous nucleation of the bulk precipitates and their aggregation behavior in supersaturated solution. Different from the previous results, the ZrO₂ and TiO₂ films could also be deposited on bare silicon substrates without any SAMs, under the same conditions used for deposition on SAMs.

DTIC

Ceramics; Deposition; Microstructure; Thin Films; Titanium Oxides; Zirconium Oxides

20080036436 Johns Hopkins Univ., Laurel, MD USA

Combined High Temperature Aerothermal-Structural Physical Property Testing of Ceramic Matrix Composites

King, Don E; Drewry, David G; Mar 2008; 19 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0212

Report No.(s): AD-A481825; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481825>

The objective was to integrate a mechanical test apparatus into a wind tunnel flow field capable of generating controlled multi-directional stress/strain states in flat coupons exposed to appropriate chemical, thermal, and aerodynamic shear flow environments. Displacement control enables imposition of stress/strain fields (in the flat coupons) similar to those expected in complex flight component geometries. Control and measurement of these variables and the material response in a controlled environment enables assessment of material performance for hypersonic missile and re-entry vehicle flight trajectories. Requirements for the test apparatus were developed and the apparatus was designed. Unfortunately, closure of the proposed wind tunnel facility led to increased costs and imposed a major schedule slip. The program's contract was not extended and the test apparatus was not assembled.

DTIC

Ceramic Matrix Composites; High Temperature

20080036447 Army Natick Soldier Center, Natick, MA USA

Biological Templating and the Production of Functional Fibers

Mello, Charlene M; Chiang, Chung-Yi; Gu, Jiji; Belcher, Angela; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481860; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481860>

Biology offers several advantages over traditional systems for the construction of novel materials. These include self-assembly, template-directed assembly, replication, molecular diversity, and the ability to screen and select from amidst this diversity. To harness the inherent advantages of biological systems, they must be interfaced with non-biological materials. Constructing these interfaces has been difficult because electrical/mechanical/optical systems have typically not been designed to accommodate the aqueous biochemistry of living systems. Recent research studies reported from the Belcher lab (Flynn, 2003; Mao, 2004; and Nam, 2006) demonstrate that this shortcoming can be overcome by utilizing genetically controlled proteins as templates to mineralize metals and inorganic materials at room temperature. In addition, fibers can be made from genetically controlled proteins in aqueous environments (Arcidiacono, 2002). Potentially, these genetically controlled peptides can mineralize inorganic or metallic particles at the surface of these fibers. Current, manufacturing of metallic or metallic-coated fibers requires high temperature and pressure processes, which are environmentally unfriendly and costly. These biological materials could open a new synthesis route to manufacture multifunctional fibers. In this paper, we will introduce the application of a genetically controlled filamentous bacteriophage in fabrication of functional fibers. New optical and semi-conducting fibers are envisioned in addition to catalysts, energy storage and generation technologies.

DTIC

Bacteriophages; Templates

20080036470 Army Research Lab., Aberdeen Proving Ground, MD USA

Towards Failure Pattern Formation in Brittle Materials

Grinfeld, M A; McCauley, J W; Schoenfeld, S E; Wright, T W; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481912; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481912>

Several Edge-on Impact (EOI) tests on transparent glasses and polycrystalline ceramics have shown that failure fronts have an extremely rough morphology, including the appearance of spikes. A simple thermodynamic theory has been used to interpret the observed morphological instability of failure fronts. For the case of isotropic phases, the instability criterion can be obtained in explicit form.

DTIC

Brittle Materials; Brittleness; Failure

20080036490 Army Research Lab., Aberdeen Proving Ground, MD USA

Multiscale Mechanical Characterization of Biomimetic Gels for Army Applications

Juliano, Thomas F; Moy, Paul; Forster, Aaron M; Weerasooriya, Tusit; VanLandingham, Mark R; Drzal, Peter L; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481959; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481959>

Ballistic gelatin often serves as a tissue surrogate for impact testing. Unfortunately, this material exhibits issues such as mechanical instability at room temperature and is difficult to structurally modify. A material system that is not as sensitive to these issues is styrene-isoprene triblock copolymer gels. In this work, two such copolymer gels were compared to ballistic gelatin via mechanical behavior evaluation using both macro-scale and micro-scale measurements. Both copolymer gels were found to have a greater degree of thermal stability than ballistic gelatin, and results based on mechanical evaluation show that the copolymer gels may be suitable as a replacement for ballistic gelatin.

DTIC

Biomimetics; Copolymers; Gelatins; Gels; Mechanical Properties

20080036594 Army Natick Research and Development Command, MA USA

Effect of Wool Components in Pile Fabrics on Water Vapor Sorption, Heat Release, and Humidity Buffering

Gibson, Phillip; May 2008; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482042; NATICK/TR-08/013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes an experimental approach for and results from measurements of the effect of wool fibers on thermal effects related to moisture sorption and desorption for several wool-containing fabrics, pile fabrics, and wool blend materials. Commercially successful polyester pile fabrics are undergoing further development to add wool fibers into one or more of the pile faces to take advantage of the natural thermal and water vapor regulation properties of wool. Wool clothing actively generates heat when moved from a warm and dry indoor environment to cold and wet outdoor conditions. This is due to the readjustment of water vapor content within wool fibers to maintain equilibrium with the local microclimate.

DTIC

Fabrics; Heat Transfer; Humidity; Sorption; Textiles; Water; Water Vapor; Wool

20080036656 California Univ., Santa Barbara, CA USA

Plastic Optoelectronics: Injection Lasers Fabricated from Soluble Semiconducting Polymers and Bulk Heterojunction Solar Cells Fabricated from Soluble Semiconducting Polymers

Heeger, Alan J; Bazan, Guillermo; Apr 17, 2008; 15 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0139

Report No.(s): AD-A482187; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We summarize progress on bulk heterojunction (BHJ) 'plastic' solar cells: BHJ solar cells are based on phase-separated blends of polymer semiconductors and fullerene derivatives. Because of self-assembly on the nanometer length scale, excitons formed after absorption of solar irradiation diffuse to a heterojunction prior to recombination and are dissociated at the polymer/fullerene interface. Ultrafast charge transfer from semiconducting polymers to fullerenes guarantees that the quantum efficiency for charge transfer (CT) at the interface approaches unity, with electrons on the fullerene network and holes on the polymer network. Electrons migrate toward the lower work function metal and holes migrate toward the higher work function

metal. Carrier recombination prior to reaching the electrodes and low mobility limit both the device fill factor (FF) and the overall photon harvesting by reducing the optimum active layer thickness. The carrier lifetime is largely controlled by the phase morphology between the donor and acceptor materials. We also summarize the results obtained to demonstrate the realization of the Light emitting Field effect Transistors.

DTIC

Absorption; Charge Transfer; Fabrication; Field Effect Transistors; Heterojunction Devices; Injection Lasers; Polymers; Quantum Efficiency; Semiconductors (Materials); Solar Cells

28

PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

20080034741 National Biodiesel Board, Jefferson City, MO, USA; Advance Fuel Solutions, Lynnfield, MA, USA
Biodiesel Fuel Management Best Practices for Transit

Oct. 01, 2007; 75 pp.; In English

Contract(s)/Grant(s): DTFT-MO-26-7009-00

Report No.(s): PB2008-100989; FTA-MO-26-7009-2007-1; No Copyright; Avail.: National Technical Information Service (NTIS)

Public transportation systems play a key role throughout the country not only in providing vital services to citizens but also in the environmental quality of our communities. Transit systems nationwide are seeking out new technologies in order to increase U.S. energy independence and reduce emissions by switching to biodiesel in diesel buses. This report discusses the benefits and challenges to the transit industry of using biodiesel. It provides information on the characteristics of biodiesel and biodiesel blends and discusses best practices for the procurement, blending, storage and use of biodiesel.

NTIS

Transportation; Diesel Fuels; Technology Assessment; Pollution Control; Energy Conservation

20080034885 Southwest Research Inst., San Antonio, TX, USA

Propellant Mass Gauging: Database of Vehicle Applications and Research and Development Studies

Dodge, Franklin T.; August 2008; 43 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NNC06QA81P; WBS 095240.04.03.03.02.04

Report No.(s): NASA/CR-2008-215281; E-16547; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080034885>

Gauging the mass of propellants in a tank in low gravity is not a straightforward task because of the uncertainty of the liquid configuration in the tank and the possibility of there being more than one ullage bubble. Several concepts for such a low-gravity gauging system have been proposed, and breadboard or flight-like versions have been tested in normal gravity or even in low gravity, but at present, a flight-proven reliable gauging system is not available. NASA desired a database of the gauging techniques used in current and past vehicles during ascent or under settled conditions, and during short coasting (unpowered) periods, for both cryogenic and storable propellants. Past and current research and development efforts on gauging systems that are believed to be applicable in low-gravity conditions were also desired. This report documents the results of that survey.

Author

Storable Propellants; Gauge Theory; Microgravity; Gravitation; Breadboard Models; Cryogenic Rocket Propellants; Ascent

20080036263 Army Tank-Automotive Research and Development Command, Warren, MI USA

Motion Base Simulation of a Hybrid-Electric HMMWV for Fuel Economy Measurement

Brudnak, Mark; Pozolo, Mike; McGough, Matthew; Mortsfield, Todd; Shvartsman, Andrey; Romano, Richard; Apr 2008; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481514; TACOM/TARDEC-18608; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481514>

This paper describes a human-in-the-loop motion-based simulator which was built to perform controlled fuel economy

measurements for both a conventional and hybrid electric HMMWV. The simulator was constructed with a driver's console, visualization system, and audio system all of which were mounted on the motion base simulator. These interface devices were then integrated with a real-time dynamics model of the HMMWV. The HMMWV dynamics model was built using the real-time vehicle modeling tool SimCreator, which, in turn was integrated with two powertrain models implemented with Gamma Technologies GT-Drive product. These two powertrains consisted of a conventional configuration and a series hybrid-electric configuration. These models were then run on four different standard Army fuel consumption courses to replicate tests which had previously been conducted at the proving ground. Experiments were performed for varying speeds with two experienced proving ground drivers. This paper describes the design and implementation of the simulation environment, the execution of the experiment and presents some results measured in the experiment.

DTIC

Fuel Consumption; Mobility; Motion Simulation; Simulation

20080036402 Precision Combustion, Inc., New Haven, CT USA

Performance of a Diesel, JP-8 Reformer

Roychoudhury, Subir; Walsh, Dennis; Chu, Deryn; Kallio, Erik; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481763; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481763>

Under a U.S. Army program, Precision Combustion, Inc. (PCI) has developed and demonstrated an ultra compact and lightweight 2.5 kWe diesel reformer and desulfurizer producing <1 ppm sulfur in reformat. The prototype includes a steam generator, fuel/air/water pumps, premixer, atomizer, igniter, sulfur cleanup and a controller to enable stand-alone operation. The reforming reactor was based on a small, modular catalytic reactor, which utilized patented Microlith substrates and catalyst technology. It uses an auto thermal reforming (ATR) approach. The reformer has been tested with JP-8 and Jet-A fuels. It can also be adapted and thermally integrated to use various fuels and fuel cells. The primary characteristic of PCI's ATR is that it operates on very low water flows (S:C d 1) without coking and the reforming catalyst is sulfur tolerant. This permits meeting water needs via recycling from the stack exhaust as well as the long-term use of a ZnO desulfurizer. The reforming efficiency is >70%. Two brassboard prototypes were developed a 5 kWe (12 kWth) and a 2 kWe (5 kWth) sized unit and tested over hundreds of hours.

DTIC

Fuels; JP-8 Jet Fuel

20080036409 Military Academy, West Point, NY USA

Army Energy Strategy for the End of Cheap Oil

Nygren, Kip P; Massie, Darrell D; Kern, Paul J; Nov 2006; 9 pp.; In English

Report No.(s): AD-A481778; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481778>

Without ready alternatives to replace ever more costly and scarce oil, we are entering an age of uncertainty and insecurity unlike any other that could include economic stagnation or even reversal. Although the military will always have access to the fuel required for national security missions, the costs will rise substantially in the near future and require the reallocation of resources from other critical mission elements and programs. The National Commission on Energy Policy conducted a simulation of oil supply disruptions in June 2005 and concluded that oil cost is highly sensitive to supply, U.S., foreign & military policy are constrained by our oil dependence, and the U.S. is vulnerable to attacks on the oil infrastructure. The nation and the global community need a unique organization to show the way to transform the energy infrastructure and resolve the countless challenges that will end our addiction to oil. The U.S. Army is that unique institution with all the advantages of disciplined organizational leadership and technical knowledge to pilot this essential energy transformation.

DTIC

Costs; Fuel Consumption; Oils; Policies

20080036596 Army Tank-Automotive Research and Development Command, Warren, MI USA

TARDEC Assured Fuels Initiative

Muzzell, Pat; Lieb, Noah; May 7, 2008; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482050; TARDEC-18859; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Briefing on alternative fuels research being done at TARDEC.

DTIC

Automobile Fuels; Energy Policy; Fuels

31
ENGINEERING (GENERAL)

Includes general research topics related to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

20080035109 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Protection of T/R-modules

Maas, A. P. M.; Janssen, J. P. B.; Visser, G. C.; vanHeijningen, M.; Monni, S.; vanVliet, F. E.; November 2007; 168 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 015.33938

Report No.(s): TNO-DV 2007 A240; TD2007-0119; Copyright; Avail.: Other Sources

The protection of T/R-modules, which are often used in modern phased-array systems, against High Power Microwave threats has been studied. An analysis of the failure mechanisms of the most sensitive devices and a study of a protection method using Frequency Selective Surfaces to effectively limit the input bandwidth of the system is presented. Electronic protection can be found in the form of solid-state limiters. These limiters need to absorb the excess input power to prevent damage by reflecting this power back to the other electronic circuits inside the module. Both active and passive operating limiters have been designed using existing GaAs-MMIC technology, making full integration with the existing functions like the Low Noise Amplifier possible. Extensive tests have been carried out, using both Ultra Wide Band high-power (pulse) sources and Continuous Wave and pulsed microwave signals. The limiters did survive a series of 2.3 kV High-voltage UWB pulses, and the limiters can handle up to 4 Watt X-band CW input power and more than 10 Watt pulsed power.

Author

Transmitter Receivers; Electronic Modules; Protection; Microwaves

20080035123 Agilent Technologies, Inc., Loveland, CO, Loveland, CO, USA

Vertically Coupling of Resonant Cavities to Bus Waveguides

Djordjev, K. D., Inventor; Lin, C. K., Inventor; Tan, M. R. T., Inventor; 8 Oct 04; 14 pp.; In English

Contract(s)/Grant(s): MDA972-03-3-0004

Patent Info.: Filed 8 Oct 04; US-Patent-Appl-SN-10-961 940

Report No.(s): PB2008-102142; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Embodiments of the invention involve a monolithic vertical configuration for coupling a ring resonator and a bus waveguides. The monolithic vertical coupling arrangement, with the epitaxial grown coupling between the waveguide and the resonator, provides control of the coupling coefficient. The vertical coupling arrangement allows for different material compositions in the waveguide and resonator structures, e.g. active quantum well resonators and transparent waveguides, to facilitate the design of active WDM components.

NTIS

Cavity Resonators; Waveguides; Coupling

20080035231 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase IV Part C1: Assessment of Pressure Measurement Systems on Flat Surfaces for use in Human Load Carriage

Fergenbaum, M A; Hadcock, L; Stevenson, J M; Morin, E; Aug 2005; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481097; DRDC-T-CR-2005-124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481097>

A variety of pressures mapping technologies have been used to assess contact pressures between human tissues and solid flat surface materials. However, research on the accuracy, repeatability, and creep for these technologies is limited. Three commonly used technologies were evaluated for accuracy, repeatability, and creep on a flat surface under highly controlled laboratory conditions. The systems tested included a resistive ink technology known as the F-scan F-socket (Tekscan Incorporated), a piezoresistive technology known as the FSA seat mat (Vista Medical, Limited), and a capacitance technology known as the XSENSOR seat mat (XSENSOR Technology Corporation). Loads between 9.392 kg and 19.627 kg were placed on each sensor using three standardized protocols: an incremental, a low threshold and a creep protocol. The XSENSOR(Registered) and FSA pressure measurement systems were superior to the F Scan system in terms of accuracy, although the XSENSOR was more accurate than the other two systems at low threshold pressures. The main drawback of each system at this time is the long settling time needed to get more accurate data due to creep. This needs to be corrected within

the software of each system. For use in human load carriage, there will need to be adjustments in amplitude and creep characteristics.

DTIC

Biodynamics; Carriages; Dynamic Models; Evaluation; Flat Surfaces; Loads (Forces); Measuring Instruments; Pressure Measurement; System Effectiveness

20080035330 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Non-Intrusive Detection of Soil Properties for Pressure-Driven Processes

Albert, M R; Albert, D G; Perron, F E; Harrelson, D W; Nov 2006; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481239; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The state of the ground can change dramatically in response to changing meteorological influences and physical disturbances of the ground (e.g. tilling) that are important to many civilian and military activities. Permeability is the fundamental parameter of a porous media that controls whether a surface is an acoustically hard one, through which fluids may not easily penetrate, or conversely a more transparent surface, across which gas and water may readily move. Permeability is the property that controls pressure-driven processes including rain infiltration in soils, surface-atmosphere gas exchange, and acoustic response of the ground. Traditionally it has been assumed that atmospheric acoustic waves do not significantly penetrate the ground. In this paper we describe a new result showing that for some common ground surface materials, acoustic wave propagation in the atmosphere can induce pressure propagation into the ground to sufficient depths to permit the non-intrusive detection of soil permeability across the ground surface.

DTIC

Nonintrusive Measurement; Permeability; Soil Science; Soils; Sound Waves

20080035357 Yuma Test Station, Yuma, AZ USA

Test Operations Procedure (TOP) 2-2-612 Fording

Nov 21, 2007; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481302; ADTC-TOP-2-2-612; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This TOP describes procedures for evaluating the fording ability of military wheeled and tracked vehicles and the effectiveness of fording kits. The types of fording (shallow water, deep water, and underwater) are considered with respect to safety hazards; performance, including water ingress and egress capability; effects on vehicle operation on land; and endurance. Fording kits are evaluated for time required for installation, ease of application, proper fit, reliability, functional suitability, and safety. When applicable, comparisons are made between the vehicle/kit under test and comparable standard equipment. Amphibious vehicles are not included in this document.

DTIC

Kits; Test Facilities; Tracked Vehicles

20080035358 Yuma Test Station, Yuma, AZ USA

Test Operations Procedure (TOP) 2-2-650 Engine Cold-Starting and Warm-Up Tests

Feb 12, 2008; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481303; ADTC-TOP-2-2-650; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Describes procedures for evaluating the cold-starting capability of military engines with and without the aid of arctic-kit engine heaters.

DTIC

Diesel Engines; Low Temperature

20080035372 Army Research Lab., Aberdeen Proving Ground, MD USA

A Laser-Based Explosives Sensor

Sausa, Rosario C; Cabalo, Jerry; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481354; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Trace explosives residues of CL20 (hexanitrohexaaisowurtzitane) and RDX (hexahydro-1,3,5-hexanitro-1,3,5-triazine) are measured in real-time by surface laser photofragmentation-fragment detection (SPFFD) spectroscopy at ambient conditions. A 248-nm laser photofragments the target residue on a substrate, and a 226-nm laser ionizes the resulting NO fragment by resonance-enhanced multiphoton ionization by means of its A-X (0,0) transitions near 226 nm. We investigate the effects of laser wavelength and energy, delay between photofragmentation and ionization lasers, and residue concentration

on signal intensity. A signal-to-noise analysis yields a limit of detection of 7.1 ng/cm² for CL20 and 1.4 ng/cm² for RDX at 1atm and 298K.

DTIC

Explosives; Explosives Detection; Lasers

20080035440 Army Engineer Research and Development Center, Vicksburg, MS USA

Grenade Range Management Using Lime for Dual Role of Metals Immobilization and Explosives Transformation Treatability

Larson, Steven L; Davis, Jeffery L; Martin, W A; Felt, Deborah R; Brannon, James M; Nov 2006; 9 pp.; In English Report No.(s): AD-A481507; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The importance of live fire training for US forces cannot be overestimated. The success of our armed forces depends upon realistic training utilizing the actual weapons and munitions that will be used in theatre during strategic and tactical operations. However, a drawback of this type of realistic training is the potential contamination of firing ranges. Most munitions-contaminated soils found on training ranges contain a mixture of compounds. For hand grenade ranges (HGR), the prevalent munition used is the fragmentation grenade, typically composed of an iron shell and Composition B explosive material. Studies performed on ranges in both the USA and Canada have shown that there is a large degree of variability in munitions constituent type, concentration, size, and spatial distribution occurring on single ranges, as well as between different ranges. Contaminants present include explosive residue in the form of Composition B and Trinitrotoluene as well as metals such as zinc, iron, manganese, calcium, lead, chromium, copper, nickel, molybdenum, vanadium, and tin. The optimum treatment technology for successful remediation of distributed energetics and metals at training ranges should be inexpensive, easily applied in remote locations, effective on heterogeneous contaminant distributions, effective over large areas, effective on multiple compounds, be non-intrusive, to the extent possible, and able to be incorporated into normal range maintenance operations. Technologies currently available for the remediation of munitions-contaminated soil and groundwater do not meet these criteria. The objectives of this study were to evaluate and develop a cost effective management technology to control active grenade range contaminant mobility and promote on-site contaminant degradation.

DTIC

Calcium Oxides; Contaminants; Contamination; Cost Effectiveness; Explosives; Grenades; Immobilization; Land Management; Metals; Rangelands

20080036067 Army Cold Regions Test Center, Fort Greely, AK USA

Cold Regions: Instrumentation Operation and Use. Test Operations Procedure (TOP) 1-1-004

Oct 10, 2007; 13 pp.; In English

Report No.(s): AD-A481103; TOP 1-1-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481103>

This Test Operating Procedure (TOP) provides background information on the problems and adaptations associated with instrumentation, photographic, and video equipment required for conducting tests in cold regions. Basic information and procedures are presented as general guidelines to planning and using instrumentation systems for cold environments. Further information regarding cold temperature effects is contained in Army Material Command Pamphlet (AMCP) 706-116, Engineering Design Handbook, Environmental Series, Part Two, Natural Environmental Factors, April 1975, [ADA012648] and AMCP 706-118, Engineering Design Handbook, Environmental Series, Part Four, Life Cycle Environments, April 1975, [ADA015179].

DTIC

Instruments; Low Temperature Environments; Polar Regions

20080036272 Battelle Eastern Regional Technology Center, Aberdeen, MD USA

Laser-Induced Breakdown Spectroscopy Infrared Emission From Inorganic and Organic Substances

Yang, C S; Brown, E; Hommerich, U; Trivedi, S B; Snyder, A P; Samuels, A C; Nov 2006; 6 pp.; In English

Report No.(s): AD-A481534; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481534>

Laser-induced breakdown spectroscopy (LIBS) has been established as a powerful method for identifying trace elemental contaminants by analyzing the atomic spectral emission lines that result subsequent to plasmas generated by laser power. The ultraviolet-visible-near infrared (UV-Vis- NIR) spectral region exploited in conventional LIBS largely elucidates the elemental composition of the laser target by profiling these atomic lines; very limited information on molecular species may be derived.

To our best knowledge, there is no reference to LIBS measurements on emission processes outside of the UV-Vis-NIR region. In this pioneer work, attempts were made herein to probe the mid-infrared (MIR) emission from a laser-induced breakdown process between 2 to 5.75 microns. Emission features between 4200 to 4800 nm from oxygenated carbon-containing breakdown fragments and between 2000 to 4000 nm from alkali metal-containing breakdown fragments have been successfully identified. These findings could provide additional spectral information to complement the conventional LIBS analysis and launch a new analytical methodology and sensing method for future contamination avoidance applications.

DTIC

Infrared Radiation; Infrared Spectra; Laser-Induced Breakdown Spectroscopy; Pulsed Lasers

20080036368 Army Research Lab., Aberdeen Proving Ground, MD USA

Inroads in the Non-Invasive Diagnostics of Ballistic Impact Damage

Green, W H; Rupert, N L; Wells, Joe M; Nov 2006; 8 pp.; In English

Report No.(s): AD-A481700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481700>

The non-invasive/non-destructive x-ray computed tomography (XCT) technique is a widely applicable and powerful inspection modality for evaluation and analysis of shock and/or impact damage in armor materials, including metallic armors and armor ceramics, as well as materials in general. It presently appears that the noninvasive damage diagnostic approach with XCT provides the only sufficiently effective nondestructive modality for high resolution ballistic impact damage interrogation, spatial characterization, quantification, visualization, and 3-D analysis. Several different examples of material evaluation by XCT analyses are given and discussed in this paper, including both qualitative and quantitative ones. However, the full capabilities of the XCT diagnostic approach have not yet been reached and the beneficial utilization of this new volumetric impact damage knowledge has yet to be extensively applied and exploited. Future developments of the XCT approach will be discussed.

DTIC

Computer Aided Tomography; Damage Assessment; Diagnosis; Impact; Impact Damage; Terminal Ballistics; Tomography; X Rays

20080036399 Army Engineer Research and Development Center, Vicksburg, MS USA

Longshore Sand Transport Calculated by Time-Dependent Shear Stress

Smith, Ernest R; Kraus, Nicholas C; Jan 2007; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481759; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481759>

Based on longshore sand transport experiments performed in a large basin, measured sand transport rates obtained for spilling and plunging waves are compared to the Bodge and Dean (1987) and Watanabe (1992) distributed load formulas, representative of typical formulas applied in engineering practice. Neither formula estimates the measurements satisfactorily. The Bodge and Dean formula is sensitive to changes in energy flux and does not include threshold shear. The Watanabe formula includes critical shear, but transport estimates are made from time-averaged values of bottom shear stress, which did not exceed critical shear stress at most cross-shore locations. A new transport formula is introduced based on time-dependent shear stress calculated from the total velocity that includes the wave orbital velocity. The new formula gives reasonable estimates for both spilling and plunging breaker types. A conclusion is that it is essential to represent the time-dependent, or fluctuating, component of fluid motion in predictive equations of the longshore sand transport rate.

DTIC

Hydrodynamics; Loads (Forces); Ocean Surface; Sands; Sediment Transport; Shear Stress; Time Dependence; Water Waves

20080036403 Army Communications Research and Development Command, Fort Monmouth, NJ USA

Product Manager C4ISR On-The-Move Experimentation

Utroska, William; Langan, Russell; Amabile, Michael; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481767; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481767>

Product Manager C4ISR On-The-Move (PM C4ISR OTM) provides a relevant operational field experimentation venue for the purpose of assessing emerging technologies in a System-of- Systems (SoS) environment. Its charter includes the mitigation of risk for Future Force technologies and the acceleration of technology insertion into the Current Force to support Army transformation. The PM accomplishes this by integrating maturing tech base systems into a holistic SoS architecture,

employing early prototypes of objective systems or surrogate and simulated systems as necessary. Technical experimentation and demonstration is then conducted at the component systems level, at the SoS level via scripted end-to-end operational threads, and through unscripted technical assessments involving Soldier role players. Additionally, the PM develops test methodologies, assessment metrics and automated data collection, reduction and analysis techniques to support this experimentation. PM C4ISR OTM is a Research, Development and Engineering Command (RDECOM) organization within the Communications- Electronics Research, Development and Engineering Center (CERDEC) at Fort Monmouth, NJ. This paper seeks to describe the facilities, capabilities and process that the PM employs to conduct its experimentation. Following that it reviews recent experimentation activities and their relevance to critical development and acquisition issues and provides selected results emerging from ongoing data analysis.

DTIC

Evaluation; Military Technology; System Effectiveness; Technology Assessment

20080036406 Xradia, Inc., Concord, CA USA

Non Destructive Characterization, Inspection, Failure Analysis of Advanced Components and Sensors With a High Resolution & High Contrast Microtomography (microCT) System

Lau, S H; Chang, Hauyee; Cheong, Joanna; Duewer, Frederick; Feser, Michael; Tkachuk, Andrei; Yun, Wenbing; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481772; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481772>

3D X-ray microtomography (microCT) can non-destructively characterize, inspect and solve many failure analysis problems associated with the manufacture of advanced materials, components, finished products, sensors for the military and industry. Conventional microCTs however, have spatial resolution limitation (typically of the order of a few microns to tens of microns) and poor contrast with low Z (atomic number) materials. We describe the role of a novel high resolution and high contrast microCT to visualize defects at the micron and sub-micron length scales, typically encountered in the manufacturing and development of advanced sensors and polymer composites. Examples shown include semiconductor packages, low temperature co-fire ceramics (LTCC), and Laser fusion targets spheres.

DTIC

Computer Aided Tomography; Destruction; Failure Analysis; High Resolution; Inspection; Microstructure; Nondestructive Tests

20080036448 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA

Test Operations Procedure (TOP) 3-2-045 Small Arms - Hand and Shoulder Weapons and Machine Guns

Sep 17, 2007; 87 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2007-DT-ATC-TOPRO-D4265

Report No.(s): AD-A481861; ATC-TOP-3-2-045; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481861>

This TOP contains a compilation of procedures for testing hand and shoulder weapons and machineguns, including crew served weapons and light automatic cannons up to 50 millimeters in caliber. The test procedures apply to the basic weapons only; see TOP 4-2-0161 for test procedures for small arms ammunition. Also, see TOP 3-2-5042 for safety evaluations of hand and shoulder weapons. Grenade launchers are covered in TOP 3-2-0303. Many small arms are also used as subsystems in combat vehicles, aircraft, watercraft, etc.; in these cases, consult TOPs relevant to the specific platforms for possible additional test procedures.

DTIC

Portable Equipment; Shoulders

20080036583 Xradia, Inc., Concord, CA USA

Non Destructive 3D X-Ray Imaging of Nano Structures & Composites at Sub-30 NM Resolution, With a Novel Lab Based X-Ray Microscope

Lau, S H; Tkachuk, Andrei; Cui, Hongtao; Duewer, Frederick; Feser, Michael; Wang, Yuxing; Yun, Wenbing; Nov 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): R44GM71090

Report No.(s): AD-A482013; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this article we describe a 3D x-ray microscope based on a laboratory x-ray source operating at 2.7, 5.4 or 8.0 keV hard

x-ray energies. X-ray computed tomography (XCT) is used to obtain detailed 3D structural information inside optically opaque materials with sub-30 nm resolution. Applications include imaging internal 3D arrays of nanostructures of smart materials, polymer nanocomposites, porosity and structural imaging within fuel cells; understanding the internal workings of nanosensors, imaging of whole hydrated cells and tissues; non destructive reverse engineering and failure analysis of semiconductor circuitry and MEMS devices.

DTIC

Destruction; Microscopes; X Ray Analysis; X Ray Imagery; X Rays

20080036614 Southwest Research Inst., San Antonio, TX USA

Comparison of Damaged Borosilicate Constitutive Constants Obtained with Confined-Compression and Constant-Pressure-Compression Devices (Comparison of ‘Sleeve’ and ‘Bomb’ Tests)

Chocron, Sidney; Dannemann, Kathryn; Nicholls, Arthur; Walker, James D; Anderson, Charles E; Jan 27, 2008; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482107; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ultimate objective of this research is to transfer properties measured in the lab to ballistic simulations that can predict ballistic tests results. Conclusions of this research includes that: 1) Mohr-Coulomb (MC) captures very nicely both strength and failure phenomenon for bomb tests. 2) MC also captures failure angle and strength in the sleeve tests. 3) The overlap between bomb and sleeve tests support the results of the sleeve tests.

DTIC

Borosilicate Glass; Compression Tests; Computerized Simulation; Confinement; Terminal Ballistics

32

COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 *Space Communications, Spacecraft Communications, Command and Tracking*; for search and rescue, see 03 *Air Transportation and Safety*, and 16 *Space Transportation and Safety*.

20080034726 Idaho National Engineering Lab., Idaho Falls, ID, USA

Intelligent Control in Automation Based on Wireless Traffic Analysis. 2007 International Joint Conference on Neural Networks

Derr, K.; Manic, M.; Aug. 2007; 9 pp.; In English

Report No.(s): DE2007-915520; INL/CON-07-12266; No Copyright; Avail.: National Technical Information Service (NTIS)

Wireless technology is a central component of many factory automation infrastructures in both the commercial and government sectors, providing connectivity among various components in industrial realms (distributed sensors, machines, mobile process controllers). However wireless technologies provide more threats to computer security than wired environments. The advantageous features of Bluetooth technology resulted in Bluetooth units shipments climbing to five million per week at the end of 2005. This is why the real-time interpretation and understanding of Bluetooth traffic behavior is critical in both maintaining the integrity of computer systems and increasing the efficient use of this technology in control type applications. Although neuro-fuzzy approaches have been applied to wireless 802.11 behavior analysis in the past, a significantly different Bluetooth protocol framework has not been extensively explored using this technology. This paper presents a new neurofuzzy traffic analysis algorithm of this still new territory of Bluetooth traffic. Further enhancements of this algorithm are presented along with the comparison against the traditional, numerical approach. Through test examples, interesting Bluetooth traffic behavior characteristics were captured, and the comparative elegance of this computationally inexpensive approach was demonstrated.

NTIS

Communication Networks; Neural Nets; Teleconferencing; Traffic

20080034732 Shumaker and Sieffert, P.A., Saint Paul, MN, USA; Minnesota Univ., Minneapolis, MN, USA

High-Speed Precoders for Communication Systems

Parhi, K. K., Inventor; Gu, Y., Inventor; 13 Sep 05; 25 pp.; In English

Contract(s)/Grant(s): NSF-CCF-0429979

Patent Info.: Filed 13 Sep 05; US-Patent-Appl-SN-11-225 383

Report No.(s): PB2008-101167; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The invention relates to techniques for implementing high-speed precoders, such as Tomlinson-Harashima (TH) precoders. In one aspect of the invention, look-ahead techniques are utilized to pipeline a TH precoder, resulting in a high-speed TH precoder. These techniques may be applied to pipeline various types of TH precoders, such as Finite Impulse Response (FIR) precoders and Infinite Impulse Response (IIR) precoders. In another aspect of the invention, parallel processing multiple non-pipelined TH precoders results in a high-speed parallel TH precoder design. Utilization of high-speed TH precoders may enable network providers to for example, operate 10 Gigabit Ethernet with copper cable rather than fiber optic cable.

NTIS

Computer Networks; Data Transmission; Transmitters; Receivers; Telecommunication

20080034808 Shumaker and Sieffert, P.A., Saint Paul, MN, USA; Minnesota Univ., Minneapolis, MN, USA

Pipelined Parallel Decision Feedback Decoders for High-Speed Communication Systems

Keshab, P. K., Inventor; Gu, Y., Inventor; 13 Sep 05; 21 pp.; In English

Contract(s)/Grant(s): NSF CCF-0429979

Patent Info.: Filed 13 Sep 05; US-Patent-Appl-SN-11-225 825

Report No.(s): PB2008-101168; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The invention relates to techniques for pipelining parallel decision feedback decoders (PDFDs) for high speed communication systems, such as 10 Gigabit Ethernet over copper medium (10GBASE-T). In one aspect, the decoder applies look-ahead methods to two concurrent computation paths. In another aspect of the invention, retiming and reformulation techniques are applied to a parallel computation scheme of the decoder to remove all or a portion of a decision feedback unit (DFU) from a critical path of the computations of the pipelined decoder. In addition, the decoder may apply a pre-cancellation technique to a parallel computation scheme to remove the entire DFU from the critical path.

NTIS

Telecommunication; High Speed; Transmission Rate (Communications); Pipelines; Decoders; Computer Networks; Decision Making; Ethernet

20080035113 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Ground-Air Information Exchange for Helicopter Operations

deNiet, M.; Kluiters, C. E.; October 2007; 55 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 032.11278

Report No.(s): TNO-DV 2007 A458; TD2007-0198; Copyright; Avail.: Other Sources

This report gives an overview of the current and needed information exchange between ground troops and helicopters on the tactical level in the execution phase, and the impact (high level) of this on the current and future required systems and techniques.

Author

Ground-Air-Ground Communication; Military Personnel; Military Helicopters; Aircraft Communication

20080035114 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Inventory on 3D Direction Finding

deWolf, F. J.; October 2007; 33 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 015.34967

Report No.(s): TNO-DV 2007 A361; TD2007-0168; Copyright; Avail.: Other Sources

This document describes an inventory on the techniques and present systems available to perform direction findings in both azimuth and elevation for Electronic Warfare purposes. Techniques were distinguished for land based, air and sea borne platforms for both radar and communications applications.

Author

Direction Finding; Electronic Warfare

20080035116 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Integrated Antenna 2D-Array, an EBG Approach

Bolt, R. J.; Juan, N. Lombart; November 2007; 54 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 015.35412

Report No.(s): TNO-DV 2006 A389; TD2006-0119; Copyright; Avail.: Other Sources

It has been shown that the application of planar circularly symmetric electromagnetic band gap (PCS-EBG) structures in 2D scanning arrays necessitate a substrate dielectric constant higher than 20 and an increase of its thickness as well. Electronic scanning the antenna beam is otherwise not guaranteed. Thickness increase introduced 2 negative effects: scan blindness problems are introduced in the H-plane that are associated to the resulting propagation of the TE-SW and, the input impedance BW of the array elements is reduced. The latter is due to the very dense dielectric that needs to be used (σ_r is approximately equal to 60) for sufficient SW-suppression and allow scanning of the main beam. It makes the bandwidth of the EBG solution comparable to a standard printed array solution using low dielectric constant materials. An EBG composed of dielectric layers topping the array face can compensate the standard $\cos(\theta)$ gain loss under scanning conditions inherent to phased arrays. Dielectric constants and thicknesses of the layers are in the order of 1.5 and a quarter of the guided wavelengths respectively. A more constant (or even improved) behaviour of the gain, up to a certain limit of scan, can be achieved. The technique presents a cheap way to improve the scanning performance of printed arrays.

Author

Antenna Arrays; Energy Gaps (Solid State); Planar Structures; Phased Arrays; Circular Polarization

20080035117 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

MIMO Radar

vanRossum, W. L.; Smits, F. M. A.; April 2008; 33 pp.; In English

Contract(s)/Grant(s): TNO Proj. 032.11184

Report No.(s): TD2008-0065; TNO-DV-2008-A169; Copyright; Avail.: Other Sources

The concept of multiple-input multiple-output (MIMO) radar exploits the frequency and spatial diversity of multiple transmit and receive antennas to improve the detection, tracking and recognition of extended objects. It enables a variety of new techniques that can improve the radar performance in many aspects. A key ingredient in MIMO radar is that multiple orthogonal waveforms can be used simultaneously. Five different radar scenarios have been simulated and compared: pencil beam, floodlight, mono-static MIMO, multi-static on transmit MIMO and multistatic on transmit and receive MIMO. In the simulation the radar environment is urban-like. An average value for the different multipath contributions is incorporated in the path losses of the signal. The simulations showed that the performance of the radar improved when longer integration times are considered. These longer times result in improved clutter suppression. This is the case when going from pencil beam to floodlight to mono-static MIMO. These three scenarios are mono-static and have identical signal-to-noise ratios and statistical behaviour per burst but different integration times. The range performance of the multi-static scenarios improves with respect to the monostatic scenarios with a fluctuating environment and/or fluctuating object at close range. In an urban scenario both the object and the path losses fluctuate indicating an improved performance for the multi-static scenarios at close range.

Author

MIMO (Control Systems); Radar Beams; Control Theory; Multipath Transmission

20080035122 Calfee Halter and Griswold, LLP, Cleveland, OH, USA

Systems and Methods for Acquisition and Tracking of Low CNR GPS Signals

van Graas, F., Inventor; Soloviev, A., Inventor; Gunawardena, S., Inventor; 22 Sep 05; 55 pp.; In English

Contract(s)/Grant(s): 98-G-002

Patent Info.: Filed 22 Sep 05; US-Patent-Appl-SN-11-233 531

Report No.(s): PB2008-102143; No Copyright; Avail.: CASI: [A04](#), Hardcopy

A receiver for continuous carrier phase tracking of low carrier-to-noise ratio ('CNR') signals from a plurality of radio navigation satellites while the receiver is mobile. The receiver may have: a radio frequency (RF) front-end that provides satellite data corresponding to signals received from the plurality of radio navigation satellites; an inertial measurement unit (IMU) that provides inertial data; and a processor circuit in circuit communication with the RF front end and the IMU, the processor circuit being capable of using satellite data from the RF front-end and inertial data from the IMU to perform continuous carrier phase tracking of low CNR radio navigation satellite signals having a CNR of about 20 dB-Hz, while the receiver is mobile. The receiver may be a GPS receiver for continuous carrier phase tracking of low-CNR GPS signals.

NTIS

Global Positioning System; Receivers; Target Acquisition; Carrier to Noise Ratios

20080035124 Agilent Technologies, Inc., Loveland, CO, Loveland, CO, USA

Wavelength Division Multiplexer Architecture

Panotopoulos, G., Inventor; 8 Oct 04; 8 pp.; In English

Contract(s)/Grant(s): MDA972-02-3-005

Patent Info.: Filed 8 Oct 04; US-Patent-Appl-SN-10-961 961

Report No.(s): PB2008-102141; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Embodiments of the invention involve separating the collimating function and tilting function into two separate optical elements. The separation increases tolerance to misalignment and simplifies the fabrication of the MUXes.

NTIS

Optical Communication; Data Transmission; Wavelength Division Multiplexing

20080035227 University of Southern California, Marina del Rey, CA USA

Evaluation of a Spoken Dialogue System for Virtual Reality Call for Fire Training

Robinson, Susan M; Roque, Antonio; Vaswani, Ashish; Traum, David; Hernandez, Charles; Millspaugh, Bill; Dec 4, 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481090; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481090>

OUTLINE: Virtual Reality Call for Fire Training * The Radiobot-CFF System * Evaluation Method * Evaluation Results * Next Steps.

DTIC

Education; Fires; Gunfire; Radio Equipment; Speech; Virtual Reality; Voice Communication

20080035277 Mitre Corp., Bedford, MA USA

The U.S. Air Force Technical Implementation Architecture (TIA)

Foote, Scott; Foote, Steve; Scarano, Jay; Modeen, Ray; Jun 2007; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481212; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481212>

This paper provides an introduction to the Air Force's Technical Implementation Architecture 'TIA' effort. The TIA is an initiative to promote the convergence of computing infrastructure for Air Force 'AF' Command and Control 'C2' information systems. The TIA is a collaborative effort across several Air Force organizations: the Air Force Electronic Systems Center 'ESC'; Air Force CIO 'SAF/XC'; Air Force Command, Control, Intelligence, Surveillance, Reconnaissance Center 'AFC2ISRC', Air Mobility Command 'AMC', Air Force Space Command 'AFSPACE', Air Force Research Labs 'AFRL' and other stakeholders.

DTIC

Architecture (Computers); Command and Control

20080035344 Military Academy, West Point, NY USA

Teaching Command and Control Systems at the USA Military Academy

Kewley, Robert; Elkins, Tim; Jun 2007; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481263; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to emerging command and control theory, doctrine, and systems, the USA Military Academy Department of Systems Engineering has introduced an undergraduate command and control systems course designed to create a core of active duty engineers who understand the potential advantages to be gained through the systemic application of tactical command and control. This course poses this fundamental hypothesis for cadets to investigate - A trained and cohesive organization enabled by well-designed collaborative command and control systems will be able to apply decentralized command and control processes in order to increase unit agility and gain a tactical advantage as compared to units that are less collaborative and more centralized. In order to allow cadets to test this hypothesis, the course exposes cadets to theoretical concepts including globalization, shared awareness and understanding, self-synchronization, and networked effects. They also investigate supporting technologies including the global information grid, shared data and communications models, and service oriented architectures. They learn how these concepts enable organizational agility by transforming how power and decision making are distributed. Finally, they exercise existing command and control systems including Future Battle

Command Brigade and Below and Command Post of the Future in simulated tactical scenarios.
DTIC
Command and Control; Education; United States

20080035350 Pittsburgh Univ., Pittsburgh, PA USA

A Smart Video Coding Method for Time Lag Reduction in Telesurgery

Sun, Mingui; Liu, Qiang; Xu, Jian; Kassam, Amin; Enos, Sharon E; Marchessault, Ronald; Gilbert, Gary; Sciabassi, Robert J; Nov 2006; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NS-38494; EB-002309

Report No.(s): AD-A481273; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the future war against terror and new types of offensive activities away from home, telemedical systems, including a telesurgical system, may become standard military medical equipment. In recent years, there have been significant technological advances in both telecommunications and robotics. These advances have made remotely operable telemedicine possible. However, a key technology that rapidly encodes, transmits, and decodes surgical video with the minimum round-trip delay and the least influence by network jitter (random fluctuation of delay) is not currently available. This paper presents a special purpose video coding method to support telesurgery, telemonitoring, and teleconsultation, with special emphasis on telesurgery. Our method utilizes advanced image processing algorithms which prioritize the importance of the scene shown on the video screen. This prioritization is performed according to a gaze map constructed based on tracking the eye movements of the remote observer. During network congestion, our system processes video data more aggressively and transmits non-essential data at reduced data rates. As a result, the essential information necessary to perform surgery is protected against network deterioration.

DTIC

Coding; Telemedicine; Time Lag; Video Signals

20080035382 Marine Corps Air-Ground Combat Center, Twentynine Palms, CA USA

'Reclaiming Rapid Cognition': Improving Decision-making in Command and Control Agencies by Understanding and Enabling Rapid Cognition

Cassleman, Elizabeth A; Jun 2007; 49 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481393; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rapid cognition decision-making has long been essential to military command and control. With the advent of new technologies that have increased information-flow and connectivity, while reducing delays in data flow, command and control agencies are now at risk of diminishing subordinate leaders' ability to make rapid cognition decisions. This leads to increased time needed to make decisions, as well as decreased quality in decisions made. To regain optimal rapid cognition decision-making, command and control units must make improvements in two areas: training and environment. Training must focus on building rapid-cognition expertise through both passive academic knowledge and active, simulation-based experiential training. Command and control agencies must evaluate current network architectures to ensure they allow appropriate decision-making styles and make necessary changes. This means facilitating rapid cognition decision-making in agencies dealing in current operations and preventing bleed-over from comprehensive analysis-based planning agencies. In order to be effective, the correct application of technology to military agencies must come with study of how it affects human behavior as well as updated education, procedures, and architecture.

DTIC

Cognition; Command and Control; Decision Making

20080035431 Florida Inst. for Human and Machine Cognition, Inc., Pensacola, FL USA

A Cross-Layer Network Substrate for the Battlefield

Carvalho, Marco; Suri, Niranjana; Shurbanov, Vladimir; Lloyd, Errol; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-04-2-0013; DAAD19-01-2-0009

Report No.(s): AD-A481488; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the initial design and implementation of a cross-layer communications substrate for tactical networks. Traditional crosslayer strategies for MANETs often rely on the direct interaction between neighbor layers in the communications stack. We propose a different approach, where all lower layers (PHY, MAC and NET) directly interact with the overlying applications (or communications middleware). In this work, we discuss some of the requirements for cross-layer

support in a tactical environment. We also introduce our proposed design for a cross-layer communications substrate for such environments, concluding the paper with a brief description of our current proof-of-concept implementation and future research proposal.

DTIC

Substrates; Telecommunication

20080035473 National Defense Univ., Washington, DC USA

Information Communications Technology Support to Reconstruction and Development: Some Observations from Afghanistan

Kramer, Frank; Starr, Stuart; Wentz, Larry; Jun 2007; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481415; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent USA (US) government experiences with failed-state interventions suggests that telecommunications (telecoms) and information technology (IT) reconstruction initiatives continue to suffer from a lack of adequate understanding of the affected nation information culture and telecoms and IT business cultures. A coherent telecoms and IT-related civil-military strategy and plan for intervening nations and responding international organizations (IO) and non-governmental organizations (NGO) is lacking as well and there are no agreed mechanisms and procedures to enable effective civil-military coordination and information sharing among participants and with the affected nation. National Defense University, Center for Technology and National Security Policy studies suggest that information and IT can significantly increase the likelihood of success in failed-state interventions and subsequent reconstruction if they are engaged from the outset as part of an overall strategy and plan that coordinates the actions of outside interveners and focuses on generating effective results for the affected nation. This paper examines Afghanistan telecoms and IT as a case study of its use as an enabler of sector reconstruction. Some of the successes and related coordination and information sharing challenges encountered by the multinational civil-military responders and affected nation telecoms and IT organizations are illuminated as well.

DTIC

Afghanistan; Information Systems; Telecommunication

20080035493 Baker Botts, LLP, Dallas, TX, USA

Improved Tapered Area Small Helix Antenna

Warnagiris, T. J., Inventor; 1 Oct 04; 9 pp.; In English

Contract(s)/Grant(s): DAAB07-03-C-K402

Patent Info.: Filed 1 Oct 04; US-Patent-Appl-SN-10-956 565

Report No.(s): PB2008-102145; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A wideband multi-mode antenna having low VSWR operating characteristics. The antenna element is formed from a right-triangularly shaped piece of conductive material, which is rolled along the base dimension. Operational characteristics may be modified by spacing the antenna element from a ground plane using dielectric spacers, and the antenna element may be shorted to the ground plane.

NTIS

Broadband; Patent Applications; Antennas

20080035532 Office of the Assistant Secretary of Defense for Networks and Information Integration, Washington, DC USA

The Future of C2: Agility, Focus and Convergence

Alberts, David S; Jun 2007; 26 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481445; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The future is not necessarily a linear extension of what we are doing now. To understand what capabilities are needed and whether we are on the right track or need to change course we need to answer the following: 1) What is the critical capability for the 21st Century? and 2) What are the implications for Command and Control? 21st Century Security Challenges are characterized by huge amounts of uncertainty and risk. Agility is the answer to uncertainty and risk.

DTIC

Command and Control; Convergence; Data Processing

20080035603 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Communication, Cooperation, and Coordination Model for Process Improvement of C2 Projects

Badiru, Adedeji B; Jun 2007; 45 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481250; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Often overlooked in the development of technological advancements are the difficulties associated with integrating these

technologies into existing processes. Technologists, scientists, and research and development engineers seldom identify problems that the new technologies will not solve. Technology programs can be divided into two categories - minor 'limited or localized scope' and major 'national or widespread scope'. Large programs require sustainable commitment of financial and human resources, and must be managed more prudently. Management teams will have to develop adaptive plans, techniques, logics, and risk management strategies in the management continuum to ensure program success. The management plan must be cognizant of the fact that the entire management team may have to change abruptly over time due to political changes. This is particularly crucial for Command and Control 'C2' projects. Thus, there must be a mechanism to ensure continuity and consistency of C2 projects over different life cycles of management. This paper presents Communication, Cooperation, and Coordination model to improve the management of technology in C2 projects. The suggested approach facilitates sustainable cooperation and upfront communication of the limitations of technology integration.

DTIC

Command and Control; Coordination

20080035637 National Inst. of Justice, Washington, DC, USA

CCTV: Constant Cameras Track Violators. Issue No. 249

Jul. 2003; 8 pp.; In English

Report No.(s): PB2008-102296; NCJ-200909; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The use of closed-circuit television (CCTV) cameras to monitor public spaces is increasing, both in the USA and abroad. The Federal government, and NIJ in particular, has funded research into these systems because of their many security applications in both the domestic and international arenas. In England, CCTV systems have monitored public places for many years, partly due to concerns over terrorism. In Israel, police in the old city of Jerusalem use CCTV to monitor every street in many commercial and religious areas. Many people are wary about the government watching and recording their movements as they pass through parks, streets, and other public areas. Yet despite the controversy, CCTV use by criminal justice personnel in the USA may be increasing.

NTIS

Cameras; Circuits; Crime; Television Cameras; Viewing

20080035639 21st Century Systems, Inc., Silver Spring, MD, USA

Building a 3-1-1 System for Police Non-Emergency Calls: A Case Study of the City of Austin Police Department. Executive Summary

Solomon, S. E.; Uchida, C. D.; Sep. 2003; 117 pp.; In English

Contract(s)/Grant(s): COPS-2000-CK-WX-K114

Report No.(s): PB2008-102309; Copyright; Avail.: National Technical Information Service (NTIS)

This report documents how the Austin Police Department (Texas) identified the need for a 3-1-1 system (phone number for non-emergency requests for public service and information), designed and procured the system, and marketed it to the citizens. In Austin, 9-1-1 call volumes were increasing faster than the city's population, and existing technology and staff levels could not support the increasing call load. The Austin Police Department (APD) concluded that 40-50 percent of the 9-1-1 calls were either for police non-emergencies or situations that were not appropriate for police, fire, or rescue operations. This was particularly true for citywide crisis situations, such as weather emergencies. The 3-1-1 calling system was developed to take such calls to relieve the 9-1-1 system. APD's implementation of 3-1-1 focused on developing highly trained and skilled call-takers, building critical partnerships, and changing public perceptions of 9-1-1. APD assured 3-1-1 callers that the staff were cross-trained as 9-1-1 call-takers who are capable of handling potential emergencies.

NTIS

Emergencies; Police

20080035640

Method and Apparatus for Offset Interleaving of Vocoder Frames

Belding, P., Inventor; Determan, J. T., Inventor; Bloom, R., Inventor; 17 Nov 04; 10 pp.; In English

Contract(s)/Grant(s): MDA-904-01-G0620-J.D.0002

Patent Info.: Filed Filed 17 Nov 04; US-Patent-Appl-SN-10-991 618

Report No.(s): PB2008-102021; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The disclosed embodiments provide methods and apparatus for offset interleaving of media frames for transmission over

a communication network. In one aspect, a method for interleaving a stream of media frames for transmission over a communication network includes the acts of defining a plurality of packets and interleaving a stream of media frames among the packets.

NTIS

Patent Applications; Vocoders

20080036055 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

The SOWNet Experiment

Ruizenar, M. G. A.; Boekema, R. B.; vanHoof, H. A. J. M.; vanVoorthuisen, G. P.; July 2008; 42 pp.; In Dutch
Contract(s)/Grant(s): 698.06.0003.01; TNO Proj. 015.35058

Report No.(s): TD2008-0098; TNO-DV-2008-A243; Copyright; Avail.: Other Sources

The Self Organising Wireless Network (SOWNet), developed by TNO, was used in a field experiment to ascertain the possible performance benefits when applied to unattended ground sensors (UGS). Detection probability, false alarm rate (FAR), and battery life-time were compared for both the conventional communications method (i.e. oneway communication) and a networked communications approach. The conclusion as a result of this experiment is that networking the UGS led to a considerable reduction in false alarms and energy consumption.

Author

Wireless Communication; Communication Networks; Energy Consumption

20080036112 Idaho Univ., Moscow, ID, USA

Modeling and Assessing Large-Scale Surface Transportation Network Component Criticality

Abdel-Rahim, A.; Oman, P.; Johnson, P.; Tung, L. W.; Sadig, R.; Sep. 2007; 78 pp.; In English

Contract(s)/Grant(s): DTRS98-G-0027

Report No.(s): PB2008-100798; N07-07; No Copyright; Avail.: CASI: [A05](#), Hardcopy

A case study to assess the survivability of a large-scale urban Intelligent Transportation System (ITS) network is presented. The ITS for the city of Boise, Idaho was analyzed using two different survivability assessment techniques that are discussed and summarized here. The first approach provides a qualitative assessment of the Boise ITS; it is based on the Survivable Systems Analysis (SSA) method as modified for critical infrastructures. The second approach provides a quantitative assessment of network survivability using a multilayered graph-based approach consisting of the greater Boise area power grid and surface transportation system. The power grid, communication network, and the physical and control transportation graphs were analyzed to determine the relative criticality of different network components. Macroscopic modeling was used to investigate the effect of components' failure on the network's operational characteristics. The greater Boise area has a population of over half a million people. The analysis presented here serves as a case study showing the means of assessing the importance of different components in critical infrastructure layers. The results enable decision makers to understand the effects of failure events and to prioritize threat mitigation alternatives.

NTIS

Surface Vehicles; Transportation; Transportation Networks

20080036221 Naval Submarine Base, New London, CT USA

C2 - Less is More

Ramsey, Ryan; Jun 2007; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481413; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In order to ensure the domination in any battlefield of the future, the new generation of war fighters needs to be empowered and educated to practice Mission Command. The net effect will be to allow Superior Commanders more time (a precious commodity) to deal with the delicate transition political requirements to strategy and provide relevant Command and Control. The direction and guidance provided to the unit commander will allow him to best employ his team, platform and tactics. The force who capitalizes on developing intuitive leadership and decision making at the unit level will have an advantage against any adversary and enhance the overall operational warfighting effort and strategic effect.

DTIC

Command and Control; Military Operations

20080036228 George Mason Univ., Fairfax, VA USA

The Environment in Network Centric Operations: A Framework for Command and Control

Hieb, Michael R; Mackay, Sean; Powers, Michael W; Kleiner, Martin; Pullen, J M; Jun 2007; 40 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481420; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As Command and Control practices are transformed by Network Centric Operations, the effect of the environment needs to be incorporated. The constraints of terrain and weather are two key limitations that apply to all operations. Sensor models will quantify these effects. Technologies developed by the commercial world to deal with these constraints, such as Geospatial Information Systems (GIS), have direct relevance to coalition forces. Conversely, advanced environmental reasoning services developed for coalition forces can also, in selective areas such as mobility analysis, have applicability to civil, humanitarian operations. Thus, technologies developed in these selective areas have the ability to leverage commercial technologies while transforming C2 processes. In this paper we present a conceptual framework for relating environmental effects, including Sensors, to Network Centric Command and Control, and investigate the utility of applying this framework through an advanced technology program. Battlefield Management Language (BML) is being developed as a common representation of military mission suitable for automated processing. Geospatial BML (geoBML) is used to relate terrain features to operations resulting in a methodology that identifies the key environmental aspects needed for specific missions. geoBML enhances a Command and Control process, whether military or civilian, by making terrain information explicit and computational.

DTIC

Command and Control; Environment Effects

20080036253 Maryland Univ., College Park, MD USA

Coalition Formation in Manets

Jiang, Tao; Theodorakopoulos, George; Baras, John S; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011; DAAD19-01-1-0494

Report No.(s): AD-A481274; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Wireless ad-hoc networks rely on the cooperation of participating nodes for almost all their functions. However, due to resource constraints, nodes are generally selfish and try to maximize their own benefit when participating in the network. Therefore, it is important to study mechanisms which can be used as incentives to form coalitions inside the network. In this paper, we study coalition formation based on game theory, especially cooperative game theory. First, the dynamics of coalition formation proceeds via pairwise bargaining. We show that the size of the maximum coalition is a decreasing function of the cost for establishing a link. After the coalition formation process reaches the steady state, we are interested in the stability of coalitions. We prove that coalitions are stable in terms of both pairwise stability and coalitional stability.

DTIC

Communication Networks; Wireless Communication

20080036254 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Research Issues in Ad Hoc Network Design

Graff, Charles; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481280; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper explores and develops some of the critical research issues in ad hoc network design. Although ad hoc network technology is critical to such major Army Programs as FCS and WIN-T, the design of ad hoc networks to meet a set of military technical and operational requirements has been shown to be more of an art than a science. For purposes of this paper, an ad hoc network is only the communication subsystem of a C4ISR network. The problem domain is exceedingly complex and rich with numerous tradeoffs, but is hampered by a lack of mathematical descriptions, tools and relationships to conduct those tradeoffs and analyses. In contrast to wired networks, where only the traffic loading is stochastic, wireless networks themselves, in addition to the traffic loadings, are also stochastic in nature. This dual stochastic nature of both the traffic and the network carrying the traffic poses significant challenges in both the modeling and design of mobile ad hoc networks. In this paper we consider network design at three distinct but interrelated levels. At the highest level, we are concerned with the overall network structure, specifically network connectivity, network capacity (in terms of end to end throughput/goodput, delay, and probability of packet loss) and network survivability. We present and discuss some mathematically based definitions of these quantities. At the next lower level, we discuss some issues with the network node design. At this level, we are concerned with issues of link design, media access, transmitter power, etc. Finally, at the lowest level of design, we present

some issues in the evolving area of cross layer protocol design. Finally this paper concludes with discussion of some research issues in the design process.

DTIC

Communication Networks; Network Analysis; Probability Theory; Protocol (Computers); Stochastic Processes

20080036255 Army War Coll., Carlisle Barracks, PA USA

Bridging the Cultural Communication Gap Between America and Its Army

Galford, Bobbie; Mar 19, 2008; 35 pp.; In English

Report No.(s): AD-A481292; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The U.S. Army continues to play a crucial role in the defense and security of the USA. Throughout history, the nation has asked its citizens to serve and support the country in times of peace and peril. Over the years, American culture, society and the U.S. Army have changed in response to a transforming world. This transformation has resulted in an altered relationship between the public and the military, and has served to broaden the communication gap between America and its Army. The differing attitudes and culture between the two has the potential to affect national policy and weaken U.S. security and stability. Recognizing and understanding this chasm is the first step in developing strategic communication initiatives to inform and educate the public about the need for a strong Army and to improve communication between the Army and society. Strengthening relationships between the military and the public will be essential if the Army is to continue to play a vital role in the defense of our nation.

DTIC

Public Relations; Stability

20080036256 Army War Coll., Carlisle Barracks, PA USA

Free Speech and GWOT: Back to the Future?

Hargis, Michael J; Feb 29, 2008; 45 pp.; In English

Report No.(s): AD-A481297; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The First Amendment to the USA Constitution provides that ‘Congress shall make no law . . . abridging the freedom of speech. . . .’ Although the language of that provision may seem clear, the history of the USA is replete with examples of restrictions upon free speech, particularly during times of national crisis. This paper examines the reasons for protecting speech as well as the reasons allowing limitations. It also examines the historical limitations placed upon free speech during times of national crisis and the response of the courts to those restrictions. Next, this paper explains the current state of constitutional law as it relates to First Amendment restrictions and applies that law to Osama bin Laden’s fatwa against the USA. Finally, this paper argues and concludes that the current law is inadequate to protect the USA, given the Global War on Terrorism, and suggests a return to a prior standard that protects free speech to the maximum extent possible, consistent with the needs of national security.

DTIC

Speech; Law (Jurisprudence)

20080036261 Air Force Research Lab., Wright-Patterson AFB, OH USA

Capturing Commander’s Intent in User Interfaces for Network-Centric Operations

Donnelly, Brian P; Bolia, Robert S; Wampler, Jeffrey L; Feb 2007; 43 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481251; AFRL-WS-07-0413; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The network-centric concept of operations (or network-centric warfare (NCW)) is predicated on the increased availability of information at every node in the network. This information is the result of both the efficient fusion of disparate sensor inputs into a coherent picture and effective sharing of situation awareness among operators supporting the combatant commander. A difficulty arises in that for both the sensors and the operators, increasing information availability is insufficient to assure either the coherency of the picture or the common understanding of it. Experience and research have shown that interface concepts focused on Commander’s Intent can provide an integrating function for both operators shared understanding of the situation and the netted sensor assets. By grounding both the logic employed in the networked sensor management and the method of visualizing the shared picture on Commander’s Intent, synergies anticipated from network centric operations may be reasonably achieved. This paper describes both a notional design framework for a common user interface for command and control operations as well as prioritization logic for network-centric sensor management.

DTIC

Computer Networks; Logic Circuits; Electrical Grounding

20080036262 Army War Coll., Carlisle Barracks, PA USA

A Way Ahead for National Emergency Communications

Biebuyck, Burt A; Apr 17, 2008; 29 pp.; In English

Report No.(s): AD-A481513; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481513>

Effective communications are essential to the success of any large-scale military operation. The shared situational awareness enabled by effective communication is as critical to successful emergency response operations as it is to victory in combat. Important decisions made by government leaders in times of federal disaster are dependent upon acquiring and maintaining effective emergency communications. Like many other government policy issues, however, this area is a complex challenge complicated by competing authorities, jurisdictions, and priorities. A variety of factors make sustained progress in this area difficult. The lack of a comprehensive national communications strategy to address information sharing and exchange is the biggest shortfall. The incredible scope of the problem requires solutions spanning federal, state, tribal, county, and local levels. Commerce and politics complicate the way ahead as industry pressures government to establish standards that ensure fair-share market distribution. The lack of an aggregated band of spectrum to enable all responders to interoperate is also a stumbling block to progress. Solving the emergency communications challenge will require wide-ranging solutions. Partnership with commercial and private sector organizations is a key component of our national strategy and will be critical to the success of any effort in the communications arena.

DTIC

Command and Control; Emergencies; Interoperability; Security; United States

20080036278 Naval Postgraduate School, Monterey, CA USA

Radio Interoperability: Addressing the Real Reason We Don't Communicate Well During Emergencies (BRIEFING CHARTS)

Hutchins, Susan G; Timmons, Ronald P; Jun 2007; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481543; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481543>

Presentation on the problems and solutions related to radio interoperability among Homeland Security, police, fire departments and other emergency response agencies.

DTIC

Charts; Emergencies; Interoperability; Telecommunication

20080036280 Klett Consulting Group, Virginia Beach, VA USA

Human Performance Technology: A Discipline to Improve C2 Concept Development and Analysis

Piersol, William J; Paris, Carol; Jun 2007; 51 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481550; XC-HPC-N5; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481550>

Human Performance Technology (HPT) is not a device but a rich discipline committed to improving performance using a systematic and holistic approach. A basic description is humans, working within a system to get desired results. The relevance to C2 is unmistakable - information age C2 is increasingly focused on all aspects of the human in the loop. The processes used, while powerful and rigorous, are easy to comprehend. Understanding the important difference between the means and ends, HPT is characterized by efficiently addressing a performance gap with a thorough cause analysis in order to address causes and not just symptoms. During this presentation, the audience will be introduced to HPT history, the ten Standards of Performance Technology, several models associated with HPT, and areas where HPT methodologies can enable optimization of C2. Military staff officers and other professional analysts can develop their HPT analytical skills through research, leading university graduate programs, and a professional organization, the International Society for Performance Improvement. While these programs are focused on dynamic business and social processes, the principles readily transfer to the C2 arena and powerfully compliment the current tools available to C2 concept developers and analysts.

DTIC

Command and Control; Human Performance

20080036318 Telcordia Technologies, Inc., Piscataway, NJ USA

Scalable and Secure IPv6 Solutions for Connecting Mobile Networks to the GIG

Sebuektekin, Isil; McAuley, Anthony; Nov 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-2-01-0011

Report No.(s): AD-A481608; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481608>

Future military programs are mandated to use IPv6; however, little emphasis has been placed on exploiting the potential in IPv6 to more efficiently support mobile networks. Current approaches mimic IPv4 solutions, which may prevent the full benefits of IPv6 from being realized in dynamic networks. These IPv4-copycat solutions may, for example, degrade routing performance and scalability. In this paper we analyze the alternatives available within IPv6 to improve the interconnection of mobile user networks with the GIG, while addressing the stringent application and security requirements of future military networks. The benefits apply to both the mobile network and its more stable transit backbones. We show that much better scalability, performance and autonomy can be achieved in supporting mobile user networks. No new protocols are required; only exploiting advanced IPv6 features such as autoconfiguration, large address space, address summarization for routing, and advanced mobility support. We also show that our proposed solutions can be made compatible with military security needs, such as the use of HAIPE.

DTIC

Connectors; Internets; Military Technology; Networks; Protocol (Computers)

20080036331 Naval Postgraduate School, Monterey, CA USA

Design of an Experiment to Investigate ISR Coordination and Information Presentation Strategies in an Expeditionary Strike Group: Combined A2C2 and CMD-21 Research

Hutchins, Susan G; Weil, Shawn; Kleinman, David L; Hocevar, Susan P; Kemple, William G; Pfeiffer, Karl; Kennedy, Doug; Oonk, Heather; Averett, Gene; Entin, Elliot; Jun 2007; 46 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481628; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481628>

This paper describes the design of an experiment that combines research of the Adaptive Architectures for Command and Control (A2C2) and the Command 21 programs, both sponsored by the Office of Naval Research. The experiment focuses on the nexus of organizational design and information presentation strategies - both of which are undergoing dramatic changes in form and function within the US military. The formation of Expeditionary Strike Groups (ESGs) is one example of the transformational vision provided in the Naval Operating Concept wherein an ESG provides a flexible force package, capable of tailoring itself to a wide variety of mission sets. In this effort, the objective is to examine experimentally how ESGs with alternative structures and processes - here specifically related to the incorporation of an ISR officer and different information presentation strategies - affects performance and information flow in an information rich planning and execution environment. We present the process used to develop the scenario environment in which the team-in-the-loop simulation experiment is conducted. This scenario reflects the new mission areas faced by ESGs that include Humanitarian Assistance/Disaster Relief (HA/DR), Maritime Domain Awareness (MDA) and Maritime Security Operations (MSO).

DTIC

Command and Control; Coordination; Experiment Design; Information Theory; Military Operations

20080036350 Army Communications Research and Development Command, Fort Monmouth, NJ USA

Design, Implementation and Execution Results for Simulations and C2 Information Systems Connectivity Experiments (SINCE). Experiment 2

Mayk, Israel; Klose, Dirk; Chan, Andrew; Mai, Mike; Goren, Bernard; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481668; XA-CERDEC/C2/NJ; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481668>

In this paper we describe the design, implementation, and execution results obtained from the SINCE experiment 2b (SINCEx2b) which took place 17-28 July, 2006 at the Fort Dix facility of the NJ Army National Guard. The objective of SINCE is to conduct R&D experimentation in support of net-centric battle command interoperability and collaboration. The primary approach of this experiment is to build upon the success of the previous SINCE experiments by more than doubling the complexity of the scenario, the breadth and depth of information exchanges as well as the number of federates and interfaces. The number of coalition partners has also increased from two to five. An integral part of the solution is the establishment and refinement of a methodology by which the various information architectures would be harmonized within

federations and across federations. The infrastructure for SINCEx2 is embodied in Proxy Servers and the Coalition Portal as federates that collectively include the various adapters and filters that mediate between the otherwise incompatible heterogeneous interfaces inherent in the selected federate systems using a common digitized Operations Order (OPORD) oriented model encoded as an XML schema.

DTIC

Command and Control; Experiment Design; Information Systems; Simulation

20080036414 Air Force Research Lab., Wright-Patterson AFB, OH USA

Putting the Science Back in C2: What Do the Buzzwords Really Mean?

Havig, Paul; Aleva, Denise; Reis, George; McIntire, John; Jun 2007; 37 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481256; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Current command and control 'C2' terminology is laden with buzzwords that may, or may not, be useful to helping advance the science of C2 'e.g., effects-based operations 'EBO' or sensemaking'. In theory each term was devised for a reason, however, more often than not the reasons are lost and the terms are bantered about as 'proof' of a good system, experiment, etc. We review some of the major terms and their history, as well as the potential evidence for their scientific integrity. Next we discuss how best to understand these terms by investigating their psychological 'e.g., cognitive and social' as well as decision making roots. Finally we show how one may develop experiments and then eventually systems that either test or use these terms as they were originally defined. We give examples of how we are attempting to test these ideas in the laboratory as well as how others may test them in the future. We conclude with some discussion about the usefulness of buzzwords in the C2 realm as well as ways to keep them effective exemplars of their original meanings thus helping to advance the theory as well as knowledge of C2 systems.

DTIC

Command and Control; System Effectiveness

20080036565 Naval Undersea Warfare Center, Newport, RI USA

High-Speed Underwater Data Transmission System and Method

Bandyopadhyay, Promode R, Inventor; May 5, 2008; 36 pp.; In English
Report No.(s): AD-D020365; No Copyright; Avail.: Other Sources
ONLINE: <http://hdl.handle.net/100.2/ADD020365>

An underwater data transmission system including arrays of nano-meter scaled photon emitters and sensors on an outer surface of an underwater platform. For the emitters, a laser is pulsed to correlate with data packets, providing a beam of photons at a prescribed frequency. Nano-scaled collecting lenses channel the incoming photons to photo-receptors located at a focal plane for the frequency at the base of each lens. A coating on the lenses absorbs photons at the frequency that are not aligned with the longitudinal axes of the lenses or tubes. Nano-wires connect the photo-receptors to a light intensity integrator. The integrator integrates the intensity over a surface area. The output of the integrator is fed to a signal processor to track and process the arriving digital packets.

DTIC

Data Transmission; Emitters; High Speed; Optical Communication; Photon Beams; Photons; Underwater Communication

20080036587 Lally and Lally, LLP, Austin, TX, USA

Optimal Interconnect Utilization in a Data Processing Network

Felter, W. M., Inventor; Krieger, O. Y., Inventor; Rajamony, R., Inventor; 23 Sep 04; 14 pp.; In English
Contract(s)/Grant(s): NBCHC020056
Patent Info.: Filed Filed 23 Sep 04; US-Patent-Appl-SN-10-948 414
Report No.(s): PB2008-101977; No Copyright; Avail.: CASI: A03, Hardcopy

A method for managing packet traffic in a data processing network includes collecting data indicative of the amount of packet traffic traversing each of the links in the network's interconnect. The collected data includes source and destination information indicative of the source and destination of corresponding packets. A heavily used links are then identified from the collected data. Packet data associated with the heavily used link is then analyzed to identify a packet source and packet destination combination that is a significant contributor to the packet traffic on the heavily used link. In response, a process associated with the identified packet source and packet destination combination is migrated, such as to another node of the

network, to reduce the traffic on the heavily used link. In one embodiment, an agent installed on each interconnect switch collects the packet data for interconnect links connected to the switch.

NTIS

Computer Networks; Data Processing; Optimal Control; Patent Applications

20080036630 California Univ., Los Angeles, CA USA

Distributed Resource Management in Multi-hop Cognitive Radio Networks for Delay Sensitive Transmission

Shiang, Hsien-Po; van der Schaar, Mihaela; Jan 2008; 36 pp.; In English

Report No.(s): AD-A482142; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we investigate the problem of multi-user resource management in multi-hop cognitive radio networks for delay-sensitive applications. Since the tolerable delay does not allow propagating global information back and forth throughout the multi-hop network to a centralized decision maker, the source nodes and relays need to adapt their actions (transmission frequency channel and route selections) in a distributed manner, based on local network information. We propose a distributed resource management algorithm that allows network nodes to exchange information and that explicitly considers the delays and cost of exchanging the network information over the multi-hop cognitive radio networks. The term 'cognitive' refers in our paper to both the capability of the network nodes to achieve large spectral efficiencies by dynamically exploiting available frequency channels as well as their ability to learn the 'environment' (the actions of interfering nodes) based on the designed information exchange. Note that the node competition is due to the mutual interference of neighboring nodes using the same frequency channel. Based on this, we adopt a multi-agent learning approach, adaptive fictitious play, which uses the available interference information. We also discuss the tradeoff between the cost of the required information exchange and the learning efficiency. The results show that our distributed resource management approach improves the PSNR of multiple video streams by more than 3dB as opposed to the state-of-the-art dynamic frequency channel/route selection approaches without learning capability, when the network resources are limited.

DTIC

Networks; Radio Transmission; Resources Management; Sensitivity

20080036631 Maryland Univ., Baltimore, MD USA

Interchannel Crosstalk Reduction in an Analog Fiber Link Using Dispersion Management

Marks, Brian S; Menyuk, Curtis R; Campillo, Anthony L; Bucholtz, Frank; Feb 15, 2008; 4 pp.; In English

Report No.(s): AD-A482143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

It has previously been shown that dispersion compensation can dramatically affect the interchannel crosstalk in a multichannel analog fiber transmission link. In this work, we use a genetic algorithm to find five-segment dispersion maps that yield low crosstalk levels over two octaves of microwave-frequency bandwidth when amplitude modulation is used. The genetic algorithm suggests that optimal dispersion maps have low residual dispersion. Despite the genetic algorithm's ability to optimize dispersion maps with many fibers, it is possible to obtain similar crosstalk levels from a simpler two-segment design whose dispersion is fully compensated.

DTIC

Analog Data; Crosstalk; Fiber Optics; Systems Engineering; Transmission Lines

20080036637 Marine Corps, Washington, DC USA

Warfighters and Humanitarians: Integrating Technology to Save Lives

Zich, Ronald M; Jan 1997; 55 pp.; In English

Report No.(s): AD-A482158; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) and civilian relief agencies (nongovernmental organizations, or NGOs) have not effectively integrated communication and data system technologies into their combined humanitarian assistance and disaster relief operations. Future humanitarian assistance and disaster relief missions will require DoD forces to integrate with NGOs. Voice and data communications, critical at all levels, are most challenging at the tactical level. The tactical Civil-Military Operations Center (CMOC) has developed into a binding organization between the military and NGOs. Operations Provide Comfort, Sea Angel, Restore Hope, and Support Hope provided four common themes concerning tactical level military-NGO communications: daily face-to-face meetings have been the most effective means of communication; NGOs do not have the capability to provide themselves robust communications capabilities; military commanders often desire to support NGOs' communication efforts, allowing for improved military-NGO relief efforts; and NGOs must have a need to communicate with the CMOC. Today's communications interfaces can take three forms: meetings, single channel radio (SCR) communications,

and host nation infrastructure use. Military-NGO meetings must be tailored to emphasize relief, vice warfighting, and provide the NGOs utility. These meetings will continue to be crucial for CMOC functionality. SCR has inherent advantages and disadvantages; for each operation the use of SCR must be considered as a coordination tool between the military and NGOs. The fundamental advantage of SCR is timeliness, while its disadvantages include security (equipment and personnel), legal issues, and NGOs' logistic and fiscal supportability. Analysis of host nation infrastructure capabilities for radio, telephone, and data systems integration must be accomplished before each operation.

DTIC

Communication Networks; Data Transmission; Disasters; Organizations; Personnel; Systems Integration

20080036643 Artenum Co., Paris, France

Cooperation Enforcement and Learning for Optimizing Packet Forwarding in Autonomous Wireless Networks

Pandana, Charles; Han, Zhu; Liu, K J; Jan 2008; 15 pp.; In English

Contract(s)/Grant(s): F49620-02-1-0217

Report No.(s): AD-A482168; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In wireless ad hoc networks, autonomous nodes are reluctant to forward others' packets because of the nodes' limited energy. However, such selfishness and noncooperation deteriorate both the system efficiency and nodes' performances. Moreover, the distributed nodes with only local information may not know the cooperation point, even if they are willing to cooperate. Hence, it is crucial to design a distributed mechanism for enforcing and learning the cooperation among the greedy nodes in packet forwarding. In this paper, we propose a self-learning repeated-game framework to overcome the problem and achieve the design goal. We employ self-transmission efficiency as the utility function of individual autonomous node. The self transmission efficiency is defined as the ratio of the power for self packet transmission over the total power for self packet transmission and packet forwarding. Then, we propose a framework to search for good cooperation points and maintain the cooperation among selfish nodes. The framework has two steps: First, an adaptive repeated game scheme is designed to ensure the cooperation among nodes for the current cooperative packet forwarding probabilities. Second, self-learning algorithms are employed to find the better cooperation probabilities that are feasible and benefit all nodes. We propose three learning schemes for different information structures, namely, learning with perfect observability learning through flooding, and learning through utility prediction. Starting from noncooperation, the above two steps are employed iteratively, so that better cooperating points can be achieved and maintained in each iteration. From the simulations, the proposed framework is able to enforce cooperation among distributed selfish nodes and the proposed learning schemes achieve 70% to 98% performance efficiency compared to that of the optimal solution.

DTIC

Autonomy; Packet Switching; Wireless Communication

33

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment; and microelectronics and integrated circuitry. for related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

20080034703 Polster Lieder Woodruff and Lucchesi, Saint Louis, MO, USA

Adaptive Solid State Image Sensor

Ackland, B. D., Inventor; King, C. A., Inventor; Rafferty, C. S., Inventor; 18 Aug 05; 15 pp.; In English

Contract(s)/Grant(s): DMI-0450487

Patent Info.: Filed Filed 18 Aug 05; US-Patent-Appl-SN-11-206 555

Report No.(s): PB2008-101211; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An improved monolithic solid state imager comprises plural sub-arrays of respectively different kinds of pixels, an optional filter mosaic comprising color filters and clear elements, and circuitry to process the output of the pixels. The different kinds of pixels respond to respectively different spectral ranges. Advantageously the different kinds of pixels can be chosen from: (1) SWIR pixels responsive to short wavelength infrared (SWIR) in the range of approximately 800-1800 nm; (2) regular pixels responsive to visible and NIR radiation (400-1000 nm) and wideband pixels responsive to visible, NIR and SWIR radiation.

NTIS

Patent Applications; Pixels; Solid State

20080034704 Morris Manning and Martin, LLP, Atlanta, GA, USA; Vanderbilt Univ., Nashville, TN, USA
Apparatus and Methods of Using Second Harmonic Generation as a Non-Invasive Optical Probe for Interface Properties in Layered Structures

Alles, M. L., Inventor; Tolk, N. H., Inventor; Jun, B., Inventor; Pasternak, R., Inventor; Schrimpf, R., Inventor; 21 Dec 04; 26 pp.; In English

Contract(s)/Grant(s): AFOSR-F49620-99-1-0289

Patent Info.: Filed Filed 21 Dec 04; US-Patent-Appl-SN-11-019 906

Report No.(s): PB2008-100761; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for non-invasively probing at least one interface property in a layered structure having at least one interface. In one embodiment, the method includes the steps of exposing the layered structure to an incident photon beam at an incident angle to produce a reflection beam, measuring intensities of the second harmonic generation signals from the reflection beam, and identifying an initial second harmonic generation intensity and a time evolution of second harmonic generation intensity from the measured second harmonic generation intensities so as to determine the at least one interface property of the layered structure.

NTIS

Harmonic Generations; Optical Properties; Patent Applications; Semiconductor Devices

20080034705 Delphi Technologies, Inc., Troy, MI, USA
Measuring Bi-Directional Current Through A Field-Effect Transistor By Virtue of Drain-To-Source Voltage Measurement

Turner, S. R., Inventor; 24 Aug 04; 9 pp.; In English

Contract(s)/Grant(s): DE-FC36-026012020

Patent Info.: Filed Filed 24 Aug 04; US-Patent-Appl-SN-10-925 025

Report No.(s): PB2008-100760; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method and apparatus for measuring current, and particularly bi-directional current, in a field-effect transistor (FET) using drain-to-source voltage measurements. The drain-to-source voltage of the FET is measured and amplified. This signal is then compensated for variations in the temperature of the FET, which affects the impedance of the FET when it is switched on. The output is a signal representative of the direction of the flow of current through the field-effect transistor and the level of the current through the field-effect transistor. Preferably, the measurement only occurs when the FET is switched on.

NTIS

Electric Current; Field Effect Transistors; Patent Applications

20080034706 McGinn Intellectual Property Law Group, PLLC, Vienna, VA, USA; International Business Machines Corp., Armonk, NY, USA

Self-Aligned Silicide (SALICIDE) Process for Low Resistivity Contacts to Thin Film Silicon-On-Insulator and Bulk Mosfets and For Shallow Junctions

Cabral, C., Inventor; Chan, K. K., Inventor; Cohen, G. M., Inventor; Lavoie, C., Inventor; Roy, R. A., Inventor; 17 Nov 04; 14 pp.; In English

Contract(s)/Grant(s): DARPA-N66001-97-1-8908

Patent Info.: Filed Filed 17 Nov 04; US-Patent-Appl-SN-10-989 639

Report No.(s): PB2008-100759; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method (and resulting structure) for fabricating a silicide for a semiconductor device, includes depositing a metal or an alloy thereof on a silicon substrate, reacting the metal or the alloy to form a first silicide phase, etching any unreacted metal, depositing a silicon cap layer over the first silicide phase, reacting the silicon cap layer to form a second silicide phase, for the semiconductor device, and etching any unreacted silicon. The substrate can be either a silicon-on-insulator (SOI) substrate or a bulk silicon substrate.

NTIS

Electrical Resistivity; Field Effect Transistors; Metal Oxide Semiconductors; Patent Applications; Semiconductor Devices; Silicides; SOI (Semiconductors); Thin Films

20080034733 Pietragallo, Bosick and Gordon, LLP, Pittsburg, PA, USA
Semiconductor Light Source with Electrically Tunable Emission Wavelength

Belenky, G., Inventor; Bruno, J. D., Inventor; Kisin, M. V., Inventor; Luryi, S., Inventor; Suchalkin, S., Inventor; 18 Aug 05; 24 pp.; In English

Contract(s)/Grant(s): AFRL-F19628-0-C-0032; DE-FG02--02ER83492

Patent Info.: Filed Filed 18 Aug 05; US-Patent-Appl-SN-11-206 505

Report No.(s): PB2008-101166; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A semiconductor light source is disclosed comprising a substrate, lower and upper claddings, a waveguide region with imbedded active area, and electrical contacts to provide voltage necessary for the wavelength tuning. The active region includes single or several heterojunction periods sandwiched between charge accumulation layers. Each of the active region periods comprises higher and lower affinity semiconductor layers with type-II band alignment. The charge carrier accumulation in the charge accumulation layers results in electric field build-up and leads to the formation of generally triangular electron and hole potential wells in the higher and lower affinity layers. Nonequilibrium carriers can be created in the active region by means of electrical injection or optical pumping. Radiative recombination occurs between the electrons and holes, accumulated in the ground states of the triangular potential wells formed in the high- and low-affinity layers of each active region periods. The ground state energy in the triangular wells and the radiation wavelength can be tuned by changing the voltage drop across the active region.

NTIS

Semiconductors (Materials); Light Sources; Wavelengths; Tuning

20080034736 National Renewable Energy Lab., Golden, CO USA

Method for Achieving Device-Quality, Lattice-Mismatched, Heteroepitaxial Active Layers

Ahrenkiel, P. S., Inventor; Wanlass, M. W., Inventor; 5 Sep 02; 13 pp.; In English

Contract(s)/Grant(s): DE-AC36-99GO-10337

Patent Info.: Filed Filed 5 Sep 02; US-Patent-Appl-SN-10-526 785

Report No.(s): PB2008-101083; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method is provided for achieving device-quality active layers in lattice-mismatched-heteroepitaxial systems. The method eliminates strain and dislocations resulting from lattice mismatch with respect to the substrate of a heteroepitaxial active layer. The optimized heterostructure comprises a substrate, a compositionally step-graded region terminated with a buffer layer, an intermediate region, an active layer, and a capping layer. Concepts of the invention are demonstrated in double heterostructures containing the semiconductor alloys Ga(sub x)In(sub 1-x)As and InAs(sub y)P(sub 1-y).

NTIS

Epitaxy; Heterojunction Devices; Semiconductor Devices; Crystal Lattices; Crystal Structure; Misalignment

20080034737 International Business Machines Corp., Dallas, TX, USA; International Business Machines Corp., Austin, TX, USA

Power-Grating Cell for Virtual Power Rail Control

Kuang, J. B., Inventor; Law, J. C., Inventor; Ngo, H. C., Inventor; Nowka, K. J., Inventor; 26 Aug 04; 31 pp.; In English

Contract(s)/Grant(s): NBCH30390004; BGR W0132280

Patent Info.: Filed Filed 26 Aug 04; US-Patent-Appl-SN-10-926 597

Report No.(s): PB2008-101212; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Virtual power-gated cells (VPC) are configured with control circuitry for buffering control signals and a power-gated block (PGB) comprising two or more NFETs for virtual ground rail nodes and PFETs for virtual positive rail nodes. Each VPC has a control voltage input, a control voltage output, a node coupled to a power supply voltage potential, and a virtual power-gated node that is coupled and decoupled from the power supply potential in response to logic states on the control input. The control signals are buffered by non-power-gated inverters before being applied to the input of a PGB. VPCs may propagate a control signal that is in phase with or inverted from a corresponding control signal at the control input. VPCs may be cascaded to create virtual power rails in chains and power grids. The control signals are latched at the cell boundaries or latched in response to a clock signal.

NTIS

Circuits; Logic Circuits; Patent Applications; Rails

20080034747 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; California Inst. of Tech., Pasadena, CA, USA

System and Method for Making Nanoparticles Using Atmospheric-Pressure Plasma Microreactor

Sankaran, R. M., Inventor; Giapis, K. P., Inventor; Flagan, R. C., Inventor; Holunga, D., Inventor; 4 May 05; 33 pp.; In English

Contract(s)/Grant(s): NSF-CTS-0404353

Patent Info.: Filed Filed 4 May 05; US-Patent-Appl-SN-11-123 884

Report No.(s): PB2008-100776; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system and method for making nanoparticles. The system includes a first cathode including a first metal tube associated with a first end and a second end, a first anode including a second metal tube associated with a third end and a fourth end, and a first container including a first gas inlet. The first end and the third end are located inside the first container. The first end and the third end are separated by a first gap, the first metal tube is configured to allow a first gas to flow from the second end to the first end, and the first container is configured to allow a second gas to flow from the first gas inlet into the second metal tube through at least a first part of the first gap.

NTIS

Atmospheric Pressure; Chemical Reactors; Nanoparticles; Plasma Generators; Optoelectronic Devices

20080034777 Steptoe and Johnson LLP, Washington, DC, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA

Inorganic Particle Conjugates

Anderson, G. P., Inventor; Mattoussi, H., Inventor; Mauro, J. M., Inventor; Bawendi, M. G., Inventor; 16 Mar 05; 26 pp.; In English

Contract(s)/Grant(s): NSF-DMR-98-08941; ONR-N0001499WX30470

Patent Info.: Filed Filed 16 Mar 05; US-Patent-Appl-SN-11-080 946

Report No.(s): PB2008-101162; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The ionic conjugates include an inorganic particle electrostatically associated with a macromolecule which can interact specifically with predetermined chemical species or biological targets.

NTIS

Conjugates; Patent Applications

20080034786 Goodwin Procter, LLP, Boston, MA, USA

Apparatus and System for Suspending a Chip-Scale Device and Related Methods

Mescher, M. J., Inventor; Varghese, M., Inventor; Weinberg, M. S., Inventor; Marinis, T., Inventor; Soucy, J. W., Inventor; 13 Jul 05; 13 pp.; In English

Contract(s)/Grant(s): NBCHC 020050

Patent Info.: Filed Filed 13 Jul 05; US-Patent-Appl-SN-11-181 035

Report No.(s): PB2008-101151; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A suspension of a chip-scale device is accomplished using a suspension frame and at least one first tether. The chip-scale suspension frame defines a first plane and an opening through the suspension frame. At least one first tether crosses the opening at a first angle relative to the first plane and can be used to position the chip-scale device at least partially within the opening.

NTIS

Chips; Patent Applications

20080034802 BAE Systems Information and Electronic Systems Integration Inc., Nashua, NH, USA

Electro-Optical Cable for Use in Transmission of High Voltage and Optical Signals Under Extremes of Temperature

Dion, J., Inventor; Carlson, M. A., Inventor; 20 Nov 03; 5 pp.; In English

Contract(s)/Grant(s): N0019-96-C005

Patent Info.: Filed Filed 20 Nov 03; US-Patent-Appl-SN-10-535 565

Report No.(s): PB2008-101173; No Copyright; Avail.: CASI: [A01](#), Hardcopy

An electro-optical cable which includes an optical element having an elongated glass fiber core, a medial cushioning layer concentrically surrounding the glass fiber core, and an outer hard shell material surrounding the medial cushioning layer. The cable also includes at least one electrically conductive element comprising an elongated conductive core and a dielectric layer concentrically surrounding the electrically conductive element.

NTIS

Electro-Optics; Cables; Signal Transmission; Electric Power Transmission; High Voltages; Optical Communication; High Temperature

20080034810 Los Alamos National Lab., NM USA; California Univ., Berkeley, CA, USA

Atmospheric Pressure Plasma Processing Reactor

Selwyn, G. S., Inventor; Henins, I., Inventor; Snyder, H. R., Inventor; Herrmann, H. W., Inventor; 11 May 05; 11 pp.; In English

Contract(s)/Grant(s): DE-W7405-ENG-36

Patent Info.: Filed Filed 11 May 05; US-Patent-Appl-SN-11-127 865

Report No.(s): PB2008-101082; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A non-arcing atmospheric pressure plasma processing reactor that includes a wafer platform that is electrically conductive and operatively placed near at least one radio frequency electrode to allow the creation of an electric field. An rf power supply is electrically attached to both the radio frequency electrode and the wafer platform to create said electric field for generation of said non-arcing atmospheric pressure plasma. A process gas supply comprising a mixture of 90% to 99% support gas to 1 % to 10% reactive gas is supplied to the electric field to generate the atmospheric pressure plasma.

NTIS

Atmospheric Pressure; Plasma Generators; Chemical Reactors

20080034812 Rosenberg (Frank), Moraga, CA, USA

Microsystem Process Networks

Wegeng, R. S., Inventor; TeGrotenhuis, W. E., Inventor; Whyatt, G. A., Inventor; 30 Sep 05; 44 pp.; In English

Contract(s)/Grant(s): DE-AC0676RL01830

Patent Info.: Filed Filed 30 Sep 05; US-Patent-Appl-SN-11-241 600

Report No.(s): PB2008-100770; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Various aspects and applications of microsystem process networks are described. The design of many types of Microsystems can be improved by ortho-cascading mass, heat, or other unit process operations. Microsystems having exergetically efficient microchannel heat exchangers are also described. Detailed descriptions of numerous design features in microcomponent systems are also provided.

NTIS

Microelectronics; Patent Applications

20080034825 Michael Best and Friedrich, LLP, Milwaukee, WI, USA

Venting Member (PAT-APPL-10-932 488)

Gonya, S. G., Inventor; Butler, J. T., Inventor; Ziolkowski, P. M., Inventor; 2 Sep 04; 5 pp.; In English

Contract(s)/Grant(s): N00019-93-C-0196

Patent Info.: Filed Filed 2 Sep 04; US-Patent-Appl-SN-10-932 488

Report No.(s): PB2008-101110; No Copyright; Avail.: CASI: [A01](#), Hardcopy

A venting member includes a fastener and a gas-permeable member positioned at least partially within the fastener to allow movement of a gas through the fastener, but prevent movement of liquids.

NTIS

Fasteners; Patent Applications; Venting

20080034829 Honeywell International, Inc., Morristown, NJ, USA

Method and Apparatus for Determining One or More Operating Parameters for a Microfluidic Circuit

Padmanabhan, A., Inventor; Reutiman, P., Inventor; Cabuz, E. I., Inventor; 2 Sep 04; 24 pp.; In English

Contract(s)/Grant(s): MDA-972-00-C-0029

Patent Info.: Filed Filed 2 Sep 04; US-Patent-Appl-SN-10-932-662

Report No.(s): PB2008-101107; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods for determining one or more operating parameters for a timing protocol of a microfluidic circuit are provided. In some embodiments, wet out times are measured for certain flow channels, and start times, flow rates and/or other parameters are calculated so that the various fluids in the microfluidic cartridge arrive at certain locations at a desired time and/or in a desired sequence. To help compensate for process variations, one or more fluidic process monitor components/structures may

be fabricated along with the functional components/structures of a microfluidic cartridge. Test may be performed on the process monitor components/structures to help identify process variations in the particular microfluidic cartridge at hand. By using the process monitor data, the timing protocol for a particular microfluidic cartridge may be made more accurate.

NTIS

Circuits; Microfluidic Devices; Patent Applications

20080034921 National Inst. of Standards and Technology, Gaithersburg, MD USA

Semiconductor Microelectronics and Nanoelectronics Programs, July 2007

Jul. 2007; 254 pp.; In English

Report No.(s): PB2008-101896; NISTIR-7426; No Copyright; Avail.: National Technical Information Service (NTIS)

The microelectronics industry supplies vital components to the electronics industry and to the U.S. economy, enabling rapid improvements in productivity and in new high technology growth industries such as electronic commerce and biotechnology. The National Institute of Standards and Technology, NIST, in fulfilling its mission of strengthening the U.S. economy, works with industry to develop and apply technology, measurements and standards; and applies substantial efforts on behalf of the semiconductor industry and its infrastructure. This report describes the many projects being conducted at NIST that constitute that effort.

NTIS

Microelectronics; Nanotechnology; Semiconductor Devices; Semiconductors (Materials)

20080034983 Jenkins, Wilson and Taylor, P.A., Durham, NC, USA

Methods for Manipulating Droplets by Electrowetting Based Techniques

Pamula, V. K., Inventor; Pollack, M. G., Inventor; Paik, P. Y., Inventor; Ren, H., Inventor; Fair, R. B., Inventor; 10 Mar 05; 66 pp.; In English

Contract(s)/Grant(s): F30602-98-2-0140

Patent Info.: Filed 10 Mar 05; US-Patent-Appl-SN-11-077 569

Report No.(s): PB2008-101244; No Copyright; Avail.: CASI: [A04](#), Hardcopy

Methods are provided for manipulating droplets. The methods include providing the droplet on a surface comprising an array of electrodes and a substantially co-planer array of reference elements, wherein the droplet is disposed on a first one of the electrodes, and the droplet at least partially overlaps a second one of the electrodes and an intervening one of the reference elements disposed between the first and second electrodes. The methods further include activating the first and second electrodes to spread at least a portion of the droplet across the second electrode and deactivating the first electrode to move the droplet from the first electrode to the second electrode.

NTIS

Drops (Liquids); Electro-Optics; Patent Applications

20080034984 McDermott Will and Emery, LLC, Los Angeles, CA, USA; University of Southern California, Los Angeles, CA, USA

Power-Efficient, Pulsed Driving of Capacitive Loads to Controllable Voltage Levels

Svensson, L. G., Inventor; Athas, W. C., Inventor; Lal, R. K., Inventor; 18 Nov 05; 19 pp.; In English

Contract(s)/Grant(s): DML01-95-K3528

Patent Info.: Filed 18 Nov 05; US-Patent-Appl-SN-11-283 292

Report No.(s): PB2008-102147; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Power-efficient, pulsed driving of capacitive loads to controllable voltage levels, with particular applicability to LCDs. Energy stored in a portion of the capacitive load is recovered during a recovery phase. Time-varying signals are used to drive the load and to recover the stored energy, thus minimizing power losses, using processes named adiabatic charging and adiabatic discharging.

NTIS

Capacitance; Display Devices; Electric Potential; Liquid Crystals; Loads (Forces); Patent Applications; Power Efficiency

20080034985 Crilly (Michael G), Esq., Hartboro, PA, USA

Method of Fabricating a Current Control Device

Bower, B., Inventor; Knowles, G., Inventor; 26 Jan 05; 11 pp.; In English

Contract(s)/Grant(s): N00024-01-C-4034

Patent Info.: Filed Filed 26 Jan 05; US-Patent-Appl-SN-11-044 856

Report No.(s): PB2008-102115; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of fabricating a current control device is presented. The method impregnates a pressure conduction composite within a current control device with a fluid additive via suffusion. The suffusion process is performed by placing the pressure conduction composite within a bath of a liquid additive. The method generally includes the steps of mixing a compressible non-conductive matrix and conductive filler, forming a pressure conduction composite composed of the non-conductive matrix having the conductive filler electrically isolated therein, suffusing the composite within a bath so as to impregnate the composite with an additive, and attaching a pair of conductive plates to the composite. Alternate methods include attaching non-conductive plates to the composite, forming pores within the pressure conduction composite, and inserting a temperature responsive material into a porous composite.

NTIS

Control Equipment; Electronic Equipment; Fabrication; Patent Applications

20080034986 Dorsey and Whitney, LLP, San Francisco, CA, USA

Capacitive Micromachined Ultrasonic Transducer Array with Through-Substrate Electrical Connection and Method of Fabricating Same

Huang, Y., Inventor; Zhuang, X., Inventor; Khuri-Yakub, B. T., Inventor; Cheng, C. H., Inventor; Ergun, A. S., Inventor; 4 Jun 05; 13 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0007

Patent Info.: Filed Filed 4 Jun 05; US-Patent-Appl-SN-11-144 184

Report No.(s): PB2008-102119; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The embodiments of the present invention provide a CMUT array and method of fabricating the same. The CMUT array has CMUT elements individually or respectively addressable from a backside of a substrate on which the CMUT array is fabricated. In one embodiment, a CMUT array is formed on a front side of a very high conductivity silicon substrate. Through wafer trenches are etched into the substrate from the backside of the substrate to electrically isolate individual CMUT elements formed on the front side of the substrate. Electrodes are formed on the backside of the substrate to individually address the CMUT elements through the substrate.

NTIS

Capacitance; Electric Connectors; Fabrication; Micromachining; Patent Applications; Substrates; Transducers

20080034987 Summa, Allan and Addition, P.A., Charlotte, NC, USA

Low Basal Plane Dislocating Bulk Grown SiC Wafers

Powell, A., Inventor; Brady, M., Inventor; Tsvetkov, V. F., Inventor; 8 Jun 05; 10 pp.; In English

Contract(s)/Grant(s): N000014-03-C-0302

Patent Info.: Filed Filed 8 Jun 05; US-Patent-Appl-SN-11-147 645

Report No.(s): PB2008-102120; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A high quality single crystal wafer of SiC is disclosed. The wafer has a diameter of at least about 3 inches (75 mm) and at least one continuous square inch (6.25 cm(sup 2)) of surface area that has a basal plane dislocation volume density of less than about 500 cm(sup -2) for a 4 degree off-axis wafer.

NTIS

Patent Applications; Semiconductors (Materials); Wafers

20080034990 Workman Nydegger, Salt Lake, UT, USA

Distributed Bragg Reflector for Optoelectronic Device

Johnson, R. H., Inventor; 28 Mar 05; 27 pp.; In English

Contract(s)/Grant(s): NIST-70NAHB8H4023

Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-091 656

Report No.(s): PB2008-100767; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A Distributed Bragg Reflector (DBR) that has relatively low light absorption, relatively low electrical resistance, and/or relatively good thermal conductivity. The DBR may include a first mirror layer and a second mirror layer, with an interface therebetween. A step transition is provided in the aluminum concentration and in the doping concentration at or near the interface between the first mirror layer and the second mirror layer. To reduce optical absorption, the interface between the first and second mirror layers may be positioned at or near a null in the optical electric field within the DBR. A graded junction

may also be provided. The graded junction may be more lightly doped, have a graded aluminum concentration, and may be placed at or near a peak in the optical electric field.

NTIS

Bragg Angle; Bragg Reflectors; Optoelectronic Devices; Patent Applications

20080034991 Maine and Asmus, Nashua, NH, USA; BAE Systems and Technology, Nashua, NH, USA

Sliding Cascode Circuit

Hairston, A. W., Inventor; 30 Aug 04; 11 pp.; In English

Contract(s)/Grant(s): DTRA-01-03-D-0007-0002

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-929 604

Report No.(s): PB2008-100766; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Described techniques extend (e.g., by a factor of 2) the dynamic range of voltage swing for amplifiers and other integrated circuits (e.g., buffers) that are fabricated using lower voltage rated semiconductor processes. Such processes include, for instance, thin gate oxide MOS, and other semiconductor processes that provide desirable features that are typically not associated with high voltage processes, such as increased radiation hardness, higher speed logic, and compactness. Thus, relatively large dynamic range is enabled for integrated circuits fabricated using feature-rich lower voltage rated semiconductor processes.

NTIS

Cascode Devices; Circuits; Integrated Circuits; Patent Applications; Sliding

20080034992 General Electric Co., Niskayuna, NY, USA

OLED Area Illumination Source

Foust, D. F., Inventor; Duggal, A. R., Inventor; Shiang, J. J., Inventor; Nealon, W. F., Inventor; 2 Sep 04; 12 pp.; In English

Contract(s)/Grant(s): DE-FC26-00NT40989

Patent Info.: Filed Filed 2 Sep 04; US-Patent-Appl-SN-10-934 015

Report No.(s): PB2008-100765; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention relates to an area illumination light source comprising a plurality of individual OLED panels. The individual OLED panels are configured in a physically modular fashion. Each OLED panel comprising a plurality of OLED devices. Each OLED panel comprises a first electrode and a second electrode such that the power being supplied to each individual OLED panel may be varied independently. A power supply unit capable of delivering varying levels of voltage simultaneously to the first and second electrodes of each of the individual OLED panels is also provided. The area illumination light source also comprises a mount within which the OLED panels are arrayed.

NTIS

Illuminance; Light Emitting Diodes; Patent Applications

20080034994 Daly, Crowley, Mofford & Durkee, LLP, Canton, MA, USA

Device For Subtracting or Adding Charge in a Charge-Coupled Device

Anthony, M. P., Inventor; 26 Aug 04; 20 pp.; In English

Contract(s)/Grant(s): AF-F19628-00-C-002

Patent Info.: Filed Filed 26 Aug 04; US-Patent-Appl-SN-10-926 937

Report No.(s): PB2008-100763; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention provides an apparatus for adding or subtracting an amount charge to or from a charge packet in a CCD as the packet traverses the CCD. The apparatus uses a 'wire transfer' device structure to perform the addition or subtraction of charge during the charge packets traversal across the device. A pair of electrically interconnected diffusions are incorporated within the charge couple path to provide an amount of charge which can be added or subtracted from packets as the packets traverse the CCD.

NTIS

Charge Coupled Devices; Patent Applications; Subtraction

20080035001 Harness, Dickey and Pierce, P.L.C., Bloomfield Hills, MI, USA

Phase Change Materials for Storage Media

Kanatzidis, M. G., Inventor; 22 Jan 04; 10 pp.; In English

Contract(s)/Grant(s): DMR-0127644

Patent Info.: Filed Filed 22 Jan 04; US-Patent-Appl-SN-10-543 214

Report No.(s): PB2008-102149; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Phase-change compounds, and optical storage recording media, for recording and/or storage of data, comprising such compounds, according to the formula $X\text{Sb}(\text{sub } y)\text{S}(\text{sub } z)$; wherein X is selected from the group consisting of K, Rb, Ti, Na, Li, Cs and mixtures thereof; and wherein y is about 1 or about 5, and z is about 1 or about 5. Preferably, X is K, y is 5 and z is 5. Also provided are optical recording media comprising a layer of the phase-change material and methods of creating a reversible phasechange by irradiating the material with a laser radiation.

NTIS

Optical Memory (Data Storage); Patent Applications; Phase Change Materials

20080035035 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Embedded ESD Protection Proof of Concept

Gerke, David; Herrmann, Bill; August 2008; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS7-03001; Proj. 102197

Report No.(s): JPL Publication 08-25; Copyright; Avail.: CASI: [A03](#), Hardcopy

The purpose of this project is to characterize and correlate Electrostatic Discharge (ESD) sensitivity levels of an Integrated Circuit (IC) package using Transmission Line Pulse (TLP) and Human Body Model (HBM) methods. This characterization will be used as a baseline ESD sensitivity level to demonstrate improvement to the ESD sensitivity of the IC package through the use of EPI-FLOTM Polymer Voltage Suppression (PVS) protection devices developed and manufactured by Electronic Polymers, Inc. (EPI).

Author

Electrostatics; Characterization; Integrated Circuits; Transmission Lines; Human Body; Embedding; Electric Potential

20080035091 Department of the Army, Washington, DC, USA

Apparatus and Method for Visible Imaging Using Darlington Phototransistors

Dang, K. V., Inventor; Terrill, C. W., Inventor; 7 Oct 04; 7 pp.; In English

Patent Info.: Filed Filed 7 Oct 04; US-Patent-Appl-SN-10-962 813

Report No.(s): PB2008-102127; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The present invention is a modified darlington phototransistor wherein a phototransistor is coupled to a Bipolar Junction Transistor (BJT). This design provides a high sensitivity and a fast response and effectively increases the gain of the photocurrent. This circuit is particularly well suited for the readily available CMOS and Bipolar Complementary Metal Oxide Semiconductor (BiCMOS) processes prevalent today.

NTIS

Bipolar Transistors; Imaging Techniques; Patent Applications; Phototransistors

20080035092 Army Space and Missile Defense Command, Huntsville, AL, USA

Integrated Transistor Devices

Braddock, W. D., Inventor; 9 Feb 05; 9 pp.; In English

Contract(s)/Grant(s): DAAH01-C-R015; DAAH-01-C-R028

Patent Info.: Filed Filed 9 Feb 05; US-Patent-Appl-SN-11-052 889

Report No.(s): PB2008-102128; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A self-aligned enhancement mode metal-oxide-compound semiconductor field effect transistor (10) includes a lower oxide layer that is a mixture of $\text{Ga}(\text{sub } 2)\text{O}$, $\text{Ga}(\text{sub } 2)\text{O}(\text{sub } 3)$, and other gallium oxide compounds (30), and a second insulating layer that is positioned immediately on top of the gallium oxygen layer together positioned on upper surface (14) of a III-V compound semiconductor wafer structure (13). Together the lower gallium oxide compound layer and the second insulating layer form a gallium oxide gate insulating structure. The gallium oxide gate insulating structure and underlying compound semiconductor gallium arsenide layer (15) meet at an atomically abrupt interface at the surface of with the compound semiconductor wafer structure (14). The initial essentially gallium oxygen layer serves to passivate and protect the underlying compound semiconductor surface from the second insulating oxide layer. A refractory metal gate electrode layer (17) is positioned on upper surface (18) of the second insulating oxide layer. The refractory metal is stable on the second insulating oxide layer at elevated temperature. Self-aligned source and drain areas, and source and drain contacts (19, 20) are positioned on the source and drain areas (21, 22) of the device. Multiple devices are then positioned in proximity and the

appropriate interconnection metal layers and insulators are utilized in concert with other passive circuit elements to form an integrated circuit structure.

NTIS

Patent Applications; Semiconductor Devices; Transistors

20080035096 Daly, Crowley, Mofford & Durkee, LLP, Canton, MA, USA

Filter Having Parasitic Inductance Cancellation

Perreault, D. J., Inventor; Neugebauer, T. C., Inventor; Phinney, J. W., Inventor; 2 May 05; 37 pp.; In English

Contract(s)/Grant(s): N000140010381

Patent Info.: Filed Filed 2 May 05; US-Patent-Appl-SN-11-119 659

Report No.(s): PB2008-102133; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An electrical component includes a capacitive impedance and a shunt path inductance cancellation feature provided by coupled windings. A filter having a capacitor with capacitor-path inductance cancellation provides enhanced performance over frequency compared with conventional capacitors.

NTIS

Cancellation; Capacitance; Capacitors; Impedance; Inductance; Patent Applications

20080035098 Qualcomm, Inc., San Diego, CA, USA

Devices and Methods for Retaining a Lens in a Mobile Electronic Device

Chintala, T. J., Inventor; Semenik, S. R., Inventor; 12 Oct 04; 31 pp.; In English

Contract(s)/Grant(s): MDA904-01-G-06

Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-109-963 962

Report No.(s): PB2008-102136; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The described embodiments provide devices and methods for securing a lens member in a mobile electronic device. The lens member is positionable between a front housing and a rear housing of the device such that inner surfaces of the housings both exert a biasing force on the lens member such that the lens member is substantially immovable relative to the inner surfaces. As such, the lens member is securely fixed within the housings and cannot be removed or separated from one or both housings without evidence of tampering.

NTIS

Lenses; Patent Applications; Electronic Equipment

20080035206 Army Natick Soldier Center, Natick, MA USA

A Self-powered Field Feeding System

Pickard, Don; DiLeo, Frank; Kushch, Aleksandr; Hauerbach, Markvard; LeVine, Lawrence; Nov 1, 2006; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481037; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481037>

Thermoelectric technology has been used to reduce the logistics of field feeding. A conventional Tray Ration Heater (TRH) powered by the HMMWV, was redesigned to include a thermoelectric generator, a low power consumption DC burner, and a newly designed Power Management System (POMS). Two STRHs were fabricated and tested, and demonstrated the capability of heating rations for field feeding independent of external power generation equipment. In addition, the STRH produces surplus electricity that can be used for various needs, such as lighting, battery charging, powering radios, communication devices, etc. Most importantly, the independent operation of the STRH provides the operational flexibility to drop the field feeding system should there be a requirement for the HMMWV to accomplish another mission. Compared to powering the TRH with a 2 kW diesel generator, the integral thermoelectric generator reduces the field feeding system weight, cost, and fuel consumption, while significantly increasing system reliability

DTIC

Electric Generators; Electric Power Plants; Thermoelectric Power Generation

20080035213 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Ultrafast Spectroscopy of Mid-Infrared Semiconductors Using the Signal and Idler Beams of a Synchronous Optical Parametric Oscillator

Derbis, Richard M; Mar 2008; 54 pp.; In English

Report No.(s): AD-A481054; AFIT/GAP/ENP/08-M02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481054>

The objective of this thesis was to improve the procedure for taking ultrafast, time-resolved measurements of photoluminescence from MWIR semiconductors. Previous work has used a mode-locked titanium sapphire (Ti:Saph)laser to excite the semiconductor sample and to upconvert the photoluminescence from the semiconductor. Work completed in this thesis improved on the techniques developed during previous work.

DTIC

Idlers; Parametric Amplifiers; Photoluminescence; Semiconductors (Materials); Spectroscopy

20080035233 Naval Research Lab., Washington, DC USA

Versatile Sample Handling System for Scanning Tunneling Microscopy Studies of Molecular Beam Epitaxy

Whitman, L J; Thibado, P M; Linker, F; Patrin, J; May 1996; 4 pp.; In English

Report No.(s): AD-A481105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481105>

The ongoing development of short-period semiconductor superlattices for electronic and optoelectronic applications requires atomic-scale control of epitaxial growth, especially at the interfaces. Given this requirement, there is a critical need for in situ characterization on the atomic scale as provided by scanning tunneling microscopy (STM). Here we describe a sample handling system designed to integrate a modified commercial STM into a multichamber ultrahigh vacuum (UHV) molecular beam epitaxy (MBE) facility. The system uses a simple, yet versatile, sample holder design that enables quick and easy sample transfers between multiple chambers, including two Riber MBE and two surface characterization chambers interconnected by Riber UHV ModuTrac (Trademark).

DTIC

Holders; Manipulators; Microscopy; Molecular Beam Epitaxy; Scanners; Scanning Tunneling Microscopy

20080035238 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Piezo-Electrochemical Transducer Effect (PECT) Intercalated Graphite Micro-Electromechanical Actuators

Kading, Glen A; Nov 2007; 193 pp.; In English

Report No.(s): AD-A481116; AFIT/DEE/ENG/08-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481116>

The purpose of this research is to investigate the Piezo-Electrochemical Transducer (PECT) effect in intercalated graphite as a possible mechanism of actuation for micro-electromechanical systems (MEMS). This dissertation presents the results of research into the PECT effect in H₂SO₄-intercalated graphitized carbon fibers, including both electrical and mechanical characteristics of this effect. PECT fibers achieve up to 1.7% strain at 1.4 V of applied potential. In contrast, the piezoelectric material polyvinylidene difluoride (PVDF) generates only 0.01% strain and polysilicon thermal expansion between 0.02 and 0.06% strain depending on the thermal conductivity of the particular polysilicon that the actuators are fabricated in. This work concludes that PECT carbon fiber actuators achieve two orders of magnitude better strain than PVDF piezoelectric actuators and polysilicon thermal expansion in the same voltage range of operation. In addition to this highly improved strain, the devices, after an initial peak power consumption of 227 micronW, a PECT device uses only 260 nW to hold actuation. Although slow operation and unpractical intercalants are serious drawbacks to PECT actuators, the characteristics of strain and power consumption presented in this dissertation prove that PECT actuators, given some minor modifications, prove to be a competitive alternative to current MEMS actuators.

DTIC

Actuators; Electromechanical Devices; Graphite; Graphitization; Microelectromechanical Systems; Piezoelectricity; Transducers

20080035249 Naval Research Lab., Washington, DC USA

Detection Limits for Nanoscale Biosensors

Sheehan, Paul E; Whitman, Lloyd J; Feb 15, 2005; 6 pp.; In English

Report No.(s): AD-A481137; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481137>

We examine through analytical calculations and finite element simulations how the detection efficiency of disk and wire-like biosensors in unmixed fluids varies with size from the micrometer to nanometer scales. Specifically, we determine the total flux of DNA-like analyte molecules on a sensor as a function of time and flow rate for a sensor incorporated into a microfluidic system. In all cases, sensor size and shape profoundly affect the total analyte flux. The calculations reveal that reported femtomolar detection limits for biomolecular assays are very likely an analyte transport limitation, not a signal transduction limitation. We conclude that without directed transport of biomolecules, individual nanoscale sensors will be limited to picomolar-order sensitivity for practical time scales.

DTIC

Bioinstrumentation; Detection; Detectors; Finite Element Method; Flow Velocity

20080035257 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Ultra-Wideband Electromagnetic Induction for UXO Discrimination

O'Neill, Kevin; Nov 30, 2002; 179 pp.; In English

Report No.(s): AD-A481173; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481173>

- 18 - The material in this section consists of extracts from, summaries of, and comments on results that appear in more detail in the following chapters of the report. For the most part, literature references are not provided in this section, when they are present adequately in the more detailed report sections. At the inception of the project, reliable, accurate means were needed to analyze EMI UWB target responses, both to identify phenomena in the new frequency frontiers and to integrate them into patterns continuing through the more familiar parts of the EMI band. Much was lacking in this regard in terms of both analytical and numerical models. To address this, formulations were developed to provide analytical solutions, for the first time, for basic non-spherical shapes (elongated and flattened spheroids). A parallel development was also undertaken in the numerical realm, designed to treat arbitrary shapes and material composition, in 3-D, from the low frequency limit to the high frequency limit. Work was successful in - 19 - both realms. All models were based on first-principles physics, in particular Maxwell's fundamental equations of electromagnetics. These are typically simplified somewhat in induction problems, as phenomena are justifiably treated as quasi-magnetostatic (MQS). In mathematical practice, this means that a term is eliminated that contains the time derivative of the electric field. At higher, e.g. radar frequencies, this term cannot be eliminated.

DTIC

Broadband; Electromagnetic Fields; Magnetic Induction

20080035270 Tennessee Technological Univ., Cookeville, TN USA

Time-Reversal Based Range Extension Technique for Ultra-wideband (UWB) Sensors and Applications in Tactical Communications and Networking

Qiu, Robert C; Apr 16, 2008; 67 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-07-1-0529; Proj-07PR05074-00

Report No.(s): AD-A481201; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481201>

This technical report (quarterly) details the work for Office of Naval Research (ONR) by Tennessee Tech. The goal of this project jointly funded by ONR, NSF, and ARO is to build a general purpose testbed with time reversal capability at the transmitter side. The envisioned application is for UWB sensors and tactical communications in RF harsh environments where multipath is rich and can be exploited through the use of time reversal. The over-the-air demonstration of the concept of time reversal for a ultra-wideband radio has been achieved recently in our Lab. In particular, synchronization has been obtained over the air. This even is, indeed, a landmark in the development of UWB radios. Time reversal represents a new transceiver framework that is an alternative to the transceivers using OFDM and RAKE receiver.

DTIC

Antennas; Broadband; Frequencies

20080035328 Purdue Univ., West Lafayette, IN USA

Three Dimensional Integration and On-Wafer Packaging for Heterogeneous Wafer-Scale Circuit Architectures

Katehi, Linda; Perlman, Barry; Chappell, William; Mohammadi, Saeed; Steer, Michael; Nov 2006; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481236; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Advanced Network Centric Warfare (NCW) systems require a new generation of circuits with deployable, agile, versatile, lethal, survivable and sustainable capabilities. The super-heterodyne radio architecture in present systems necessitates multiple passive off-chip components including IF filters adapted to the channel filtering requirements to support different standards. A newer direct conversion (including low IF) architecture has evolved that lends itself to a single- or few-chip mixed signal implementation although performance is compromised primarily because of the loss and finite Q of on-chip passives leading to low RF efficiency, increased power consumption and high phase noise. The potential of using high density, low-loss interconnects and integrated high quality passives has been shown to provide maximum benefit for integrated microwave systems. Both design cycle times and system performance have been advanced through the use of high-resistivity silicon in a unique Si-based Self-Aligned Wafer Level Integration Technology (SAWLIT), that was developed as part of this project. In this technology the CMOS or SiGe ICs are integrated within the Si interposer using low-loss interconnects with a definition better than 1 micron. This integration approach allows the removal of passives from the expensive IC chip and their integration on the interposer for lower cost and better performance. Additionally, the use of a multi-layer package integrated with the interposer allows for the high density integration of high quality components such as cavity based filter with unloaded Q's > 1500s. In this paper we will present the implementation of the interposer concept on a transceiver architecture that easily lends itself to a three-dimensional heterogeneous integration along with the passives that make this integration possible. The three-dimensional circuit architecture will be demonstrated on a 10GHz CMOS receiver.

DTIC

Circuits; Heterogeneity; Integrated Circuits; Packaging; Wafers

20080035334 Naval Research Lab., Washington, DC USA

Perturbation Evolution Started by Richtmyer-Meshkov Instability in Planar Laser Targets

Aglitskiy, Y; Metzler, N; Karasik, M; Serlin, V; Velikovich, A L; Obenschain, S P; Mostovych, A N; Schmitt, A J; Weaver, J; Gardner, J H; Walsh, T; Jan 2006; 18 pp.; In English

Report No.(s): AD-A481244; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first observations of the interaction of the Richtmyer-Meshkov (RM) instability with reflected shock and rarefaction waves in laser-driven targets are reported. The RM growth is started by a shock wave incident upon a rippled interface between low-density foam and solid plastic. Subsequent interaction of secondary rarefaction and/or shock waves arriving from the ablation front and the rear surface of the target with the RM-unstable interface stops the perturbation growth and reverses its direction. The ensuing exponential Rayleigh-Taylor growth thus can sometimes proceed with an inverted phase.

DTIC

Laser Targets; Perturbation; Planar Structures

20080035336 Army Research Lab., Adelphi, MD USA

Degradation, Reliability, and Failure of Semiconductor Electronic Devices

Derenge, M A; Ervin, M H; Kirchner, K W; Jones, K A; Wood, M C; Zheleva, T S; Nov 1, 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481246; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We show how defects in semiconductor device structures are formed, how they can affect the properties and reliability of devices, and how they might be avoided. Examples will be drawn from wide band gap semiconductor materials and devices we have fabricated in-house or examined for DARPA, collaborators in the P&E CTA, a power electronics MTO, or an SBIR.

DTIC

Degradation; Failure; Reliability; Semiconductor Devices

20080035341 American Superconductor Corp., Devens, MA USA

YBCO Coated Conductors with Reduced AC Losses

Thieme, C L; Gurevich, A; Labalestier, D; Jan 30, 2008; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-C-0025

Report No.(s): AD-A481255; No Copyright; Avail.: Defense Technical Information Center (DTIC)

At the onset of this Project AMSC used an R&D scale to demonstrate the AMSC 2G HTS process in 10 m long, 10 mm

wide 2G conductors which showed 250 A end-to-end critical currents I_c at 77 K. Standard deviation of I_c in these wires was low and index values n (V tilde I_n) were quite high, ranging from 31 to 37. For a more cost-effective full scale 2G HTS production, a processing width of 100 mm is envisioned, with a processing length of >1000m. Only at the very end of the process, after coating of the Ag cap layer, is the conductor slit to final conductor width which is around 4 mm. To bridge this gap between the 10 and 100 mm process width, the 2G HTS development used an in-between process width of 40 mm. During the Phase II the process width remained at 4 cm, and length was around 130 m. At the end of the Phase II the length was extended to 500 m.

DTIC

Alternating Current; Coatings; Conductors; Superconductors (Materials); YBCO Superconductors

20080035366 Maryland Univ., College Park, MD USA

Energy Efficient Millimeter Wave Radio Link Establishment With Smart Array Antennas

Neekzad, Behnam; Baras, John S; Sayrafian-Pour, Kamran; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481336; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Consider a system of two millimeter wave transceiver nodes A and B. We assume that each node is equipped with a circular array antenna that has beamforming capability. We are interested in using the beamforming capability to find the best possible directions for transmission and reception such that the communication link between two nodes provides maximal SNR at the receiver. A protocol that in most cases achieves the optimal solution is developed and simulation results are provided to show the effectiveness of the algorithm.

DTIC

Antenna Arrays; Millimeter Waves

20080035370 Yokohama Coll. of Pharmacy, Kanagawa, Japan

The Superlattice Story with the Esaki Tunnel Diode

Esaki, Leo; Nov 2006; 54 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481345; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Esaki discusses the history of solid state physics, quantum theory and the development of superlattices, including the work that won him the Nobel Prize. In the end he presents his list of 'five don'ts' which anyone with an interest in realizing his or her creative potential should follow.

DTIC

Superlattices; Tunnel Diodes

20080035399 Army Research Lab., Adelphi, MD USA

The MEMS Flux Concentrator: Potential Low-Cost, High-Sensitivity Magnetometer

Edelstein, Alan S; Fischer, Greg; Bernard, William; Nowak, Edmond; Cheng, Shu Fan; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481427; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Progress on the development of a device, the MEMS flux concentrator, for mitigating the problem of 1/f noise in magnetic sensors will be presented. The MEMS flux concentrator essentially eliminates the effect of 1/f noise by increasing the operating frequency of the sensor to a frequency region where 1/f noise is small. This is accomplished by putting flux concentrators on MEMS structures whose motion modulates the magnetic field at the position of the magnetic sensor. Depending on the sensor, mitigating the effect of 1/f noise will increase the sensitivity of magnetic sensors by one to three orders of magnitude. Combining the MEMS flux concentrator with magnetic tunnel junctions with MgO barriers should lead to low cost magnetic sensors that are able to detect 1 pT signals at 1 Hz.

DTIC

Concentrators; Low Cost; Magnetometers; Microelectromechanical Systems; Sensitivity

20080035420 New Mexico State Univ., Las Cruces, NM USA

(Theme 2 Quantum Computing) Nanostructured Surface Plasmon Resonators

Armstrong, Robert; Apr 3, 2008; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0197; 04NE097

Report No.(s): AD-A481475; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nano-scale sub-wavelength plasmon resonators will be fabricated by e-beam lithography, and evaluated to determine their

suitability for solid-state quantum computing and other applications. The goal of the spectroscopic studies is to carry out spectroscopic, and especially nonlinear spectroscopic, studies of fractal/microcavity (including PBG cavities) composites, and to assess the effect of metal nanoparticle quantum well structures on the spectra. There will be an assessment of the potential of such structures in the fabrication of ultra-sensitive molecular, and particularly biochemical media. These experiments will be compared with similar experiments in which chemical techniques are used to fabricate composites.

DTIC

Plasmons; Quantum Computation; Resonators

20080035432 Army Research Lab., Adelphi, MD USA

An Aperture-Coupled Patch Antenna Design for Improved Impedance Bandwidth

Coburn, William O; Keller, Steven D; Patterson, Chad E; Harris, Russell; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481489; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Method of Moments, implemented in 2.5-D with the multilayer Green's Function, or implemented as a fully 3-D solution of Maxwell's equations, is a popular method for microwave antenna simulations. Commercial software was used to simulate two different designs for a single aperture-coupled patch antenna element. The simulation results are compared with experimental data measured for antenna prototypes having substrate and ground plane dimensions 4-in x 4-in. For C-Band applications (4.4 - 5 GHz) a conventional patch antenna solution, with stub-terminated microstrip feed and slotted ground plane, would not cover the entire band. A different design, incorporating thicker substrate layers and a bottom ground plane for unidirectional radiation, was modeled in 2.5-D with encouraging results. The design had improved bandwidth and was fabricated even though the simulations results were known to be approximate. The concern for the microstrip feed structure is the frequency variation of the propagation velocity and the presence of higher order waveguide modes that are not incorporated in the simulation but serve to limit the measured bandwidth. We compare the calculated and measured antenna performance and show that specialized software is often sufficient for the design of conventional aperture-coupled patch antennas but can be misleading for thick substrates.

DTIC

Antenna Design; Apertures; Bandwidth; Impedance; Microwave Antennas; Patch Antennas; Simulation

20080035457 Christian (Stephen R.), Idaho Falls, ID, USA

Induction Heating Apparatus, Methods of Operation Thereof, and Method for Indication of a Temperature of a Material to Be Heated Therewith

Richardson, J. G., Inventor; Morrison, J. L., Inventor; Hawkes, G. L., Inventor; 25 Aug 04; 22 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID13727

Patent Info.: Filed Filed 25 Aug 04; US-Patent-Appl-SN-10-926 899

Report No.(s): PB2008-101717; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An induction heating apparatus and methods of operation thereof are disclosed. Particularly, an electrical resistance of at least one material to be induction heated may be indicated and at least one characteristic of an alternating current may be selected in response to the indicated electrical resistance and an inductor may be energized therewith. Alternatively, a temperature of the at least one material may be indicated via measuring the electrical resistance thereof and at least one characteristic of an alternating current for energizing the inductor may be selected in response to the indicated temperature. Energizing the inductor may minimize the difference between a desired and indicated resistance or the difference between a desired and indicated temperature. A method of determining a temperature of at least one region of at least one material to be induction heated via correlating a measured electrical resistance thereof to an average temperature thereof is also disclosed.

NTIS

Heating; Induction Heating; Patent Applications

20080035458 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA

Nanowire Optoelectric Switching Device and Method

Yang, P., Inventor; Kind, H., Inventor; Yan, H., Inventor; Law, M., Inventor; Messer, B., Inventor; 30 Dec 04; 23 pp.; In English

Contract(s)/Grant(s): NSF DMR0092086

Patent Info.: Filed Filed 30 Dec 04; US-Patent-Appl-SN-11-026 576

Report No.(s): PB2008-101707; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The device has a nanowire structure comprising an elongated member having a cross-sectional area ranging from about 1 nanometers but less than about 500 nanometers, but can also be at other dimensions, which vary or are substantially constant or any combination of these. The device also has a first terminal coupled to a first portion of the nanowire structure; and a second terminal coupled to a second portion of the nanowire structure. The second portion of the nanowire structure is disposed spatially from the first portion of the nanowire structure. An active surface structure is coupled to the nanowire structure. The active surface structure extends from the first portion to the second portion along the elongated member.

NTIS

Electric Wire; Electro-Optics; Nanowires; Optical Switching; Patent Applications; Switching

20080035463 Christian (Stephen R.), Idaho Falls, ID, USA

Induction Heating Apparatus and Methods of Operation Thereof

Richardson, J. G., Inventor; 25 Aug 04; 21 pp.; In English

Contract(s)/Grant(s): DE-AC07-991D13727

Patent Info.: Filed Filed 25 Aug 04; US-Patent-Appl-SN-10-926 900

Report No.(s): PB2008-101718; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods of operation of an induction melter are disclosed. Particularly, a cooled crucible and an inductor may be provided proximate thereto for heating at least one material therein. A desired electromagnetic flux skin depth for heating the at least one material within the crucible may be selected and a frequency of an alternating current for energizing the inductor therewith and for producing the desired skin depth may be selected. The inductor may be energized with the alternating current having the selected frequency. Optionally, the frequency of the alternating current may be selected in response to a difference between a desired skin depth and the indicated skin depth. The desired skin depth may be selected to be about 38% of a diameter of the at least one material. The desired skin depth may be substantially maintained as the temperature of the at least one material varies.

NTIS

Induction Heating; Patent Applications; Alternating Current

20080035477 Wolf Greenfield and Sacks, P.C., Boston, MA, USA

Nanosensors (PAT-APPL-11-012 549)

Lieber, C. M., Inventor; Park, H., Inventor; Wei, Q., Inventor; Cui, Y., Inventor; Liang, W., Inventor; 15 Dec 04; 33 pp.; In English

Contract(s)/Grant(s): ONR-N00014-00-1-0476; NSF-981226

Patent Info.: Filed Filed 15 Dec 04; US-Patent-Appl-SN-11-012 549

Report No.(s): PB2008-101706; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Electrical devices comprised of nanowires are described, along with methods of their manufacture and use. The nanowires can be nanotubes and nanowires. The surface of the nanowires may be selectively functionalized. Nanodetector devices are described.

NTIS

Electric Equipment; Patent Applications; Detectors

20080035561 UT-Battelle, LLC, Oak Ridge, TN, USA

Rail-to-Rail Differential Input Amplification Stage with Main and Surrogate Differential Pairs

Britton, C. L., Inventor; Smith, S. F., Inventor; 7 Sep 04; 7 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 7 Sep 04; US-Patent-Appl-SN-10-935 525

Report No.(s): PB2008-101702; No Copyright; Avail.: CASI: [A02](#), Hardcopy

An operational amplifier input stage provides a symmetrical rail-to-rail input common-mode voltage without turning off either pair of complementary differential input transistors. Secondary, or surrogate, transistor pairs assume the function of the complementary differential transistors. The circuit also maintains essentially constant transconductance, constant slew rate, and constant signal-path supply current as it provides rail-to-rail operation.

NTIS

Amplification; Patent Applications; Rails

20080035565 Davis Wright Tremaine, LLP, Seattle, WA, USA; Washington State Univ., Pullman, WA, USA

Thermal Switch, Methods of Use and Manufacturing Methods for Same

Richards, R. F., Inventor; Bahr, D. F., Inventor; Richards, C., Inventor; 18 Nov 03; 29 pp.; In English

Contract(s)/Grant(s): DARPA-DASG60-02-C-0001; DASG60-02-C-0084

Patent Info.: Filed Filed 18 Nov 03; US-Patent-Appl-SN-10-535 315

Report No.(s): PB2008-102023; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present disclosure concerns embodiments of a thermal switch used to control the transfer of heat from a heat source to a heat sink. According to one aspect, the thermal switch can be activated, or turned 'on', so as to establish a path of low thermal resistance between the heat source and the heat sink to facilitate the transfer of heat therebetween. The thermal switch can also be de-activated, or turned 'off', so as to establish a path of high thermal resistance between the heat source and the heat sink to minimize or totally prevent the transfer of heat between the heat source and heat sink. In certain embodiments, the thermal switch includes at least drop of a thermally conductive liquid that thermally couples the heat source to the heat sink whenever the switch is activated.

NTIS

Heat Sinks; Manufacturing; Patent Applications; Switches

20080035597 Army Research Lab., Adelphi, MD USA

Indium Nitride: A New Material for High Efficiency, Compact, 1550NM Laser-Based Terahertz Sources in Explosives Detection and Concealed Weapons Imaging

Wraback, Michael; Chern, Grace D; Readinger, Eric D; Shen, Paul H; Koblmueeller, Gregor; Gallinat, Chad S; Speck, James S; Schaff, William J; Nov 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Indium nitride (InN) is identified as a promising terahertz (THz) emitter based on the optical and electronic properties of high quality In- and N-face samples. Time domain THz spectroscopy has been employed to measure the pump wavelength and background carrier concentration dependence of THz emission from InN. There is no discernable difference between the In- and Nface InN samples, as expected for the improved crystalline quality and concomitant low background electron density and high mobility for both polarities. While there is only a weak dependence of THz signal on pump wavelength from 800 nm to 1500 nm, there is a strong dependence on background electron density. Modeling shows that the dominant mechanism for THz generation in bulk InN is the current associated with the diffusion of the photo-generated electrons at elevated electron temperature (photo-Dember effect) and the redistribution of the background electrons under drift, with larger screening from the higher mobility electrons as compared to holes. Compensation or p-type doping in conjunction with manipulation of the large internal electric fields in InN/InGaN nanostructures should lead to significant improvements in THz emitters.

DTIC

Explosives Detection; Imaging Techniques; Indium; Indium Compounds; Lasers; Nanostructures (Devices); Nitrides

20080035613 Bruckner (John), P.C, Austin, TX, USA

Nanotransfer and Nanoreplication Using Deterministically Grown Sacrificial Nanotemplates (PAT-APPL-11-273 316)

Melechko, A. V., Inventor; McKnight, T. E., Inventor; Guillorn, M. A., Inventor; Ilic, B., Inventor; Merkulov, V. I., Inventor; 14 Nov 05; 19 pp.; In English

Contract(s)/Grant(s): DE-AC05-00-00-022725

Patent Info.: Filed Filed 14 Nov 05; US-Patent-Appl-SN-11-273 316

Report No.(s): PB2008-102040; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods, manufactures, machines and compositions are described for nanotransfer and nanoreplication using deterministically grown sacrificial nanotemplates. A method includes depositing a catalyst particle on a surface of a substrate to define a deterministically located position; growing an aligned elongated nanostructure on the substrate, an end of the aligned elongated nanostructure coupled to the substrate at the deterministically located position; coating the aligned elongated nanostructure with a conduit material; removing a portion of the conduit material to expose the catalyst particle; removing the catalyst particle; and removing the elongated nanostructure to define a nanoconduit.

NTIS

Nanostructures (Devices); Patent Applications; Carbon Nanotubes

20080035625 O'Banion and Ritchey, LLP, Sacramento, CA, USA

Surface Nanopatterning

Monbouquette, H. G., Inventor; Garcia-Garibay, M., Inventor; 5 Jan 05; 34 pp.; In English

Contract(s)/Grant(s): CTS-9816494; N000141-0919

Patent Info.: Filed 5 Jan 05; US-Patent-Appl-SN-11-029 303

Report No.(s): PB2008-102042; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for producing, and a product having, a surface nanopattern, wherein the method comprises the steps of: obtaining a substrate with a smooth surface; acquiring a self-assembling monolayer precursor, wherein the precursor includes an inducible, usually photocatalytically, active region and a substrate attachment region; mixing a plurality of the self-assembling monolayer precursors with the substrate to produce a self-assembled monolayer having an exposed surface comprising the inducible active regions and anchored to the substrate smooth surface by the substrate attachment regions; obtaining a path-directable nanoparticle; contacting the path-directable nanoparticle with the exposed surface at an interface area; exposing the exposed surface contacted with the path-directable nanoparticle to an inducing event, usually exposure to light, thereby chemically altering the inducible active regions and producing a detectable state in the interface area on the exposed surface; and applying a force of variable magnitude and direction in the plane of the surface to the contacted path-directable nanoparticle to produce movement of the contacted nanoparticle over the exposed surface thereby extending the detectable state interface area into a detectable trace over the exposed surface to produce the nanopatterned surface.

NTIS

Nanoparticles; Patent Applications; Exposure

20080035626 Polster, Lieder, Woodruff and Lucchesi, L.C., St. Louis, MO, USA

Fuse Applications of Reactive Composite Structures

Weih, T. P., Inventor; Heian, E. M., Inventor; Vincent, R., Inventor; Valliappan, S., Inventor; Besnoin, E., Inventor; 16 Sep 05; 19 pp.; In English

Contract(s)/Grant(s): NIST-70NANB3H3045

Patent Info.: Filed 16 Sep 05; US-Patent-Appl-SN-11-228 085

Report No.(s): PB2008-102043; No Copyright; Avail.: CASI: [A03](#), Hardcopy

In accordance with the invention, a fuse comprises a reactive composite structure to interrupt the flow of current in a circuit. The term fuse, as used herein, is intended to cover current interrupters generically and thus encompasses fuses, circuit breakers and other devices for interrupting the flow of current through a conductor. Reactive composite structures comprise two or more phases of materials spaced in a controlled fashion throughout a composite in uniform layers, local layers, islands, or particles. Upon appropriate excitation, the materials undergo an exothermic chemical reaction that spreads rapidly through the composite structure generating heat and light. Moreover a reactive composite structure can break apart upon reaction. This breakage can rapidly interrupt the flow of current through the reactive composite structure. Such structures can provide high-speed current interruption. In addition, reactive composite structures can have abrupt reaction initiation thresholds such that a pulse of energy of a certain magnitude may initiate a clearing reaction but a slightly smaller pulse of energy may not. Such a reactive composite structure can thus provide a high speed, highly sensitive current interrupter.

NTIS

Circuits; Composite Structures; Patent Applications; Reactivity

20080036018 Greer, Burns and Crain, Chicago, IL, USA

Microdischarge Devices with Encapsulated Electrodes

Eden, J. G., Inventor; Park, S. J., Inventor; 4 Oct 04; 10 pp.; In English

Contract(s)/Grant(s): AFOSR-F49620-00-1-0391; AFOSR-F49620-03-1-0391

Patent Info.: Filed 4 Oct 04; US-Patent-Appl-SN-10-958 174

Report No.(s): PB2008-102007; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method for fabricating dielectric encapsulated electrodes. The process includes anodizing a metal to form a dielectric layer with columnar micropores; dissolving a portion of the dielectric layer and then anodizing the resultant structure a second time. The nanoporous structure that results can provide properties superior to those of conventional dielectric encapsulated metals. The pores of the dielectric may be backfilled with one or more materials to further tailor the properties of the dielectric.

NTIS

Anodizing; Dielectrics; Electrodes; Patent Applications

20080036019 Intelliserv, Inc., Houston, TX, USA

System for Adjusting Frequency of Electrical Output Pulses Derived from an Oscillator

Bartholomew, D. B., Inventor; 29 Sep 04; 13 pp.; In English

Contract(s)/Grant(s): DE-FC26-01-NT41229

Patent Info.: Filed Filed 29 Sep 04; US-Patent-Appl-SN-10-711 648

Report No.(s): PB2008-102008; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system for setting and adjusting a frequency of electrical output pulses derived from an oscillator in a network is disclosed. The system comprises an accumulator module configured to receive pulses from an oscillator and to output an accumulated value. An adjustor module is configured to store an adjustor value used to correct local oscillator drift. A digital adder adds values from the accumulator module to values stored in the adjustor module and outputs their sums to the accumulator module, where they are stored. The digital adder also outputs an electrical pulse to a logic module. The logic module is in electrical communication with the adjustor module and the network. The logic module may change the value stored in the adjustor module to compensate for local oscillator drift or change the frequency of output pulses. The logic module may also keep time and calculate drift.

NTIS

Frequencies; Oscillators; Patent Applications

20080036020 BAE Systems and Technology, Nashua, NH, USA

Multifunction Receiver-on-Chip for Electronic Warfare Applications

Stroili, F. D., Inventor; Huggett, J. M., Inventor; 20 Jan 05; 25 pp.; In English

Contract(s)/Grant(s): DAAB07-02-C-K513

Patent Info.: Filed Filed 20 Jan 05; US-Patent-Appl-SN-10-543 343

Report No.(s): PB2008-102009; No Copyright; Avail.: CASI: [A03](#), Hardcopy

What is provided is a receiver-on-a-chip comprising a monolithic integrated circuit that reduces the receiver to a cigarette-pack-sized assembly mountable directly at an antenna element, with a much-increased operational bandwidth and instantaneous bandwidth, increased dynamic range and with a two-order-of-magnitude decrease in size and weight. Moreover, because of the elimination of all of the I/O drivers and attendant circuitry, power consumption is reduced by two-thirds, whereas the mean time before failure is increased to 10,000 hours due to the robustness of the monolithic integrated circuit and use of fiber optics.

NTIS

Chips; Electronic Warfare; Patent Applications; Receivers

20080036023 Epping, Hermann, Fischer, Munich, Germany

Integrated Fuses for OLED Lighting Device

Pschenitzka, F., Inventor; 27 Sep 04; 15 pp.; In English

Contract(s)/Grant(s): DE-FC26-04NT41947

Patent Info.: Filed Filed 27 Sep 04; US-Patent-Appl-SN-10-951 479

Report No.(s): PB2008-102011; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An embodiment of the present invention pertains to an electroluminescent lighting device for area illumination. The lighting device is fault tolerant due, in part, to the patterning of one or both of the electrodes into strips, and each of one or more of these strips has a fuse formed on it. The fuses are integrated on the substrate. By using the integrated fuses, the number of external contacts that are used is minimized. The fuse material is deposited using one of the deposition techniques that is used to deposit the thin layers of the electroluminescent lighting device.

NTIS

Electroluminescence; Illuminance; Illuminating; Light Emitting Diodes; Patent Applications

20080036024 Knobbe Martens Olson and Bear, LLP, Irvine, CA, USA; Micron Technology, Inc., Boise, ID, USA

Methods for Fabricating a Magnetic Keeper for a Memory Device

Witcraft, W. F., Inventor; Berg, L., Inventor; Hurst, A., Inventor; Vavra, W., Inventor; Jenson, M., Inventor; 19 May 05; 13 pp.; In English

Contract(s)/Grant(s): N00014-96-C-2114

Patent Info.: Filed Filed 19 May 05; US-Patent-Appl-SN-11-132 798

Report No.(s): PB2008-102019; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An MRAM device comprising an array of MRAM elements, with each element having an MRAM bit influenced by a magnetic field from a current flowing through a conductor, also includes a magnetic keeper formed adjacent the conductor to advantageously alter the magnetic field. The magnetic keeper alters the magnetic field by concentrating the field within the keeper thereby reducing the extent in which fringe field exists, thus allowing the MRAM elements to be formed closer to

increase the areal density of the MRAM device. Increase in magnetic field flux due to the magnetic keeper allows operation of the MRAM device with lowered power. Soft magnetic materials such as nickel iron, nickel iron cobalt, or cobalt iron may be used to form the magnetic keeper.

NTIS

Computer Storage Devices; Magnetic Fields; Magnetic Storage; Magnetoresistivity; Patent Applications; Random Access Memory

20080036025 Naval Undersea Warfare Center, Newport, RI, USA

Natural Fiber Span Reflectometer Providing a Virtual Signal Sensing Array Capability (PAT-APPL-11-056 630)

Payton, R. M., Inventor; 7 Feb 05; 34 pp.; In English

Patent Info.: Filed 7 Feb 05; US-Patent-App-SN-11-056 630

Report No.(s): PB2008-102020; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A CW lightwave modulated by a continuously reiterated binary pseudorandom code sequence is launched into an end of a span of ordinary optical fiber cable. Portions of the launched lightwave back propagate to the launch end from a continuum of locations along the span because of innate fiber properties including Rayleigh scattering. This is picked off the launch end and heterodyned to produce a r.f. beat signal. The r.f. beat signal is processed by a plurality (which can be thousands) of correlator type binary pseudonoise code sequence demodulators respectively operated in different delay time relationships to the timing base of the reiterated modulation sequences. The outputs of the demodulators provide r.f. time-domain reflectometry outputs representative of signals (e.g., acoustic pressure waves) incident to virtual sensors along the fiber at positions corresponding to the various time delay relationships.

NTIS

Detection; Linear Arrays; Patent Applications; Reflectometers; Signal Processing

20080036060 California Univ., Santa Barbara, CA USA

Biotechnology Opens New Routes to High-Performance Materials for Improved Photovoltaics, Batteries, Uncooled IR Detectors, Ferroelectrics and Optical Applications

Morse, Daniel E; Nov 2006; 31 pp.; In English

Contract(s)/Grant(s): DAAD19-03-D-0004

Report No.(s): AD-A481234; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Biological systems fabricate multifunctional, high performance materials at low temperatures and near-neutral pH with a precision of three-dimensional nanostructural control that exceeds the capabilities of present human engineering. Using the tools of biotechnology and genetic engineering, we discovered the unanticipated mechanism of simultaneous catalysis and templating governing the nanofabrication of silica in a biological system. We then translated this mechanism to develop a new biologically inspired, low-temperature, low-cost route for the synthesis of silica and a wide range of silicones, organic polymers and nanostructured metal oxide, -hydroxide and -phosphate semiconductor thin films without the use of organic templates. This new synthesis method is generic, yielding more than 30 different inorganic thin films and nanostructured, bimetallic perovskite ferroelectrics. Because kinetic control is achieved at low temperature, thus circumventing the thermodynamic default, many of the inorganic materials made by this process exhibit morphologies and electronic properties not observable in the corresponding products made by conventional high temperature processes. The electronic properties of some of these novel materials suggest strong advantages for high-efficiency photovoltaics, lightweight high power-density 3-D batteries, improved battery safety, uncooled IR detectors and other energy and information storage applications. Because no organics are used, the resulting products exhibit very high purity, making the process fully integrable with MOCVD and other conventional manufacturing methods. Because synthesis occurs from solution, adaptation to roll-to-roll and other high throughput methods may be possible. Transitioning of these developments to Army applications is now beginning. Related efforts now in progress are focused on revolutionary, bio-inspired approaches to optical materials.

DTIC

Biotechnology; Electric Batteries; Ferroelectricity; Infrared Detectors; Perovskites; Photovoltaic Conversion; Routes; Semiconductors (Materials); Thin Films

20080036109 Summa Allan and Additon, P.A., Charlotte, NC, USA

Method of Forming Vias in Silicon Carbide and Resulting Devices and Circuits

Ring, Z., Inventor; Sheppard, S., Inventor; Hagleitner, H., Inventor; 25 Feb 05; 17 pp.; In English

Contract(s)/Grant(s): F3361596-C-1967

Patent Info.: Filed Filed 25 Feb 05; US-Patent-Appl-SN-11-067 543

Report No.(s): PB2008-100696; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of fabricating an integrated circuit on a silicon carbide substrate is disclosed that eliminates wire bonding that can otherwise cause undesired inductance. The method includes fabricating a semiconductor device in epitaxial layers on a surface of a silicon carbide substrate and with at least one metal contact for the device on the uppermost surface of the epitaxial layer. The opposite surface of the substrate is then ground and polished until it is substantially transparent. The method then includes masking the polished surface of the silicon carbide substrate to define a predetermined location for at least one via that is opposite the device metal contact on the uppermost surface of the epitaxial layer and etching the desired via in steps. The first etching step etches through the silicon carbide substrate at the desired masked location until the etch reaches the epitaxial layer. The second etching step etches through the epitaxial layer to the device contacts. Finally, metallizing the via provides an electrical path from the first surface of the substrate to the metal contact and to the device on the second surface of the substrate.

NTIS

Fabrication; Integrated Circuits; Patent Applications; Silicon Carbides; Substrates

20080036111 Foley and Lardner, LLP, Madison, WI, USA

Process and Apparatus for Forming Nanoparticles Using Radiofrequency Plasmas

Kortshagen, U., Inventor; Timesen, E. J., Inventor; Mangolini, L., Inventor; Bapat, A., Inventor; Jurbergs, D., Inventor; 17 Jun 05; 35 pp.; In English

Contract(s)/Grant(s): NSF-DGE 0114372; NSF-DMR 0212302

Patent Info.: Filed Filed 17 Jun 05; US-Patent-Appl-SN-11-155 340

Report No.(s): PB2008-101747; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods and apparatus for producing nanoparticles, including single-crystal semiconductor nanoparticles, are provided. The methods include the step of generating a constricted radiofrequency plasma in the presence of a precursor gas containing precursor molecules to form nanoparticles. Single-crystal semiconductor nanoparticles, including photoluminescent silicon nanoparticles, having diameters of no more than 10 nm may be fabricated in accordance with the methods.

NTIS

Nanoparticles; Nanostructures (Devices); Patent Applications; Plasmas (Physics); Radio Frequencies

20080036113 Los Alamos National Lab., NM USA

Method for Preparation of Semiconductive Films

Jia, Q., Inventor; Li, L. S., Inventor; 8 Jul 03; 13 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-36

Patent Info.: Filed Filed 8 Jul 03; US-Patent-Appl-SN-10-615 645

Report No.(s): PB2008-101750; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A polymer assisted solution process for deposition of semiconductive thin films is presented. The process can be organic solvent-free. The process includes solutions of necessary metal precursors and soluble polymers. After a coating operation, the resultant coating is fired at high temperatures to yield optical quality metal oxide thin films that can be converted to semiconductive thin films.

NTIS

Patent Applications; Semiconductors (Materials); Thin Films

20080036120 Myers (Peacock), P.C., Albuquerque, NM, USA; TPI, Inc., Albuquerque, NM, USA

Structured Composite Dielectrics

Slenes, K. M., Inventor; Perry, D., Inventor; Labanowski, C., Inventor; Perry, H., Inventor; Luther, E., Inventor; 31 May 05; 14 pp.; In English

Contract(s)/Grant(s): N001-78-03C-3044; N00178-04C-1013

Patent Info.: Filed Filed 31 May 05; US-Patent-Appl-SN-11-142 515

Report No.(s): PB2008-102105; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention provides a structured, nano-composite, dielectric film. The invention also provides a method for

producing the thin composite film. The composite material comprises ceramic dielectric particles, preferably nano-sized particles, and a thermoset polymer system. The composite material exhibits a high energy density.

NTIS

Composite Materials; Dielectric Properties; Dielectrics; Patent Applications

20080036123 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA

Retention of Counterions in the Separative Bioreactor

Lin, Y. J., Inventor; Snyder, S. W., Inventor; St. Martin, E. J., Inventor; 19 Nov 04; 11 pp.; In English

Contract(s)/Grant(s): W-31-109-ENG-38

Patent Info.: Filed Filed 19 Nov 04; US-Patent-Appl-SN-10-993 642

Report No.(s): PB2008-100687; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A bioreactor with an anode and a cathode, and a plurality of reaction chambers each having an inlet and an outlet and each including a porous solid ion exchange wafer having ion-exchange resins. Each of the reaction chambers is interleaved between a cation exchange membrane and an anion exchange membrane or between either a cation or an anion exchange membrane and a bipolar exchange membrane. A product chamber is separated from one of the reaction chambers by either a cation or an anion exchange membrane. Recirculation mechanism is provided for transporting material between the reaction chamber inlets and outlets. A method of producing organic acids, amino acids, or amines using the separative bioreactor is disclosed.

NTIS

Anodes; Bioreactors; Cathodes; Patent Applications

20080036124 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

High Density Polymer-Based Integrated Electrode Array

Maghribi, M. N., Inventor; Krulevitch, P. A., Inventor; Davidson, J. C., Inventor; Hamilton, J. K., Inventor; 16 Apr 04; 12 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed Filed 16 Apr 04; US-Patent-Appl-SN-10-825 782

Report No.(s): PB2008-102112; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A high density polymer-based integrated electrode apparatus that comprises a central electrode body and a multiplicity of arms extending from the electrode body. The central electrode body and the multiplicity of arms are comprised of a silicone material with metal features in said silicone material that comprise electronic circuits.

NTIS

Electrodes; High Polymers; Patent Applications

20080036138 Morgan Lewis and Bockius, LLP, Washington, DC, USA

Ultratough CVD Single Crystal Diamond and Three Dimensional Growth Thereof

Hemley, R. J., Inventor; Mao, H. K., Inventor; Yan, C. S., Inventor; 9 Sep 05; 11 pp.; In English

Contract(s)/Grant(s): EAR-0135626; DE-FC03-03NA00144

Patent Info.: Filed Filed 9 Sep 05; US-Patent-Appl-SN-11-222 224

Report No.(s): PB2008-100120; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The invention relates to a single-crystal diamond grown by microwave plasma chemical vapor deposition that has a toughness of at least about 30 MPa m^(sup 1/2). The invention also relates to a method of producing a single-crystal diamond with a toughness of at least about 30 MPa m^(sup 1/2). The invention further relates to a process for producing a single crystal CVD diamond in three dimensions on a single crystal diamond substrate.

NTIS

Diamonds; Microwaves; Patent Applications; Plasmas (Physics); Single Crystals; Vapor Deposition

20080036140 Carmody and Torrance, LLP, Waterbury, CT, USA

Epitaxial Growth of Aligned Aligned Nanowires by Metal-Organic Chemical Vapor Deposition

Han, J., Inventor; Su, J., Inventor; 19 Aug 05; 13 pp.; In English

Contract(s)/Grant(s): DE-FC26-03NT4194; ECD-0304468

Patent Info.: Filed Filed 19 Aug 05; US-Patent-Appl-SN-11-207 226

Report No.(s): PB2008-100682; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Highly ordered and aligned epitaxy of III-Nitride nanowires is demonstrated in this work. <1010> M-axis is identified as a preferential nanowire growth direction through a detailed study of GaN/AlN trunk/branch nanostructures by transmission electron microscopy. Crystallographic selectivity can be used to achieve spatial and orientational control of nanowire growth. Vertically aligned (Al)GaN nanowires are prepared on M-plane AlN substrates. Horizontally ordered nanowires, extending from the M-plane sidewalls of GaN hexagonal mesas or islands demonstrate new opportunities for self-aligned nanowire devices, interconnects, and networks.

NTIS

Epitaxy; Nanowires; Nitrides; Patent Applications; Vapor Deposition

20080036141 General Electric Co., Niskayuna, NY, USA

Electronic Assemblies and Methods of Making the Same

Tonapi, S. S., Inventor; Gowda, A. V., Inventor; Durocher, K. M., Inventor; Esler, D., Inventor; Zhong, H., Inventor; 28 Sep 04; 11 pp.; In English

Contract(s)/Grant(s): 70NANB243034

Patent Info.: Filed Filed 28 Sep 04; US-Patent-Appl-SN-10-950 554

Report No.(s): PB2008-100683; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An electronic assembly having at least a heat dissipating unit and a heat generating unit is provided. At least one of the heat dissipating unit and the heat generating unit has at least one deliberately modified surface.

NTIS

Patent Applications; Heat Generation; Electronic Equipment; Cooling

20080036305 Army Research Lab., Adelphi, MD USA

Remote Station User's Guide

Clark, John T; May 2008; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481590; ARL-TR-4449; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481590>

A transmitter that responds to an input signal (transponder) has been designed at the Ka Band frequency range. The transponder is further enhanced to simulate a moving target by returning a signal with an artificial Doppler frequency and power level commensurate with that of a particular Radar Cross Section (RCS). The RF architecture is described first, followed by a detailed derivation of simulated RCS and then a complete step by step operational instruction is provided.

DTIC

Transmitters; Transponders

20080036313 Maryland Univ., College Park, MD USA

Advanced Techniques in 3D Photolithography for MEMS

Mosher, L A; Morgan, B C; Waits, C M; Ghodssi, R; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0010

Report No.(s): AD-A481602; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481602>

Three dimensional (3D) MEMS fabrication is essential to many power MEMS applications important to today's soldier. We present two advanced techniques to realize 3D structures in photoresist. Both technologies are based on gray-scale photolithography, which is a method to modulate the light intensity incident on photoresist to control the development rate. We compare a commercial technique, HEBS glass, to a technique developed in-house called double-exposure gray-scale. HEBS glass has a better horizontal resolution and is more suited to small structures that require high vertical resolution. Double exposure gray-scale technology has a comparable vertical resolution to HEBS glass, but is better suited to large MEMS structures over 100 m.

DTIC

High Resolution; Microelectromechanical Systems; Photolithography

20080036317 Virginia Research Inst., Inc., Arlington, VA USA

Distributed Beam Former for Distributed-Aperture Electronically Steered Antennas

Zaghloul, Amir I; Kilic, Ozlem; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481607; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA481607>

Applications for electronically steered arrays (ESA) in army communication systems span frequencies from UHF to Ka bands and requirements that include single and multiple beams, various scanning speeds, and different polarizations. The radiating apertures can be planar, conformal or segmented and distributed over multi-faceted structures. Examples include distributed apertures on military vehicles, antennas on elevated posts or towers on stationary or mobile platforms, and others. The beam former is an essential part of the ESA design and its optimization in functionality and cost lead to improving the whole system. This paper presents a concept for a distributed beam former that is composed of two stages: an RF stage with limited scanning steps and a digital stage that is capable of steering multiple beams in all required directions. The two-stage beam former uses fewer A/D converters than its all-digital counterpart and lower losses than the all-RF beam former. Examples are given for multi-faceted apertures.

DTIC

Apertures; Beamforming; High Gain; Steerable Antennas

20080036377 Delaware Univ., Newark, DE USA

Ballistic Radomes for Communications Antennas

Yarlagadda, S; Gama, B; Linden, D; Lilly, J; Fung, T; Coryell, L; Goodall, S; Nov 2006; 6 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481721; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA481721>

The Army Digitized Force requires a robust communications infrastructure for its superior IT/C4ISR (Information Technologies / Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance). It will lose its cohesion and combat effectiveness with the loss of communications connectivity. Ballistic radomes protecting communications antennas will increase the survivability, and maintain the lethality of combat platforms. Legacy antennas on combat platforms are vulnerable to small arms fires and munitions fragments. Antennas on platform with active threat protection system have the added threat from the munitions fragments generated by the system that can shoot down and pre-detonate incoming warheads. Current radomes do not protect the antenna from these threats, as they are usually thinwalled composite structures to minimize RF transmission loss. In this effort, a combined ballistic and electromagnetic design and testing methodology has been formulated to develop radomes capable of providing ballistic protection to the antenna system with low RF loss. Technologies developed are applicable to frequencies from 225 MHz up to 45.5 GHz, with specific receive and transmit bands, for dish, phased array and other types of low profile antenna systems. Results to date have demonstrated the potential for efficient radome designs (less than 1 dB transmission loss), while meeting ballistic requirements using multi-layer thick-section sandwich constructions. Non-traditional radome materials (ballistic fibers with thermoplastic matrices) are evaluated; where as thick radomes with traditional materials (Quartz/Cyanate Ester) would be cost prohibitive.

DTIC

Antennas; Ballistics; Radomes; Telecommunication

20080036380 Delaware Univ., Newark, DE USA

Miniaturized Antennas for Compact Soldier Combat Systems

Mirza, Iftexhar O; Shi, Shouyuan; Fazi, Christian; Mait, Joseph N; Prather, Dennis W; Nov 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481725; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: <http://hdl.handle.net/100.2/ADA481725>

We simulate miniature loop and patch antennas with reactive elements embedded in the substrate of the antenna. To lower the antenna's effective resonant frequency and reduce the physical size of the antenna, we considered split-ring resonators (SRRs) as the antenna's inductive substrate material. Simulation results indicate a size reduction of up to thirty-eight percent is possible using this technique.

DTIC

Armed Forces (United States); Combat; Loop Antennas; Miniaturization

20080036394 Army Research Lab., Adelphi, MD USA

Scalable Electrospray Components for Portable Power Applications Using MEMS Fabrication Techniques

Waits, C M; Jankowski, N; Geil, B; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481749; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481749>

Methods for integrative assembly and manufacturing using micro-electro mechanical systems (MEMS) fabrication are reported for a novel compact fuel injector having applications in soldier level power systems. MEMS techniques are used to precisely fabricate and accurately assemble the components of a multiplexed electrospray device allowing for higher compactness, while achieving higher flow rates and using lower power. Integrated devices are reported to achieve 20 cc/hour of ethanol flow with a droplet size of 11 micrometers using a voltage of 1.8kV.

DTIC

Fabrication; Microelectromechanical Systems; Portable Equipment

20080036408 Pennsylvania State Univ., University Park, PA USA

Performance Limiting Defects in SiC Based Transistors

Lenahan, P M; Daurich, M S; Cochrane, C J; Lelis, Aivars J; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481777; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481777>

We have combined very sensitive electron paramagnetic resonance measurements and electrical measurements to identify performance limiting defects in SiC based semiconductor devices. This work is relevant to the US Army because SiC based devices offer quite significant potential advantages for high power and high temperature electronics.

DTIC

Defects; Detection; Silicon Carbides; Transistors

20080036411 University of Central Florida, Orlando, FL USA

Communicating Through the Use of Vibrotactile Displays for Dismounted and Mounted Soldiers

Merlo, James L; Terrence, Peter I; Stafford, Shawn; Gilson, Richard; Hancock, P A; Redden, Elizabeth S; Krausman, Andrea; Carstens, Christian B; Pettitt, Rodger; White, Timothy L; Nov 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-1-0621

Report No.(s): AD-A481784; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481784>

The purpose of the studies reported here was to determine if participants wearing a purposed-designed tactile display could accurately report cue localization and messaging while undergoing different levels of physiological stress. Experiment 1 found that participants could effectively receive tactile messaging while navigating a physically challenging obstacle course. Experiment 2 demonstrated that tactile localization could be achieved by participants experiencing extreme whole body vibration produced by a vehicle simulator which replicated movement of different military vehicles in extreme conditions. Collective results illustrate that the current tactile display has significant potential for communication and/or directional cueing in demanding, real-world conditions.

DTIC

Communicating; Display Devices; Touch

20080036424 Delaware Univ., Newark, DE USA

Embedded RF Photonic Crystals as Routing and Processing Devices in Naval Aperstructures

Prather, Dennis W; May 16, 2008; 16 pp.; In English

Contract(s)/Grant(s): N00014-07-1-0280

Report No.(s): AD-A481812; ELEG332234-011408; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481812>

The ability to rapidly detect and process radio frequency (RF) signals is of extreme importance in the modern warfare environment. As the use of the electromagnetic spectrum continues to expand, the technical requirements necessary to maintain such a critical ability becomes very challenging; additional requirements such as miniaturization of the system, reduction in power consumption and the miniaturization of signatures places even more stringent requirements on an already pressing problem. To address these issues, we utilize advanced artificial materials - photonic crystals (PhCs) and meta-material - to construct a sensing head with minaturized antennas as RF receivers and embedded signal channelization for

pre-processing. This sensor head can directly detect and process RF signals, significantly decreasing the response time on Naval platforms to potential threats. In this report, we present an overview of our work on theoretical design and experimental demonstration of miniaturized RF correlators and antennas based on meta-materials, as well as hybrid lattice PhCs and Schottky diodes for RF correlation and channelization.

DTIC

Antennas; Correlators; Crystals; Electromagnetic Spectra; Embedding; Millimeter Waves; Radio Frequencies; Receivers

20080036431 Army Research Lab., Adelphi, MD USA

Evaluation of SiC VJFET Devices for Scalable Solid-State Circuit Breakers

Urciuoli, Damian P; May 2008; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481819; ARL-MR-0693; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481819>

Power electronic converters functioning as components in high power systems, such as those of hybrid military ground vehicles require fast fault isolation, and in most cases benefit additionally from bi-directional fault isolation. To prevent converter damage or failure, fault current interrupt speeds in the hundreds of microseconds to few millisecond range are necessary. Presently used mechanical contractors do not provide adequate actuation speeds, and suffer severe degradation during repeated fault isolation. Instead, it is desired to use a large array of semiconductor devices having a collectively low conduction loss to provide large current handling capability and fast transition speed for current interruption. This report discusses the use of SiC MOSFETs and the evaluation of SiC JFETs for a bi-directional solid-state circuit breaker application.

DTIC

Circuit Breakers; Silicon Carbides; Solid State

20080036456 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Production and Characterization of Nano-RDX

Redner, P; Kapoor, D; Patel, R; Chung, M; Martin, D; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481870; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481870>

Many techniques have been used in the past to produce nanoscale RDX but all suffer difficulties with process scale-up. The approach used in this study is a mechanical approach as opposed to a chemical one such as recrystallization using supercritical fluids such as CO₂.

DTIC

Nanostructures (Devices); RDX

20080036463 Michigan Technological Univ., Houghton, MI USA

Effect of Tunnel Resistance in the Strong Tunneling Regime on the Conductance of the Single Electron Transistors Fabricated Using Focused Ion Beam Etching

Karre, P S; Bergstrom, Paul L; Mallick, Govind; Karna, Shashi P; Nov 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD17-03-C-0115

Report No.(s): AD-A481893; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481893>

Ultra light and portable nano systems with integrated functionalities of sensing, data acquisition, data processing and communications will improve the effectiveness of electronic systems and potentially improve the decision making time in the battle field for the Land Warrior. Nanoelectronic devices form the building blocks of nanoscaled systems and require innovative technologies for their realization. The single electron transistor (SET) is a novel class of nano transistor which operates using quantum mechanical processes. Single electron transistors can be fabricated using methods like AFM nano oxidation, e-beam lithography, or shadow mask evaporation. Focused Ion Beam (FIB) based fabrication of SET devices is a novel method to produce SETs. SET based nano systems will enable potentially novel embedded applications to the Future Force Warriors (FFW) and Future Combat Systems (FCS). We report on the characterization of multiple SET devices in the strong tunneling regime. The effect of the magnitude of tunnel resistance on the conductance of the SET in the strong tunneling

regime is studied and the experimental data is in close correlation with theory of strong tunneling. Characterization and understanding the SET device characteristics are vital for the realization of integrated nano scaled systems.

DTIC

Etching; Fabrication; Ion Beams; Single Electron Transistors; Transistors

20080036467 Army Research Lab., Adelphi, MD USA

Ultraviolet Light Emitting Diodes Employing Nanoscale Compositional Inhomogeneities: A New Approach for Transforming Army Ultraviolet Applications

Sampath, A V; Garrett, G A; Reed, M L; Readinger, E D; Wraback, M; Chua, C; Johnson, N M; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481906; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481906>

Nitride semiconductor ultraviolet optical sources offer the possibility of compact, light-weight, low-cost, low-power-consumption optoelectronic sensors that would enable a new generation of fieldable systems for applications that include biodetection, non-line-of-sight covert communications, and water purification. To realize this promise, significant improvements are required in the wall plug efficiency and lifetimes of these devices that are currently limited by the presence of defects in these materials. In this paper we present optical studies of a new material, AlGaN containing nanoscale compositional inhomogeneities, that indicate that active regions containing this material can significantly improve the efficiency of III-Nitride ultraviolet sources. Further, we demonstrate the operation of these active regions within double heterostructure ultraviolet light emitting diodes that further corroborates this conclusion.

DTIC

Aluminum Nitrides; Gallium Nitrides; Light Emitting Diodes; Ultraviolet Radiation

20080036471 Michigan Technological Univ., Houghton, MI USA

2-D Electric Field Assisted Assembly of Single Carbon Nanotubes and the Effect on the Applied Field

An, L; Friedrich, C R; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD17-03-C-0115

Report No.(s): AD-A481915; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481915>

This paper reports on research work on electric field assisted assembly of single carbon nanotubes onto microcircuit electrodes, and the effect of the carbon nanotubes on the electric field. The research supports the development of nanoelectronics for reducing weight in military systems. A simulation method of assembly processes of carbon nanotubes by dielectrophoresis is introduced. The method considers the effect of carbon nanotubes on the electric field. A calculation model of the dielectrophoretic force based on the effective dipole moment method is presented. The model divides a carbon nanotube into multiple segments, computes the dielectrophoretic force for each segment and sums all of the forces to get a total effect. Compared to the field nonuniformity around the whole carbon nanotube, the field non-uniformity around each segment is reduced, leading to increased computational accuracy. The method can be used to simulate the dielectrophoretic assembly processes of a carbon nanotube originally located at any position of the electric field and the numerical results help to analyze carbon nanotube assembly processes and to optimize the process controlling parameters.

DTIC

Carbon Nanotubes; Electric Fields

20080036472 Army Research Lab., Aberdeen Proving Ground, MD USA

Affordable OTM Phased Array Antennas: Design and Fabrication of Temperature Stable and Performance Consistent Phase Shifters

Cole, M W; Nothwang, W D; Hubbard, C; Ngo, E; Hirsch, S; Coryell, L A; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481916; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481916>

Electronically scanned phased array antennas (ESAs) provide the means for achieving high data rate, beyond line of sight, on-the-move (OTM) communications. The phase shifter is a key component of ESAs, and the Army's Communications Engineering Research and Development Center (CERDEC) has recently acknowledged BaSrTiO₃ (BST) thin film technology as the premier candidate for achieving affordable high performance phase shifter elements. Unfortunately, there is concern that

in practical applications the device performance will be compromised due to the temperature dependence of the BST based device capacitance. We report a material design which controls the magnitude and the sign of the temperature coefficient of capacitance (TCC) via a multilayer paraelectric BST/buffer layer/ferroelectric BST coplanar device structure. To realize this multilayer device structure we have designed, fabricated, and optimized an Al doped Ta₂O₅ barrier layer with low loss, moderate permittivity, low TCC, and excellent bias stability of capacitance. The integration of the barrier layer with the BST layers was optimized for structure, microstructure, interfacial/surface morphology, and dielectric properties as a function of Al doping concentration, annealing temperature, material growth and integration process parameters.

DTIC

Fabrication; Phased Arrays; Thermal Stability; Thin Films

20080036481 Delaware Univ., Newark, DE USA

Multifunctional Magnetodielectric Composites for Antenna and High Frequency Applications

Zhang, Xiaokai; Golt, Michael C; Ekiert, Jr , Thomas F; Yarlagadda, Shridhar; Unruh, Karl M; Xaio, John Q; Nov 2006; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-04-1-0264

Report No.(s): AD-A481941; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481941>

Miniaturization of high frequency antennas while maintaining desirable bandwidth, impedance, and loss characteristics has recently attracted great attention in part due to the development of metamaterials. Ideal magnetodielectric materials should have the largest possible index of refraction which match the impedance of the materials to the environment and improve the antenna bandwidth. One approach to achieve such magnetodielectrics is to embed magnetic materials in a dielectric matrix. In this work, we have prepared and characterized a series of magnetodielectric composites with oriented Fe flake inclusions in an insulating dielectric polymeric matrix. The Fe flakes were prepared by mechanically deforming commercial Fe particles into sub-micrometers thick with aspect ratio (width/thickness) over 100. Several methods were employed to uniformly mix the Fe flakes in polymer matrix over a wide range of volume concentrations. Alignment is achieved either by using external magnetic field or flow method. High frequency complex permeability and permittivity values for the various loaded composites were measured and analyzed. These magnetodielectric composites indeed have high and, which can be matched by adjusting volume concentration.

DTIC

Antenna Components; High Frequencies; Miniaturization

20080036482 California Univ., Santa Barbara, CA USA

Biosensor Assay Enhancement Through AC Electrokinetic Microstirring

Sigurdson, M; Feldman, H; Meinhart, C D; Nov 2006; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-D-004

Report No.(s): AD-A481942; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481942>

A microstirring tool is developed to improve binding rates in biosensor devices by an order of magnitude. AC electric fields generate fluid motion through the well documented but unexploited phenomenon, Electrothermal Flow, where the circulating flow redirects or stirs the fluid, providing more binding opportunities between suspended and wall-immobilized molecules. Simulations and experiments show improvement by a factor of 6-13. This is applicable to diffusion limited assays of different formats, from handheld microfluidic to benchtop microarray. Electrothermal microstirring is a tool that can be incorporated in existing devices, to speed up, for example, food-borne pathogen detection, or portable medical diagnostics.

DTIC

Alternating Current; Assaying; Augmentation; Bioinstrumentation; Electrokinetics

20080036484 Michigan Technological Univ., Houghton, MI USA

Spin-Valve Effect in a Ni-C60-Ni Device

He, Haiying; Pandey, Ravindra; Karna, Shashi P; Nov 2006; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD17-03-C-0115

Report No.(s): AD-A481944; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481944>

We present here the results of theoretical calculations on the spin-valve effect in a Ni-C60-Ni device. The magnitude of

the junction magnetoresistance (JMR) is found to be significantly large for the device, which makes it a promising candidate for realistic applications in molecular spintronics. The exploration of the origin of the observed spin-valve effect in the Ni-C60-Ni system will be discussed.

DTIC

Electron Transfer; Fullerenes; Magnetoresistivity; Valves

20080036528 NASA Marshall Space Flight Center, Huntsville, AL, USA

Characterizing an Analog Amplifier Utilizing a Ferroelectric Transistor

MacLeond, Todd C.; Phillips, Thomas A.; Ho, Fat D.; June 09, 2008; 2 pp.; In English; International Symposium on Integrated Ferroelectrics, 9-12 Jun. 2008, Singapore; Original contains color illustrations; Copyright; Avail.: Other Sources

The use of ferroelectric materials for digital memory devices is widely researched and implemented, but ferroelectric devices also possess unique characteristics that made them have interesting and useful properties in analog circuits. Because ferroelectric transistors possess the properties of hysteresis and nonlinearity, an analog amplifier containing an FeFET has very different characteristics than one with a traditional FET. This paper characterizes the properties of a simple analog amplifier using both a traditional FET and a ferroelectric FET. The characterization includes voltage transfer, gain, frequency response, and operating modes. Because of the hysteresis effects the FeFET amplifier has two distinct operating modes, each with significantly different properties. These two regions have very different gain characteristics and are nonlinear. This has the effect of being able to program the FeFET to have two different voltage transfer/current characteristics with a single device. This can allow a flexible circuit that can change its analog properties on-the-fly with only a programming pulse. Modeled and measured data are presented showing the characteristics of this device. Comparisons are made between the ferroelectric device and the properties of a standard analog amplifier. Potential benefits and possible uses of such a device are presented.

Author

Field Effect Transistors; Ferroelectric Materials; Electric Potential; Frequency Response; Transistors; Analog Circuits; Computer Storage Devices; Ferroelectricity

20080036584 Air Force Research Lab., Wright-Patterson AFB, OH USA

Shared Displays: An Overview of Perceptual and Cognitive Issues

Douglas, Lisa; Aleva, Denise; Havig, Paul; Jun 2007; 62 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481266; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Large screen shared displays are a standard fixture in most command and control (C2) centers, but are often under-utilized. Many of the problems stem from the fact that shared displays are repeater displays from individual workstations. Scaling from workstation displays to large screen displays does not guarantee text will be large enough to be visible to all users. The colors and color range visible on the shared displays may not automatically match the colors displayed on individual workstations. Text and symbology overlays on maps are often not discernible when translated from individual workstations to shared displays. And when shared displays are repeaters, the operator's navigation and control icons, menus and pallets are visible on the shared displays and obstruct the view of displayed information. Shared displays often present what is called a common operating picture, or COP. The COP should be the basis of a common operational understanding, but they are often too cluttered, yet lack useful information. In today's complex environment of asymmetric warfare, effects-based operations and coalition forces, decision quality information is needed to support collaboration and synchronization of operations. This means delivering the right information at the right time in a clearly visible and easily understandable format that supports cognitive processes associated with situation awareness, decision making, and collaboration. The present paper will discuss perceptual and cognitive issues associated with shared displays and COPs in command centers.

DTIC

Cognition; Perception

20080036597 California Univ., Berkeley, CA USA

Bioinspired Routes to Lithium-Ion Conducting Polymers and Nanomembranes

Arnold, John; May 21, 2008; 8 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0066

Report No.(s): AD-A482051; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project involves a novel approach to the synthesis of new classes of materials designed to function as ion conducting systems. In particular, we are developing new methods to produce materials with new chemical characteristics which can be

used to modulated electrical behavior on the nanoscale. The current phase of this proposed work is designed to identify promising candidates and to study the mechanism by which ions are transported through these new solids. The ultimate goal is to produce a working lithium battery incorporating new electrolytes.

DTIC

Conducting Polymers; Electrolytes; Lithium; Lithium Batteries; Metal Ions; Routes

20080036599 Calabazas Creek Research, Inc., San Mateo, CA USA

High Current Density Cathodes for Future Vacuum Electronics Applications

May 30, 2008; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-07-C-0063

Report No.(s): AD-A482055; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report summarizes the achievements at Calabazas Creek Research, Inc. and Massachusetts Institute of Technology to develop and demonstrate techniques for fabricating high current density cathodes using scandium to lower the emission work function. Several techniques were investigated for depositing scandium on and beneath the surface of cathode emitters with techniques for replenishing that removed by normal surface erosion processes. Results indicate that several techniques can successfully provide the initial deposition and subsequent replenishment for long lifetime operation. The techniques use readily available fabrication capabilities. A photonic band gap traveling wave circuit was designed compatible with an electron gun incorporating the high current density capability. Such a device would demonstrate the effectiveness of scandate cathodes in typical RF sources.

DTIC

Cathodes; Current Density; High Current; Radio Frequencies; Vacuum

20080036627 Naval Research Lab., Washington, DC USA

Electronic Versus Geometric Contrast in Cross-Sectional STM Images of III-V Semiconductor Heterostructures

Kim, S G; Erwin, S C; Nosh, B Z; Whitman, L J; Mar 21, 2003; 5 pp.; In English

Report No.(s): AD-A482132; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report first-principles calculations of the electronic and geometric structure of the (110) cross-sectional surfaces on InAs/GaSb superlattices, and compare the results with scanning tunneling microscopy images of filled electronic states. In both the predicted and measured images the InAs surfaces appear lower than GaSb, a height difference we show is caused primarily by differences in the electronic structure of the two materials. In contrast, local variations in the apparent height of surface atoms at InSb- or GaAs-like interfaces arise primarily from geometric distortions associated with local differences in bond length. Our calculated energies for atomic intermixing indicate that anion exchanges are exothermic at GaAs interfaces but endothermic at InSb interfaces. This difference may explain why GaAs interfaces are typically more disordered than InSb interfaces in these heterostructures.

DTIC

Image Contrast; Semiconductors (Materials)

20080036646 Calabazas Creek Research, Inc., San Mateo, CA USA

High Current Density Scandate Cathodes for Future Vacuum Electronics Applications

May 30, 2008; 28 pp.; In English

Contract(s)/Grant(s): FA9550-07-C-0063

Report No.(s): AD-A482174; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This final report summarizes the achievements at Calabazas Creek Research, Inc. and Massachusetts Institute of Technology to develop and demonstrate techniques for fabricating high current density cathodes using scandium to lower the emission work function. Several techniques were investigated for depositing scandium on and beneath the surface of cathode emitters with techniques for replenishing that removed by normal surface erosion processes. Results indicate that several techniques can successfully provide the initial deposition and subsequent replenishment for long lifetime operation. The techniques use readily available fabrication capabilities. A photonic band gap traveling wave circuit was designed compatible with an electron gun incorporating the high current density capability. Such a device would demonstrate the effectiveness of scandate cathodes in typical RF sources.

DTIC

Cathodes; Current Density; Electron Guns; High Current; Vacuum

20080036670 Geo-Centers, Inc., Fort Washington, MD USA

Hybrid Macro-Micro Fluidics System for a Chip-Based Biosensor

Tamanaha, C R; Whitman, L J; Colton, R J; Feb 18, 2002; 12 pp.; In English

Report No.(s): AD-A482207; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe the engineering of a hybrid fluidics platform for a chip-based biosensor system that combines high-performance microfluidics components with powerful, yet compact, millimeter-scale pump and valve actuators. The microfluidics system includes channels, valveless diffuser-based pumps, and pinch-valves that are cast into a poly(dimethylsiloxane) (PDMS) membrane and packaged along with the sensor chip into a palm-sized plastic cartridge. The microfluidics are driven by pump and valve actuators contained in an external unit (with a volume ~30 cm³) that interfaces kinematically with the PDMS microelements on the cartridge. The pump actuator is a simple-lever, flexure-hinge displacement amplifier that increases the motion of a piezoelectric stack. The valve actuators are an array of cantilevers operated by shape memory alloy wires. All components can be fabricated without the need for complex lithography or micromachining, and can be used with fluids containing micron-sized particulates. Prototypes have been modeled and tested to ensure the delivery of microliter volumes of fluid and the even dispersion of reagents over the chip sensing elements. With this hybrid approach to the fluidics system, the biochemical assay benefits from the many advantages of microfluidics yet we avoid the complexity and unknown reliability of immature microactuator technologies.

DTIC

Actuators; Bioinstrumentation; Biological Effects; Chips (Electronics); Detection; Fluidics

20080036671 Naval Research Lab., Washington, DC USA

Current Collapse Induced in AlGa_N/Ga_N High-Electron-Mobility Transistors by Bias Stress

Mittereder, J A; Binari, S C; Klein, P B; Roussos, J A; Katzer, D S; Storm, D F; Koleske, D D; Wickenden, A E; Henry, R L; Aug 25, 2003; 4 pp.; In English

Report No.(s): AD-A482208; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Current collapse is observed to be induced in AlGa_N/Ga_N high-electron-mobility transistors as a result of short-term bias stress. This effect was seen in devices grown by both metalorganic chemical vapor deposition (MOCVD) and molecular-beam epitaxy (MBE). The induced collapse appears to be permanent and can be reversed by SiN passivation. The traps responsible for the collapse have been studied by photoionization spectroscopy. For the MOCVD-grown devices, the same traps cause the collapse in both unstressed and stressed devices. These effects are thought to result from hot-carrier damage during stress.

DTIC

Bias; Collapse; Electron Mobility; High Electron Mobility Transistors; Transistors

20080036691 Naval Research Lab., Washington, DC USA

Nonvolatile Reprogrammable Logic Elements Using Hybrid Resonant Tunneling Diode-Giant Magnetoresistance Circuits

Hanbicki, A T; Magno, R; Cheng, S F; Park, Y D; Bracker, A S; Jonker, B T; Aug 20, 2001; 4 pp.; In English

Report No.(s): AD-A482261; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have combined resonant interband tunneling diodes (RITDs) with giant magnetoresistance (GMR) elements so that the GMR element controls the switching current and stable operating voltage points of the hybrid circuit. Parallel and series combinations demonstrate continuous or two-state tunability of the subsequent RITD-like current voltage characteristic via the magnetic field response of the GMR element. Monostable bistable transition logic element operation is demonstrated with a GMR/RITD circuit in both the dc limit and clocked operation. The output of such hybrid circuits is nonvolatile, reprogrammable, and multivalued.

DTIC

Circuits; Diodes; Hybrid Circuits; Logical Elements; Magnetoresistivity; Resonant Frequencies; Resonant Tunneling; Tunnel Diodes

FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

20080034725 National Energy Technology Lab., Morgantown, WV, USA

Cluster Dynamics in a Circulating Fluidized Bed

Guenther, C.; Breault, R.; January 2007; 18 pp.; In English

Report No.(s): DE2007-915355; No Copyright; Avail.: National Technical Information Service (NTIS)

A common hydrodynamic feature in industrial scale circulating fluidized beds is the presence of clusters. The continuous formation and destruction of clusters strongly influences particle hold-up, pressure drop, heat transfer at the wall, and mixing. In this paper fiber optic data is analyzed using discrete wavelet analysis to characterize the dynamic behavior of clusters. Five radial positions at three different axial locations under five different operating were analyzed using discrete wavelets. Results are summarized with respect to cluster size and frequency.

NTIS

Circulation; Combustion Chambers

20080034731 National Energy Technology Lab., Pittsburgh, PA USA

Measurement of Gas Velocities in the Presence of Solids in the Riser of a Cold Flow Circulating Fluidized Bed

Spenik, J.; Ludlow, J. C.; Compston, R.; Breault, R. W.; January 2007; 10 pp.; In English

Report No.(s): DE2007-915488; No Copyright; Avail.: National Technical Information Service (NTIS)

The local gas velocity and the intensity of the gas turbulence in a gas/solid flow are a required measurement in validating the gas and solids flow structure predicted by computational fluid dynamic (CFD) models in fluid bed and transport reactors. The high concentration and velocities of solids, however, make the use of traditional gas velocity measurement devices such as pitot tubes, hot wire anemometers and other such devices difficult. A method of determining these velocities has been devised at the National Energy Technology Laboratory employing tracer gas. The technique developed measures the time average local axial velocity gas component of a gas/solid flow using an injected tracer gas which induces changes in the heat transfer characteristics of the gas mixture. A small amount of helium is injected upstream a known distance from a self-heated thermistor. The thermistor, protected from the solids by means of a filter, is exposed to gases that are continuously extracted from the flow. Changes in the convective heat transfer characteristics of the gas are indicated by voltage variations across a Wheatstone bridge. When pulsed injections of helium are introduced to the riser flow the change in convective heat transfer coefficient of the gas can be rapidly and accurately determined with this instrument.

NTIS

Circulation; Combustion Chambers; Risers; Solids; Velocity Measurement

20080034738 National Energy Technology Lab., Pittsburgh, PA USA

Transient Characterization of Type B Particles in a Transport Riser

Mei, J.; Shadle, L. J.; Monazam, E. R.; January 2007; 10 pp.; In English

Report No.(s): DE2007-915487; No Copyright; Avail.: National Technical Information Service (NTIS)

Simple and rapid dynamic tests were used to evaluate fluid dynamic behavior of granular materials in the transport regime. Particles with densities ranging from 189 to 2,500 kg/m³ and Sauter mean size from 61 to 812 μ m were tested in a 0.305 m diameter, 15.5 m height circulating fluidized bed (CFB) riser. The transient tests involved the abrupt stoppage of solids flow for each granular material over a wide range gas flow rates. The riser emptying time was linearly related to the Froude number in each of three different operating regimes. The flow structure along the height of the riser followed a distinct pattern as tracked through incremental pressures. These results are discussed to better understand the transformations that take place when operating over various regimes. During the transients the particle size distribution was measured. The effects of pressure, particle size, and density on test performance are also presented.

NTIS

Combustion Chambers; Risers

20080034739 National Energy Technology Lab., Pittsburgh, PA USA

Flow Regime Study in a High Density Circulating Fluidized Bed Riser with an Abrupt Exit

Mei, J.; Shadle, L. J.; Yuc, P. C.; Monazam, E. R.; January 2007; 11 pp.; In English

Report No.(s): DE2007-915486; No Copyright; Avail.: National Technical Information Service (NTIS)

Flow regime study was conducted in a 0.3 m diameter, 15.5 m height circulating fluidized bed (CFB) riser with an abrupt

exit at the National Energy Technology Laboratory of the U.S. Department of Energy. Local particle velocities were measured at various radial positions and riser heights using an optical fiber probe. On-line measurement of solid circulating rate was continuously recorded by the Spiral. Glass beads of mean diameter 61 μm and particle density of 2,500 kg/m^3 were used as bed material. The CFB riser was operated at various superficial gas velocities ranging from 3 to 7.6 m/s and solid mass flux from 20 to 550 $\text{kg/m}^2\text{-s}$. At a constant riser gas velocity, transition from fast fluidization to dense suspension upflow (DSU) regime started at the bottom of the riser with increasing solid flux. Except at comparatively low riser gas velocity and solid flux, the apparent solid holdup at the top exit region was higher than the middle section of the riser. The solid fraction at this top region could be much higher than 7% under high riser gas velocity and solid mass flux. The local particle velocity showed downward flow near the wall at the top of the riser due to its abrupt exit. This abrupt geometry reflected the solids and, therefore, caused solid particles traveling downward along the wall. However, at location below, but near, the top of the riser the local particle velocities were observed flowing upward at the wall. Therefore, DSU was identified in the upper region of the riser with an abrupt exit while the fully developed region, lower in the riser, was still exhibiting core-annular flow structure. Our data were compared with the flow regime boundaries proposed by Kim et al. for distinguishing the dilute pneumatic transport, fast fluidization, and DSU.

NTIS

Circulation; Combustion Chambers; Gas Flow; Risers

20080034752 Idaho Univ., Moscow, ID, USA

Feasibility Study on Hydro-Thermal Conversion of Low-Grade Glycerol to Alcohols for Use in Biodiesel Production

He, B. B.; Dec. 2006; 18 pp.; In English

Contract(s)/Grant(s): DTRS98-G-0027

Report No.(s): PB2008-101765; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this project was to conduct a feasibility study on converting the low-grade glycerol derived from biodiesel production to short-chain alcohols such as methanol, ethanol, or propanols, or their mix and applying back to the biodiesel production process. The specific objectives were (1) to explore whether controlled thermal cracking of glycerol alone is suitable for alcohol conversion; (2) to determine the feasibility of hydro-thermal cracking of glycerol for targeted alcohols; and (3) to evaluate process parameters to maximize alcohol production if the process is feasible. Trial experiments indicated that it is possible to convert glycerol hydro-thermally into primary alcohols that are potentially applied back to the biodiesel production. If achieved, this would be a break-through in utilizing alternatively low grade glycerol for value-added applications. However, the results from the feasibility testing were far away from satisfaction: the product yield was low, the reactions were lack of consistency, and the process efficiency needs to be improved greatly. Future work will involve an improved reactor system that will provide the ability to design a through experimental procedure and systematically test the effects of operating parameters and fine tune the analytical procedures to improve repeatability and sensitivity.

NTIS

Alcohols; Feasibility; Glycerols

20080034763 Lawrence Livermore National Lab., Livermore, CA USA

Catalyst for Microelectromechanical Systems Microreactors

Morse, J. D., Inventor; Sopchak, D. A., Inventor; Upadhye, R. S., Inventor; Reynolds, J. G., Inventor; Satcher, J. H., Inventor; 28 Apr 05; 15 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed Filed 28 Apr 05; US-Patent-Appl-SN-11-119 047

Report No.(s): PB2008-101194; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A microreactor comprising a silicon wafer, a multiplicity of microchannels in the silicon wafer, and a catalyst coating the microchannels. In one embodiment the catalyst coating the microchannels comprises a nanostructured material. In another embodiment the catalyst coating the microchannels comprises an aerogel. In another embodiment the catalyst coating the microchannels comprises a solgel. In another embodiment the catalyst coating the microchannels comprises carbon nanotubes.

NTIS

Catalysts; Microelectromechanical Systems

20080034864 National Inst. of Standards and Technology, Gaithersburg, MD USA; Technical Research Centre of Finland, Helsinki, Finland; Hughes Associates, Inc., Baltimore, MD, USA

Fire Dynamics Simulator (Version 5) User's Guide

McGrattan, K.; Klein, B.; Hostikka, S.; Floyd, J.; January 2007; 206 pp.; In English

Report No.(s): PB2008-101897; NIST/SP-1019-5; No Copyright; Avail.: National Technical Information Service (NTIS)

This guide describes how to use the Fire Dynamics Simulator (FDS), Version 5. It does not provide the background theory. A companion document, called the FDS Technical Reference Guide, contains details about the governing equations and numerical methods. The FDS Users Guide contains limited information on how to operate Smokeview, the companion visualization program for FDS. Its full capability is described in the Users Guide for Smokeview Version 5. The software described in this document, Fire Dynamics Simulator (FDS), is a computational fluid dynamics (CFD) model of fire-driven fluid flow. FDS solves numerically a form of the Navier-Stokes equations appropriate for low-speed, thermally-driven flow with an emphasis on smoke and heat transport from fires.

NTIS

Combustion Physics; Computational Fluid Dynamics; Fires; Simulators

20080034867 National Inst. of Standards and Technology, Gaithersburg, MD USA

User's Guide for Smokeview Version 5: A Tool for Visualizing Fire Dynamics Simulation Data

Forney, G. P.; Aug. 2007; 132 pp.; In English

Report No.(s): PB2008-101898; NIST/SP-1017-1; No Copyright; Avail.: National Technical Information Service (NTIS)

Smokeview is a software tool designed to visualize numerical calculations generated by fire models such as the Fire Dynamics Simulator (FDS), a computational fluid dynamics (CFD) model of fire-driven fluid flow or CFAST, a zone fire model. Smokeview visualizes smoke and other attributes of the fire using traditional scientific methods such as displaying tracer particle flow, 2D or 3D shaded contours of gas flow data such as temperature and flow vectors showing flow direction and magnitude. Smokeview also visualizes fire attributes realistically so that one can experience the fire. This is done by displaying a series of partially transparent planes where the transparencies in each plane (at each grid node) are determined from soot densities computed by FDS. Smokeview also visualizes static data at particular times again using 2D or 3D contours of data such as temperature and flow vectors showing flow direction and magnitude.

NTIS

Computer Programs; Fires; Flow Visualization; Simulation; Simulators; User Manuals (Computer Programs)

20080034887 ASRC Aerospace Corp., Cleveland, OH, USA

LSPRAY-III: A Lagrangian Spray Module

Raju, M. S.; July 2008; 64 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNC06BA07B; WBS 984754.02.07.03.19.02

Report No.(s): NASA/CR-2008-215290; E-16564; No Copyright; Avail.: CASI: A04, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080034887>

LSPRAY-III is a Lagrangian spray solver developed for application with parallel computing and unstructured grids. It is designed to be massively parallel and could easily be coupled with any existing gas-phase flow and/or Monte Carlo Probability Density Function (PDF) solvers. The solver accommodates the use of an unstructured mesh with mixed elements of either triangular, quadrilateral, and/or tetrahedral type for the gas flow grid representation. It is mainly designed to predict the flow, thermal and transport properties of a rapidly vaporizing spray because of its importance in aerospace application. The manual provides the user with an understanding of various models involved in the spray formulation, its code structure and solution algorithm, and various other issues related to parallelization and its coupling with other solvers. With the development of LSPRAY-III, we have advanced the state-of-the-art in spray computations in several important ways.

Author

Sprayers; Gas Flow; Vapor Phases; Flow Characteristics; Unstructured Grids (Mathematics); Thermodynamic Properties; Transport Properties

20080034922 National Inst. of Standards and Technology, Gaithersburg, MD USA; Technical Research Centre of Finland, Helsinki, Finland; Hughes Associates, Inc., Baltimore, MD, USA

Fire Dynamics Simulator (Version 5) Technical Reference Guide

McGrattan, K.; Hostikka, S.; Floyd, J.; Baum, H.; Rehm, R.; Oct. 01, 2007; 100 pp.; In English

Report No.(s): PB2008-101870; NIST/SP-1018-5; No Copyright; Avail.: CASI: A05, Hardcopy

The idea that the dynamics of a fire might be studied numerically dates back to the beginning of the computer age. Indeed,

the fundamental conservation equations governing fluid dynamics, heat transfer, and combustion were first written down over a century ago. Despite this, practical mathematical models of fire (as distinct from controlled combustion) are relatively recent due to the inherent complexity of the problem. Indeed, in his brief history of the early days of fire research, Hoyt Hottel noted A case can be made for fire being, next to the life processes, the most complex of phenomena to understand. The difficulties revolve about three issues: First, there are an enormous number of possible fire scenarios to consider due to their accidental nature. Second, the physical insight and computing power required to perform all the necessary calculations for most fire scenarios are limited. Any fundamentally based study of fires must consider at least some aspects of bluff body aerodynamics, multi-phase flow, turbulent mixing and combustion, radiative transport, and conjugate heat transfer; all of which are active research areas in their own right. Finally, the fuel in most fires was never intended as such. Thus, the mathematical models and the data needed to characterize the degradation of the condensed phase materials that supply the fuel may not be available. Indeed, the mathematical modeling of the physical and chemical transformations of real materials as they burn is still in its infancy. In order to make progress, the questions that are asked have to be greatly simplified. To begin with, instead of seeking a methodology that can be applied to all fire problems, we begin by looking at a few scenarios that seem to be most amenable to analysis. Hopefully, the methods developed to study these simple problems can be generalized over time so that more complex scenarios can be analyzed. Second, we must learn to live with idealized descriptions of fires and approximate solutions to our idealized equations. Finally, the methods should be capable of systematic improvement. As our physical insight and computing power grow more powerful, the methods of analysis can grow with them.

NTIS

Combustion Physics; Computational Fluid Dynamics; Fires; Simulators

20080034937 Idaho National Engineering Lab., Idaho Falls, ID, USA

Experimental Modeling of VHTR Plenum Flows During Normal Operation and Pressurized Conduction Cooldown

McCreery, G. E.; Condie, K. G.; Sep. 2006; 33 pp.; In English

Report No.(s): DE2007-911716; INL/EXT-06-11760; No Copyright; Avail.: National Technical Information Service (NTIS)

The Very High Temperature Reactor (VHTR) is the leading candidate for the Next Generation Nuclear Power (NGNP) Project in the U.S. which has the goal of demonstrating the production of emissions free electricity and hydrogen by 2015. The present document addresses experimental modeling of flow and thermal mixing phenomena of importance during normal or reduced power operation and during a loss of forced reactor cooling (pressurized conduction cooldown) scenario. The objectives of the experiments are, (1), provide benchmark data for assessment and improvement of codes proposed for NGNP designs and safety studies, and, (2), obtain a better understanding of related phenomena, behavior and needs. Physical models of VHTR vessel upper and lower plenums which use various working fluids to scale phenomena of interest are described. The models may be used to both simulate natural convection conditions during pressurized conduction cooldown and turbulent lower plenum flow during normal or reduced power operation.

NTIS

High Temperature; Turbulent Flow; High Temperature Nuclear Reactors

20080034940 Idaho National Engineering Lab., Idaho Falls, ID, USA

Modeling Strategies for Unsteady Turbulent Flows in the Lower Plenum of the VHTR

Johnson, R. W.; Sep. 2006; 14 pp.; In English

Report No.(s): DE2007-911700; INL/CON-06-01371; No Copyright; Avail.: National Technical Information Service (NTIS)

Validation simulations are presented for turbulent flow in a staggered tube bank, geometry similar to that in the lower plenum of a block very high temperature reactor. Steady 2D RANS predictions are compared to unsteady 2D RANS results and experiment. The unsteady calculations account for the fact that nonturbulent fluctuations (due to vortex-shedding) are present in the flow. The unsteady computations are shown to predict the mean variables and the total shear stress quite well. Previous workers have presented results that indicated that 3D simulations were necessary to obtain reasonable results. Best practices are based on requirements for the ASME Journal of Fluids Engineering.

NTIS

Computational Fluid Dynamics; Unsteady Flow; High Temperature Nuclear Reactors; Vortex Shedding

20080035183 Naval Research Lab., Washington, DC USA

Shock Front Distortion and Richtmyer-Meshkov-like Growth Caused by a Small Pre-Shock Non-Uniformity

Velikovich, A L; Wouchuk, J G; Ruiz de Lira, C H; Metzler, N; Zalesak, S; Schmitt, A J; Jan 2007; 76 pp.; In English
Report No.(s): AD-A480977; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480977>

Response of a shock front to small pre-shock non-uniformities of density, pressure and velocity is studied theoretically and numerically. These pre-shock nonuniformities emulate imperfections of a laser target, due either to its manufacturing, like joints or feeding tubes, or to pre-shock perturbation seeding/growth, as well as density fluctuations in foam targets, 'thermal layers' near heated surfaces, etc. Similarly to the shock-wave interaction with a small non-uniformity localized at a material interface which triggers a classical Richtmyer-Meshkov (RM) instability, interaction of a shock wave with periodic or localized pre-shock perturbations distributed in the volume distorts the shape of the shock front and can cause a RM-type instability growth. Explicit asymptotic formulae describing distortion of the shock front and the rate of RM-type growth are presented. These formulae are favorably compared both to the exact solutions of the corresponding initial-boundary-value problem and to numerical simulations. It is demonstrated that a small density modulation localized sufficiently close to a flat target surface produces the same perturbation growth as an 'equivalent' ripple on the surface of a uniform target, characterized by the same initial areal mass modulation amplitude.

DTIC

Distortion; Shock Fronts; Shock Waves

20080035194 Illinois Univ., Urbana-Champaign, IL USA

Studies of Real Roughness Effects for Improved Modeling and Control of Practical Wall-Bounded Turbulent Flows

Christensen, Kenneth T; Wu, Yanhua; Apr 22, 2008; 183 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0043

Report No.(s): AD-A481002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481002>

The present effort investigates the effects of practical roughness replicated from a turbine blade damaged by deposition of foreign materials or statistical and structural characteristics of wall turbulence. Two-dimensional particle image velocimetry (PIV) measurements are performed in the streamwise-wall-normal plane of turbulent boundary layers at momentum Reynolds numbers of 8000 and 13000. The surface conditions include a smooth wall and two highly-irregular rough walls. These rough surfaces have the same roughness topography but differ in spatial scaling. The validity of Townsend's wall similarity hypothesis in the presence of practical roughness is assessed and the impact of this roughness on the spatial structure of the flow is investigated. In addition, stereoscopic PIV measurements are made in streamwise-spanwise planes of smooth- and rough-wall turbulent boundary layers both within and at the outer edge of the roughness sublayer. This data is used to explore the impact of dominant topographical features on the near-wall flow as well as the influence of practical roughness on the spatial organization of the flow. Understanding such effects provides a steppingstone toward efficient modeling and control of practical flows in the presence of roughness.

DTIC

Models; Surface Roughness; Turbulent Flow; Wall Flow

20080035487 National Inst. of Standards and Technology, Gaithersburg, MD USA

Visualization: A Tool for Understanding Fire Dynamics

Forney, G. P.; Jul. 2007; 13 pp.; In English

Report No.(s): PB2008-101883; NISTIR-7431; No Copyright; Avail.: National Technical Information Service (NTIS)

Computational tools have been developed at the National Institute of Standards and Technology (NIST) for modeling fire spread and smoke transport in order that various professionals such as fire protection engineers, fire researchers, fire investigators, fire fighters, AHJs (authorities having jurisdiction) etc. may study the dynamics of fire with the ultimate aim of improving fire safety. These models include FDS (Fire Dynamics Simulator) for modeling fire spread and smoke transport and Smokeview for visualizing the resulting fire dynamics. This article will give an overview of many of the features and techniques one can use with Smokeview to better understand fire dynamics. Modeling is especially useful when other methods of study such as experimentation are not practical or are too dangerous to conduct.

NTIS

Fires; Flow Visualization; Smoke

20080035641 National Inst. of Standards and Technology, Gaithersburg, MD USA

Visualization and Modeling of Smoke Transport Over Landscape Scales

Forney, G. P.; Mell, W. E.; January 2007; 17 pp.; In English

Report No.(s): PB2008-101884; NISTIR-7428; No Copyright; Avail.: National Technical Information Service (NTIS)

Computational tools have been developed at the National Institute of Standards and Technology (NIST) for modeling fire spread and smoke transport. These tools have been adapted to address fire scenarios that occur in the wildland urban interface (WUI) over kilometer-scale distances. These models include the smoke plume transport model ALOFT (A Large Open Fire plume Trajectory model) and WFDS (Wildland-urban interface Fire Dynamics Simulator) for fire spread and smoke transport in the wildland-urban interface. The visualization tool is called Smokeview. In this paper, an overview of the physical basis of the fire spread and smoke transport models will be discussed briefly along with the visualization of characteristic results using Smokeview. A technique will be described for visualizing smoke realistically and indications will be given how Smokeview can be applied to other fire models. Computational tools have been developed at the National Institute of Standards and Technology (NIST) for modeling fire spread and smoke transport in order that various professionals such as fire protection engineers, fire researchers, fire investigators, fire fighters, AHJs (authorities having jurisdiction) etc. may study the dynamics of fire with the ultimate aim of improving fire safety. These models include FDS (Fire Dynamics Simulator) for modeling fire spread and smoke transport and Smokeview for visualizing the resulting fire dynamics. This article will give an overview of many of the features and techniques one can use with Smokeview to better understand fire dynamics. Modeling is especially useful when other methods of study such as experimentation are not practical or are too dangerous to conduct.

NTIS

Fires; Flow Visualization; Smoke; Terrain; Topography

20080036015 Oliff and Berridge, PLC, Alexandria, VA, USA; Southwest Research Inst., San Antonio, TX USA

Systems and Methods for Dispensing an Anti-Traction, Mobility Denial Material

Glauser, R., Inventor; Brigance, E. M., Inventor; 24 Sep 04; 11 pp.; In English

Contract(s)/Grant(s): USMC-V674P-2995; USMC-M67854-02-D-1087

Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-948 317

Report No.(s): PB2008-102004; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Man-portable systems and methods for dispensing an anti-traction, mobility denial material on a target surface. In various exemplary embodiments, a method of dispensing an anti-traction material on a target surface includes providing a dry polymer powder to a first section of a dispensing nozzle, providing a water stream to a separate second section of a dispensing nozzle, and mixing the polymer powder with the water stream upon exit of the streams out of the first and second sections of the dispensing nozzle to form the anti-traction material on the target surface, the formed anti-traction material being a gel.

NTIS

Dispensers; Mobility; Patent Applications; Targets; Traction

20080036026 Holland and Hart, LLP, Salt Lake City, UT, USA

Induced Sludge Bed Anaerobic Reactor

Hansen, C. L., Inventor; Hansen, C. S., Inventor; Watts, E. D., Inventor; Pack, K. D., Inventor; 10 Nov 05; 21 pp.; In English

Contract(s)/Grant(s): 68-3A75-3-153

Patent Info.: Filed Filed 10 Nov 05; US-Patent-Appl-SN-11-272 293

Report No.(s): PB2008-100688; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An induced sludge bed anaerobic reactor includes a vessel in which a septum or other partition is positioned to maintain solids in wastewater being treated toward a lower zone in the reactor. A gas trap, which may also comprise an overpressure protection device, may be arranged at an outlet of the vessel. A distribution plate may be located at an inlet. A central aperture is formed in the septum into which a plug control mechanism, such as an auger, may be positioned to force solids to the lower zone of the reactor or, alternatively, pull solids up above the septum so that they can be removed from the vessel, if desired. A mixer may be utilized in connection with the bioreactor to mix the contents and prevent a crust from forming at the top of the bioreactor. Still further, a wall may be positioned to extend above the septum around its perimeter to assist in separating solids from the wastewater. The various types of bacteria used in the anaerobic process may also be separated, according to the present invention, in either a single vessel or multiple vessels so that the conditions of each respective vessel can be altered as desired.

NTIS

Activity (Biology); Anaerobes; Patent Applications; Sludge

20080036028 General Electric Co., Niskayuna, NY, USA

Portable Plenum Laser Forming

Zhang, W., Inventor; Jones, M. G., Inventor; Farrell, B. H., Inventor; 24 Mar 05; 9 pp.; In English

Contract(s)/Grant(s): 70NANB2H3031

Patent Info.: Filed Filed 24 Mar 05; US-Patent-Appl-SN-11-089 750

Report No.(s): PB2008-100689; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A laser forming system includes a motion system. A mounting fixture is affixed to the motion system for supporting a workpiece. A plenum is affixed to the fixture for surrounding the workpiece. A gas supply is joined in flow communication with the plenum for channeling thereto an inert gas under pressure to fill the plenum. A laser is aligned with the plenum for projecting a laser beam at the workpiece for laser forming thereof inside the plenum.

NTIS

Lasers; Patent Applications

20080036135 Honeywell International, Inc., Morristown, NJ, USA

Throat Retention Apparatus for Hot Gas Applications

Gratton, J. A., Inventor; Christensen, D. J., Inventor; 27 Sep 04; 8 pp.; In English

Contract(s)/Grant(s): F0863099C0027

Patent Info.: Filed Filed 27 Sep 04; US-Patent-Appl-SN-10-952 109

Report No.(s): PB2008-100116; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A nozzle for use in a hot gas valve is provided that includes a housing, an insert, and a throat retainer. The housing is constructed of an insulating material and has a flow path formed therein. The flow path has a throat section. The insert is made of material capable of maintaining structural integrity at a temperature up to about 5000 degrees F. and is disposed at least partially in the throat section and has a flow path extending therethrough in fluid communication with the housing flow path. The throat retainer is constructed of material having insulating and ablative properties and is coupled between the housing and the insert and configured to retain the insert within the housing throat section.

NTIS

Gas Valves; High Temperature Gases; Patent Applications; Throats

20080036226 Florida State Univ. Research Foundation Inc., Tallahassee, FL, USA

Variable Charge Films for Controlling Microfluidic Flow

Schlenoff, J. B., Inventor; Sui, Z., Inventor; 2 Mar 05; 32 pp.; In English

Contract(s)/Grant(s): DMR9727717

Patent Info.: Filed Filed 2 Mar 05; US-Patent-Appl-SN-11-070 770

Report No.(s): PB2008-100685; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A microfluidic device for carrying a liquid, the device comprising a microfluidic channel having an interior wall and a polyelectrolyte film on the interior wall whereby liquid carried by the channel contacts the polyelectrolyte film, the polyelectrolyte film having a thickness of about 1 to about 1000 nanometers and comprising an interpenetrating network of a predominantly positively charged polymer and a predominantly negatively charged polymer, the predominantly positively charged polymer, the predominantly negatively charged polymer or both containing (i) a pH insensitive positively or negatively charged repeat unit having a pKa greater than 9 or less than 3, and (ii) a pH sensitive repeat unit, the pH sensitive repeat unit having a pKa of 3 to 9, whereby the pH of liquid in the microfluidic channel may be used to control the velocity or direction of electroosmotic flow of the liquid within said microfluidic channel.

NTIS

Microfluidic Devices; Patent Applications

20080036227 Schwegman Lundberg Woessner and Kluth, PA, Minneapolis, MN, USA

Nanostructured Devices for Separation and Analysis

Lopez, G., Inventor; Brueck, S. R. J., Inventor; Ista, L. K., Inventor; O'Brien, M., Inventor; 3 Feb 05; 26 pp.; In English

Contract(s)/Grant(s): DAAD19-99-1096

Patent Info.: Filed Filed 3 Feb 05; US-Patent-Appl-SN-11-050 424

Report No.(s): PB2008-100686; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods for forming an apparatus containing a nanofluidic device with a pattern having nanoscopic features includes producing a regular interference pattern in a substrate using two coherent light beams. In an embodiment, an apparatus

includes a nanofluidic device having nanoscopic features in at least two dimensions. In an embodiment, a nanofluidic device having nanoscopic features is formed using an ultraviolet source to generate a regular interference pattern.

NTIS

Patent Applications; Coherent Light; Nanostructures (Devices)

20080036250 NASA Marshall Space Flight Center, Huntsville, AL, USA

Effect of Step-wise Change in Processing Pressure on Isolated Pore Growth during Controlled Directional Solidification in Small Channels

Cox, Matthew C.; Anilkumar, Amrutur V.; Grugel, Richard N.; Lee, Chun P.; [2008]; 32 pp.; In English

Contract(s)/Grant(s): NNM07AA82P; Copyright; Avail.: Other Sources

Directional solidification experiments were performed using succinonitrile saturated with nitrogen gas to examine the effects of in-situ processing pressure changes on the formation, growth, and evolution of an isolated, cylindrical gaseous pore. A novel solidification facility capable of processing small cylindrical samples (I.D. < 1.0 mm), under controlled pressure conditions, was developed for the experiments. A new experimental method for growing the isolated pore from a seed bubble is introduced. The experimental results indicate that a step-wise processing pressure change will result in either a transient change in pore diameter or a complete termination of pore growth, demonstrating that pressure changes can be used as a control parameter to influence bubble growth. During steady-state growth, however, pore size shows no dependence on processing pressure. A simple analytical model has been introduced to explain the experimental observations.

Author

Pressure Effects; Pressure Dependence; Directional Solidification (Crystals); Cylindrical Bodies; Steady State; Nitrogen

20080036434 Massachusetts Inst. of Tech., Cambridge, MA USA

Performance Limiting Flow Processes in High-State Loading High-Mach Number Compressors

Tan, Choon S; Mar 13, 2008; 67 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0050

Report No.(s): AD-A481823; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481823>

In high-stage loading high-Mach number (HLM) compressors, counter-rotating pairs of discrete vortices are shed at the trailing edge of the upstream blade row at a frequency corresponding to the downstream rotor blade passing frequency. This is a consequence of an alternating change in blade loading caused by the passage of shocks or compression waves emanating from the downstream rotor. While this effect is present at any Mach number the combination of high loading and high Mach number mean that the attenuation of the rotor pressure field with upstream distance is much less than at either lower loading or subsonic Mach numbers, i.e., the upstream extent of rotor influence is a generic feature for HLHM compressors. Computations and physical arguments have shown that the pitchwise location at which these discrete vortices enter the rotor passage has a substantial impact on the rotor performance, for example work input and entropy (loss) generation. The features of the effect have been characterized by a reduced frequency parameter defined as the ratio of convective time for the vortex to travel from trailing edge of the upstream blade-row to the leading edge of downstream rotor to vortex shedding time (rotor blade passing time). Thus a change in inter-blade-row spacing, rotor wheel speed, through-flow velocity in the intrastator /vane-rotor gap, rotor pitch, and shock angle would result in rotor performance change. The flow in a two-dimensional diffuser subjected to a wake and jet is used to provide a physical context explaining the response of the rotor performance to the discrete wakes. This provides a more direct avenue for establishing the scaling of rotor performance change, appropriately non-dimensionalized, in terms of the reduced frequency, Mach number and characteristics of discrete vortices (i.e. its strength and Size).

DTIC

Compressors; Flow; Mach Number

20080036438 Stanford Univ., Stanford, CA USA

Subpipe Project

Bradshaw, Peter; Jul 2007; 3 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0240

Report No.(s): AD-A481827; TAAAC-26848; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481827>

The purpose of this project was to examine the effect of surface roughness on a turbulent wall flow, in the limit of small

roughness. It is, in effect, an attempt to throw light on experimental results dating from 1933, which appear to have been misinterpreted ever since as the result of an imprecise statement in the original (German) report by Nikuradse (a.k.a. Nikuradze) and its translations. It was stated that below a certain Reynolds number, based on the (sand-grain) roughness height and the friction velocity, the roughness had 'no effect' on the friction factor (i.e. no effect on the additive constant in the logarithmic law for velocity). All that can be deduced from the plotted results is that the effect became smaller than the experimental scatter, and there is no reason to suppose that the roughness effect depends on instability above some 'critical' Reynolds number - particularly as later estimates of this Reynolds number are very low.

DTIC

Surface Roughness; Turbulent Flow

20080036439 Army Engineer Research and Development Center, Vicksburg, MS USA

A 2D Unstructured Dam-Break Model: Formulation and Validation

Ying, Xinya; Jorgeson, Jeff; Yang, Sam S; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-04-1-0048

Report No.(s): AD-A481832; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481832>

Two-dimensional simulations of dam-break flows using finite volume method and approximate Riemann solvers for computing the intercell fluxes have drawn growing attentions because of their robustness and abilities to handle mixed flows and discontinuities. Such models usually require complicated algorithms for treating source terms and second-order schemes for computing the intercell fluxes in order to gain numerically balanced solutions and accuracy, which often results in an excessively long computational time. With a view of developing an accurate and efficient model for real-life applications, this paper proposed a finite volume method, which uses the first-order HLL approximate Riemann solver for computing intercell fluxes and adopts the conservative form of the momentum equations with one source term representing the driving forces in each equation. Such treatment can easily eliminate numerical imbalance between source and flux terms without introducing complicated algorithms. The accuracy and improvement in computational efficiency of the newly developed model are demonstrated by means of a real-life test example.

DTIC

Dams; Flow Velocity; Simulation

20080036641 Texas A&M Univ., College Station, TX USA

Second Moment Closure Modeling of Complex Turbulent Flows

Girimaji, Sharath S; Dec 31, 2007; 47 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0177

Report No.(s): AD-A482166; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Turbulence subject to unsteady forcing can exhibit novel features that cannot be explained using the well-known steady-turbulence paradigm. Modeling and prediction of such statistically unsteady flows are important in many practical AFOSR applications: turbine flows, wake-flows with vortex shedding, etc. Further, many flow control strategies depend upon the knowledge of unsteady turbulence dynamics to achieve the desired objectives. However, our understanding of unsteadily-forced turbulence dynamics or our ability to predict them is inadequate.

DTIC

Turbulent Flow; Viscous Flow

20080036647 Texas A&M Univ., College Station, TX USA

A Model for the Propagation of Nonlinear Surface Waves over Viscous Muds

Kaihatu, James M; Sheremet, Alexandru; Holland, K T; Jul 5, 2007; 14 pp.; In English

Report No.(s): AD-A482175; NRL/JA/7320-06-6266; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effect of a thin viscous fluid -mud layer on nearshore nonlinear wave-wave interactions is studied using a parabolic frequency-domain nonlinear wave model, modified to incorporate a bottom dissipation mechanism based on a viscous boundary layer approach. The boundary-layer formulation allows for explicit calculation of the mud-induced wave damping rate. The model performed well in tests based on laboratory data. Numerical tests show that damping of high frequency waves

occurs, mediated by ‘difference’ nonlinear interactions. Simulations of 2-dimensional wave propagation over a mud ‘patch’ of finite extent show that the wave dissipation causes significant downwave diffraction effects.

DTIC

Nonlinearity; Surface Waves; Viscous Flow; Wave Propagation

35

INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation and Astrionics*.

20080034734 Humphreys Engineer Center, Alexandria, VA, USA

Device for Determining Changes in Dimension Due to Temperature Fluctuation

Korhonen, C. J., Inventor; 16 Sep 04; 11 pp.; In English

Patent Info.: Filed 16 Sep 04; US-Patent-Appl-SN-10-941 958

Report No.(s): PB2008-101165; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An apparatus for non-destructively testing the response of a specimen to temperature change. An embodiment temperature cycles a specimen, such as a wet mortar beam, dynamically measuring change in dimension and the temperature of the specimen during the cycle. Among other elements, the apparatus employs an accelerometer, a thermistor, a thermocouple, a temperature controller, linear variable differential transducers (LVDTs), an FET device, a data logger and a heat tape controller. A typical cycle involves using liquid nitrogen to reduce the temperature in an insulated test chamber from ambient to less than -60 degrees C and returning to ambient by dispersing the nitrogen with a source of ambient air. Further, in select embodiments, the apparatus measures fundamental frequencies induced by a micro-hammer as measured transversely along a dimension of a specimen during the cooling-warming cycle. Also provided is a method for testing specimens using devices representative of embodiments of the present invention.

NTIS

Detectors; Materials Tests; Nondestructive Tests; Temperature Effects; Mortars (Material)

20080034744 Snider and Associates, Washington, DC, USA

Method and Apparatus for Radiation Detection

Tumer, T. O., Inventor; 28 Jan 05; 34 pp.; In English

Contract(s)/Grant(s): DASG60-92-C-00200; DAAA21-93-C-1014

Patent Info.: Filed 28 Jan 05; US-Patent-Appl-SN-11-044 207

Report No.(s): PB2008-100779; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An imaging system for imaging a living organism that is treated with a radionuclide emitting positrons is provided. A portion of the emitted positrons create photons within said living organism. The living organism is placed between first and second detection systems, which are diametrically opposed. The first and second detection systems are comprised of a plurality of position sensitive detectors. A portion of said photons are detected within said detection systems. A multi-channel readout system is coupled to the position sensitive detectors. A display system is coupled to the multi-channel readout system and includes a processor which determines directions of the portion of said photons.

NTIS

Radiation Detectors; Imaging Techniques; Display Devices

20080034803 UT-Battelle, LLC, Oak Ridge, TN, USA

Gold Thiolate and Photochemically Functionalized Microcantilevers Using Molecular Recognition Agents

Boiadjev, V. I., Inventor; Brown, G. M., Inventor; Pinnaduwege, L. A., Inventor; Thundat, T. G., Inventor; Bonnesen, P. V., Inventor; 14 Jun 05; 17 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed 14 Jun 05; US-Patent-Appl-SN-11-152 627

Report No.(s): PB2008-101172; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Highly sensitive sensor platforms for the detection of specific reagents, such as chromate, gasoline and biological species, using microcantilevers and other microelectromechanical systems (MEMS) whose surfaces have been modified with photochemically attached organic monolayers, such as self-assembled monolayers (SAM), or gold-thiol surface linkage are

taught. The microcantilever sensors use photochemical hydrosilylation to modify silicon surfaces and gold-thiol chemistry to modify metallic surfaces thereby enabling individual microcantilevers in multicantilever array chips to be modified separately. Terminal vinyl substituted hydrocarbons with a variety of molecular recognition sites can be attached to the surface of silicon via the photochemical hydrosilylation process. By focusing the activating UV light sequentially on selected silicon or silicon nitride hydrogen terminated surfaces and soaking or spotting selected metallic surfaces with organic thiols, sulfides, or disulfides, the microcantilevers are functionalized. The device and photochemical method are intended to be integrated into systems for detecting specific agents including chromate groundwater contamination, gasoline, and biological species.

NTIS

Gold; Microelectromechanical Systems; Photochemical Reactions; Sensors; Detection; Reagents

20080035118 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Chemical Detection Patches 2007

Kievit, O.; Zappey, H. W.; deKoning, M. C.; Alkema, D. P. W.; May 2008; 21 pp.; In English

Contract(s)/Grant(s): TNO Proj. 032.12685

Report No.(s): TD2008-0061; TNO-DV-2008-A150; Copyright; Avail.: Other Sources

This report describes the results of a study on chemical detection patches. Several potential applications and technological solutions were evaluated, which yielded no strong preference. Future projects may be initiated on specific application-technology combinations, if desired. Research on the detection of organophosphates using fluorescent indicators showed that this does not work. Screening of several polymer matrix systems yielded one potential candidate material for application in chemical indicator coatings.

Author

Chemical Indicators; Polymer Matrix Composites; Coatings; Detectors

20080035119 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Superlattice Infrared Detectors - Literature Review

Bekman, H. H. P.; April 2008; 31 pp.; In English

Contract(s)/Grant(s): TNO Proj. 015.35441

Report No.(s): TD2008-0042; TNO-DV-2008-A112; Copyright; Avail.: Other Sources

This report contains a literature review on strained layer superlattice infrared detectors. After an introduction into superlattice infrared detectors a comparison is made between MCT and QWIP infrared detectors. An overview is given of the state of the art in infrared detectors and focal plane arrays made with superlattice structures.

Author

Focal Plane Devices; Infrared Detectors; Quantum Well Infrared Photodetectors; Superlattices

20080035190 Woods Hole Oceanographic Inst., MA USA

Acoustic Detection, Behavior, and Habitat Use of Deep-Diving Odontocetes

Johnson, Mark; Tyack, Peter; Aguilar, Natacha; Brito, Alberto; Madsen, Peter; Jan 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-07-1-0991

Report No.(s): AD-A480993; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480993>

Passive acoustic monitoring is a key enabling technology in mitigating the effects of Naval activities on sound-sensitive cetaceans. The goals of this project are to obtain and disseminate critical information needed for the design of acoustic monitoring systems. The primary objectives of the work are: 1. Develop and evaluate passive acoustic detection/classification methods for click and whistle sounds produced by deep-diving toothed whales. 2. Examine the relationships between diving, acoustic behavior, habitat use and group size with implications for acoustic detection and density estimation of toothed whales. 3. Correlate fine-scale oceanographic parameters with foraging behavior of tagged whales to predict habitat suitability and movement patterns.

DTIC

Detection; Diving (Underwater); Habitats; Sound Detecting and Ranging; Whales

20080035197 Chemimage Corp., Pittsburgh, PA USA

Demonstration of a Robot-Based Raman Spectroscopic Detector for the Identification of CBE Threat Agents

Gardner, C W; Treado, P J; Jochem, T M; Gilbert, G R; Nov 1, 2006; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-06-C-0010

Report No.(s): AD-A481010; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481010>

This paper describes the feasibility demonstration of a chemical, biological and explosive (CBE) detection system based on Raman spectroscopic measurements integrated to a commercially available unmanned ground vehicle (UGV) platform. Raman detection of CBE agents is reagentless and offers the ability to detect a broad range of threats in a single measurement and is well suited to remote operation. The performance of this sensor system for the detection of chemical and biological warfare agents was validated through comparison of results from a system performance model and from laboratory testing of a breadboard system. This breadboard was successfully integrated on a Joint Architecture for Unmanned Systems (JAUS)-compliant Remotec ANDROS Wolverine UGV and the ability of the unit to target and detect a biothreat simulant on a complex background was demonstrated. High-level detector functions, as well as the reporting of results to the operator were performed through the UGV wireless communications link to the operator control unit. This work has application to the remote detection of chemical, biological and explosive agents in military/civilian medical and emergency response applications.

DTIC

Detectors; Robots; Spectroscopy

20080035268 Army Night Vision Lab., Fort Belvoir, VA USA

Iterative Redeployment of Illumination and Sensing (IRIS): Application to STW-SAR Imaging

Marble, Jay; Raich, Raviv; Hero, Alfred O; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-02-1-0262

Report No.(s): AD-A481198; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481198>

A new technique which we call Iterative Redeployment of Illumination and Sensing (IRIS) is introduced and applied to See-Through-the-Wall radar imaging. IRIS is applicable to adaptive sensing scenarios where the medium is illuminated and measured multiple times using different illuminator/sensor configurations, e.g., position, bandwidth, or polarization. These configurations are adaptively selected to minimize uncertainty in the image reconstruction. The IRIS algorithm has the following features: (1) use of a sparse Bayesian image model that captures the free-space dominated propagation characteristics of interiors of man-made structures such as caves and residences; (2) iterative reconstruction of both an image and an image confidence map from the posterior likelihood in the form of a thresholded Landweber recursion, (3) use of the Bayesian model to predict the best redeployment configuration of the illuminator platform given the current image and confidence map. For the STW application we approximate the forward operator by a matrix formulation of wavenumber migration. A simulated STW application is provided that illustrates the IRIS algorithm.

DTIC

Detection; Imaging Techniques; Radar Equipment

20080035273 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Discriminating Sea Spikes in Incoherent Radar Measurements of Sea Clutter

de Wit, J J; Schouten, M W; Mar 2008; 36 pp.; In Dutch; In Dutch; In English; Original contains color illustrations

Report No.(s): AD-A481206; TNO-DV-2008-A067; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481206>

In this report, the results of an inventory of sea spike characteristics is given. Furthermore, the possibility to detect sea spikes with standard ship navigation radars is explored. In literature it was found that the most distinct properties of sea spikes are the sudden increase in polarization ratio MH/VV and Doppler velocity. These properties cannot be measured with current navigation radars, but future navigation radars will be coherent. It is therefore worthwhile to investigate the added value of using coherent sea clutter data in the sea spike detection and classification process.

DTIC

Clutter; Discrimination; Incoherence; Oceanographic Parameters; Radar Equipment; Radar Measurement; Seas; Ships

20080035326 Naval Postgraduate School, Monterey, CA USA

TNT Maritime Interdiction Operation Experiments: Enabling Radiation Awareness and Geographically Distributed Collaboration for Network-Centric Maritime Interdiction Operations [Preprint]

Bordetsky, Alex; Dougan, Arden; Chiann, Foo Y; Kilberg, Andres; Jun 2007; 93 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): AD-A481233; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The paper addresses technological and operational challenges of developing a global plug-and-play Maritime Domain Security testbed. This joint Naval Postgraduate School (NPS)-Lawrence Livermore National Laboratory (LLNL) project, supported by partners from Sweden, Austria, and Singapore is based on the NPS Tactical Network Topology (TNT) comprised of long-haul OFDM networks combined with self-forming wireless mesh links to radiation detection sensors, and real-time radiation awareness collaboration with geographically distributed partners. In the center of our discussion are networking, sensor, and collaborative solutions for the Maritime Interdiction Operation (MIO) Experiments in which geographically distributed command centers and subject matter experts collaborate with the Boarding Party in real time to facilitate situational understanding and course of action selection. The most recent experiment conducted in the San Francisco Bay jointly with partners from Sweden, Singapore, and Austria proved feasibility and good potential of the proposed key technologies aimed at improving MIO.

DTIC

Communication Networks; Detection; Military Operations; Radioactive Materials

20080035374 Army Research Lab., Adelphi, MD USA

Photon Counting Chirped AM Ladar: Concept, Simulation, and Experimental Results

Redman, Brian; Ruff, William; Giza, Mark; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481357; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The operating principles and experimental results for the Army Research Laboratory's (ARL's) patented chirped amplitude modulation (AM) ladar using linear response detectors have been presented and published previously, and will be briefly summarized here (Stann, et. al., 1996). In ARL's current prototypes using unity gain detectors, amplifier noise limits the receiver sensitivity. This noise is well above the signal shot noise limit. We are developing a method using Geiger-mode avalanche photodiode (Gm-APD) photon counting detectors in the chirped AM ladar receiver to yield sensitivities approaching the shot noise limit. Such sensitivities represent about four orders-of-magnitude improvement over the sensitivities of the currently used unity-gain, opto-electronic mixing (OEM) metal-semiconductor-metal (MSM) detectors. The sensitivity improvement demonstrated by the photon counting chirped AM ladar experiments may enable very compact, low power, eye-safe, and/or long range ladars with low cost, low bandwidth readout integrated circuits (ROICs).

DTIC

Amplitude Modulation; Counting; Optical Radar; Photons; Simulation

20080035385 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Adaptive Target-Scale-Invariant Hyperspectral Anomaly Detection

Romano, Joao M; Rosario, Dalton; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481398; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Ground to ground, sensor to object viewing perspective presents a major challenge for autonomous window based object detection, since object scales at this viewing perspective cannot be approximated. In this paper, we present a fully autonomous parallel approach to address this challenge. Using hyperspectral (HS) imagery as input, the approach features a random sampling stage, which does not require secondary information (range) about the targets; a parallel process is introduced to mitigate the inclusion by chance of target samples into clutter background classes during random sampling; and a fusion of results. The probability of sampling targets by chance within the parallel processes is modeled by the binomial distribution family, which can assist on tradeoff decisions. Since this approach relies on the effectiveness of its core algorithmic detection technique, we also propose a compact test statistic for anomaly detection, which is based on a principle of indirect comparison. This detection technique has shown to preserve meaningful detections (genuine anomalies in the scene) while significantly reducing the number of false positives (e.g. transitions of background regions). To capture the influence of parametric changes using both the binomial distribution family and actual HS imagery, we conducted a series of rigid statistical experiments and present the results in this paper.

DTIC

Anomalies; Detection; Imagery; Target Acquisition; Targets

20080035393 Army Communications-Electronics Command, Fort Belvoir, VA USA

3rd Generation Thermal Imager Sensor Performance

Hodgkin, Van A; Driggers, Ronald G; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481411; No Copyright; Avail.: Defense Technical Information Center (DTIC)

3rd Generation FLIR (3rd Gen) is defined as a dual band (MWIR and LWIR) thermal imager. It is targeted to be one of the principle sensor systems for the Army's Future Combat System (FCS), Stryker, and Airborne Reconnaissance System. In early 2005, the Night Vision and Electronic Sensors Directorate (NVESD) created a large scale project to research and quantify the potential benefits of a 3rd Gen FLIR. This research was partitioned up into multiple individual studies, each of which is focused on a particular technical area, i.e., topic, to quantify its impact on the performance of a 3rd Gen FLIR. The set of topics include long range target identification (ID), aided target recognition (AiTR), apparent high temperature (T) sources of clutter, target and background contrasts and signatures, conventional and urban search and detection, advanced signal processing, cold weather, atmospheric turbulence, sensor integration time, camouflage, spectral signature differences, smoke, pilotage, wet targets, laser susceptibility, and path radiance. Whenever possible and appropriate, actual MWIR and LWIR imagery were used as inputs in the applicable physics (or psycho-physics) models. Even though every attempt was made to partition a research project of this size and scope into individual, independent components of an n-dimensional parameter space, it was obvious that there were varying degrees of dependence amongst and between these topics. In each of these studies, specific benefit of 3rd Gen FLIR was assessed from either the direct or indirect impact upon target discrimination task performance.

DTIC

FLIR Detectors; Infrared Instruments; System Effectiveness; Temperature Effects

20080035397 Pennsylvania State Univ., University Park, PA USA

Through Wall Surveillance Using Ultrawideband Random Noise Radar

Lai, C P; Narayanan, R M; Culkowski, G; Nov 2006; 9 pp.; In English

Report No.(s): AD-A481425; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent terrorist activities and law-enforcement situations involving hostage situations underscore the need for effective through-wall detection. Current building interior imaging systems are based on short-pulse waveforms, which require specially designed antennas to subdue unwanted ringing. In addition, periodically transmitted pulses of energy are easily recognizable by the intelligent adversary who may employ appropriate countermeasures to confound detection. A non-coherent polarimetric random noise radar architecture is being developed based on ultrawideband (UWB) technology and software defined radio, which has great promise in its ability to covertly detect obscured targets. The main advantages of the random noise radar lie in two aspects: first, random noise waveform has an ideal thumbtack ambiguity function, i.e., its down range and cross range resolution can be separately controlled, thus providing unambiguous high resolution imaging at any distance; second, random noise waveform is inherently low probability of intercept (LPI) and low probability of detection (LPD), i.e., it is immune from detection, jamming, and interference. Thus, it is an ideal candidate sensor for covert imaging of obscured regions in hostile environments. Other than those advantages, we also suffer some real problems that we lack of the back scattering information in the strong clutter and interference environment and most of the previous through wall studies are based on the research of light cluttered environment. This paper presents the radar system design, simulation study, measurements, and data analysis.

DTIC

Radar; Random Noise; Surveillance; Walls

20080035405 Oakland Univ., Rochester, MI USA

Magnetic Sensor for Detection of Ground Vehicles Based on Microwave Spin Wave Generation in Ferrite Films

Slavin, A; Tiberkevich, V; Bankowski, E; Nov 2006; 5 pp.; In English

Report No.(s): AD-A481438; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We propose to use the magnetic signatures, formed either by the residual magnetization or by deformation of the local Earth's magnetic field by large metal masses, for distant detection of ground vehicles. Measuring this weak magnetic field would allow one to determine the position, type, and velocity of the vehicle. Wirelessly transmitting data from the net of such detectors and processing the obtained information at the central processing computer will enable one to determine the number of ground vehicles and their individual characteristics in a group. The problem of vehicle detection is of great importance for both the combat and civil applications. The usual radio and microwave frequency radar technologies, which are successfully used for the detection of flying objects, have a limited application for the solution of this problem, due to a strong noise signal

created by other surface objects (like buildings and trees) and by the Earth surface itself. The proposed magnetic sensor will not be affected by the weather conditions, such as snow, fog, or rain. It can be used in urban setting.

DTIC

Ferrites; Magnons; Microwaves; Wave Generation

20080035417 Army Communications-Electronics Command, Fort Monmouth, NJ USA

An Optical Network Integration Platform Based on Holographic Super-Dense WDM Filters

Shahriar, M S; Andrews, M; Tseng, S; Kuykendall, J; Meshal, A; Valletero, N; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481464; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have demonstrated the feasibility of realizing an Optical Network Integration Platform (ONIP) that would address the requirements of the Army's FCS and WIN-T programs. The breakthrough networking capabilities represented by this technology is in the ability to filter and multiplex extremely narrow optical channels, on the order of 10 GHz at bandwidths of 5 GHz each and the ability to increase significantly the number of channels that can be carried on a fiber or free space optical transmission facility. The ONIP is a generic, scalable networking device that accepts inputs from wired, wireless or free-space and fiber based communications networks. The design of the ONIP is based on the use of ultra-narrow band, thick holographic filters. Briefly, each filter can combine two optical channels, separated by a frequency as small as 10 GHz. At the input port of the ONIP, two optical frequencies are first combined using a single filter. This is followed by another filter, which combines the first two frequencies with a third frequency. By repeating this process, (N-1) gratings can be used to combine N optical frequencies, representing N input channels. On the output port, this process is reversed. We have successfully demonstrated a six-channel ONIP using thick holographic gratings. The frequencies of the lasers used for this ONIP were each close to 1550 nm, but all distinct from each other. The laser frequencies were controlled using a combination of current and temperature. We have demonstrated channel multiplexed optical communication with this ONIP, using direct modulations as well as wireless devices. The bandwidths of the gratings used for this proof-of principle system were not very narrow --- each about 50 GHz. However, very recently, we have succeeded in making much narrower gratings (close to 10 GHz).

DTIC

Communication Networks; Holography; Optical Properties

20080035423 Applied Science Innovations, Inc., Troy, NY USA

Automatic Thermal Infrared Panoramic Imaging Sensor

Gutin, Mikhail; Tsui, Eddy K; Gutin, Olga; Wang, Xu-Ming; Gutin, Alexey; Nov 2006; 9 pp.; In English

Contract(s)/Grant(s): W15QKN-04-C-1132

Report No.(s): AD-A481479; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Panoramic cameras offer true real-time, 360-degree coverage of the surrounding area, valuable for a variety of defense and security applications, including force protection, asset protection, asset control, security including port security, perimeter security, video surveillance, border control, airport security, coastguard operations, search and rescue, intrusion detection, and many others. Automatic detection, location, and tracking of targets outside protected area ensures maximum protection and at the same time reduces the workload on personnel, increases reliability and confidence of target detection, and enables both man-in-the-loop and fully automated system operation. Thermal imaging provides the benefits of all-weather, 24-hour day/night operation with no downtime. In addition, thermal signatures of different target types facilitate better classification, beyond the limits set by camera's spatial resolution. The useful range of catadioptric panoramic cameras is affected by their limited resolution. In many existing systems the resolution is optics-limited. Reflectors customarily used in catadioptric imagers introduce aberrations that may become significant at large camera apertures, such as required in low-light and thermal imaging. Advantages of panoramic imagers with high image resolution include increased area coverage with fewer cameras, instantaneous full horizon detection, location and tracking of multiple targets simultaneously, extended range, and others. The Automatic Panoramic Thermal Integrated Sensor (APTIS), being jointly developed by Applied Science Innovative, Inc. (ASI) and the Armament Research, Development and Engineering Center (ARDEC) combines the strengths of improved, high-resolution panoramic optics with thermal imaging in the 8 - 14 micron spectral range, leveraged by intelligent video processing for automated detection, location, and tracking of moving targets. The work in progress supports the Future Combat Systems (FCS) and the In

DTIC

Infrared Imagery; Panoramic Cameras; Targets; Thermal Mapping

20080035551 University of Southern California, Marina del Rey, CA USA

Concave Surround Optics for Rapid Multi-View Imaging

Jones, A; Debevec, P; Bolas, M; McDowall, I; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481474; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Many image-based modeling and rendering techniques involve photographing a scene from an array of different viewpoints. Usually, this is achieved by moving the camera or the subject to successive positions, or by photographing the scene with an array of cameras. In this work, we present a system of mirrors to simulate the appearance of camera movement around a scene while the physical camera remains stationary. The system thus is amenable to capturing dynamic events avoiding the need to construct and calibrate an array of cameras. We demonstrate the system with a high speed video of a dynamic scene. We show smooth camera motion rotating 360 degrees around the scene. We discuss the optical performance of our system and compare with alternate setups.

DTIC

Cameras; Imaging Techniques; Mirrors

20080035591 Army Research Lab., Adelphi, MD USA

Numeric Simulations for Sensing Through the Wall Radar

Dogaru, Traian; Le, Calvin; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper presents numeric simulations related to sensing through the wall radar technologies. Our computational approaches include the Finite Difference Time Domain (FDTD) algorithm and the shooting and bouncing ray technique (Xpatch). We analyze the radar signatures of the human body and other objects, in free-space and inside a room. The emphasis is on radar scattering phenomenology, with results presented as Radar Cross Section (RCS) and Synthetic Aperture Radar (SAR) images.

DTIC

Algorithms; Detection; Radar Signatures; Scattering; Simulation; Walls

20080036080 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Quantum Well Intrasubband Photodetector for Far Infrared and Terahertz Radiation Detection

Ting, David Z. -Y.; Chang, Yia-Chung; Bandara, Sumith V.; Gunapala, Sarath D.; Applied Physics Letters; August 14, 2007; Volume 91, Issue 7; 3 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40918>; <http://dx.doi.org/10.1063/1.2770766>

The authors present a theoretical analysis on the possibility of using the dopant-assisted intrasubband absorption mechanism in quantum wells for normal-incidence far infrared/terahertz radiation detection. The authors describe the proposed concept of the quantum well intrasubband photodetector (QWISP), which is a compact semiconductor heterostructure device compatible with existing GaAs focal-plane array technology, and present theoretical results demonstrating strong normal-incidence absorption and responsivity in the QWISP.

Author

Quantum Well Infrared Photodetectors; Far Infrared Radiation; Submillimeter Waves

20080036084 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Optical Design of a Compact Imaging Spectrometer for Planetary Mineralogy

Mouroulis, Pantazis; Sellar, R. Glenn; Wilson, Daniel W.; Shea, James J.; Green, Robert O.; Optical Engineering; June 29, 2007; Volume 46, No. 6; 9 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40926>

We present the design of a compact, wide-angle pushbroom imaging spectrometer suitable for exploration of solar system bodies from low orbit. The spectrometer is based on a single detector array with a broadband response that covers the range 400 to 3000 nm and provides a spectral sampling of 10 nm. The telescope has a 24-deg field of view with 600 spatially resolved elements (detector pixels). A specially designed convex diffraction grating permits optimization of the signal-to-noise ratio through the entire spectral band. Tolerances and design parameters permit the achievement of high uniformity of response through field and wavelength. The spectrometer performance is evaluated in terms of predicted spectral and spatial response

functions and from the point of view of minimizing their variation through field and wavelength. The design serves as an example for illustrating the design principles specific to this type of system.

Author

Imaging Spectrometers; Functional Design Specifications; Design Analysis; Planetary Composition; Planetary Geology; Mineralogy

20080036444 Army Research Lab., Adelphi, MD USA

Revolutionizing Doppler Radar With RF-Photonics

Zhou, Weimin; Li, Ming-Chiang; Okusaga, Olukayode; Stead, Michael; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481846; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481846>

We will discuss how to fundamentally improve radar systems by using RF-photonics in two ways: 1). Using a fiber-optic recirculation loop based interferometer to realize true correlation. It is an optimum extra-wideband radar receiver capable of measuring Doppler beating with a single pulse. This eliminates Doppler range ambiguity. In addition, micro-Doppler signatures of any target become clearly recognizable for passive identification to prevent fratricide. 2). Further reduce the phase noise in an ultra-low-phase-noise opto-electronic oscillator (OEO) by eliminating RF amplifiers in the OEO loop to meet the requirement for low-speed Doppler detection and weak signal detection.

DTIC

Doppler Radar; Photonics; Radio Frequencies

20080036579 National Taiwan Univ., Taipei, Taiwan, Province of China

Ultra-Fast Image Sensor Using Ge on Insulator MIS/Schottky Detectors

Liu, Chee-Wee; May 28, 2008; 26 pp.; In English

Contract(s)/Grant(s): FA4869-06-1-0068

Report No.(s): AD-A481999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Ge-on-insulator has been fabricated by wafer bonding and smart-cut. The MIS structure leads to simple fabrication process as compared to the conventional PIN structure. Due to the small band gap of Ge, 1.3 microns and 1.55 microns infrared beside 850 nm can be detected. The low parasitics of GOI structure also increase the detection speed. The large work function metal (Pt) is used for the gate electrode to reduce the dark current of the MIS tunneling diode. Chemical etching is an effective method to remove the implantation damage in order to reduce the dark current and increase the responsivities of visible light. The major achievements are: 1. Thin film Ge on oxide on Si has been demonstrated with smart-cut and wafer bonding at low temperature as low as 150 deg. C, and the detector has been fabricated using simple MIS structure. 2. Responsivity up to 0.2 A/W can be obtained for 850 nm and 1.3 microns infrared. 3. The dark current of the GOI MIS detector at -2 V can be decreased by a factor of 18 as compared to the GOI SB detector. 4. External mechanical strain can further enhance the photo current, while the dark current variation is smaller than 2 %. 5. Higher operational speed can be achieved with a Ge-on-insulator detector as compared to the bulk Ge detector. 6. Thin film Ge can be used for visible light detection. The red- and green- responses have been measured.

DTIC

Germanium; Insulators; Photometers; Thin Films

20080036593 Naval Surface Warfare Center, Bethesda, MD USA

Evaluation of the Performance of the LCC Windows for Use in Laser Doppler Velocimetry

Chesnakas, Christopher J; May 2008; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482041; NSWCCD-50-TR-2008/031; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In order to get improved Laser Doppler Velocimeter (LDV) measurements in the LCC, two glass windows were acquired. The windows were specified to have surface and material quality suitable for quantitative LDV measurements, and much higher than that achievable with existing acrylic windows. Quantitative LDV measurements were taken of the flow in the

empty channel both through the new glass window and through an acrylic window in order to compare window performance. The glass windows were found to show benefits for use with LDV in increased measurement accuracy, increased access to the flowfield, decreased time to obtain measurements, and increased capability to make spectral measurements.

DTIC

Doppler Effect; Laser Doppler Velocimeters

20080036611 California Univ., Santa Barbara, CA USA

Multi-Disciplinary Ocean Sensors for Environmental Analyses and Networks (MOSEAN)

Dickey, T; Hanson, A; Karl, D; Moore, C; Jan 2004; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N000140210941

Report No.(s): AD-A482102; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Multi-disciplinary Ocean Sensors for Environmental Analyses and Networks (MOSEAN) project has the long-term goal of developing and testing new technologies that will lead to increased observations that are essential for solving a variety of interdisciplinary oceanographic problems of societal importance. These include: biogeochemical cycling, climate change effects, ocean pollution, harmful algal blooms (HABs), ocean ecology, and underwater visibility. The collective MOSEAN sensors will be able to sample key variables that are vital to solve problems in nearshore to coastal to open ocean environments. The overall objective of MOSEAN is to produce new sensors that will be able to sample key variables that are vital to solve interdisciplinary oceanographic problems in virtually all ocean environments. To accomplish this objective, the MOSEAN partnership is developing, interfacing, testing, and demonstrating new interdisciplinary sensor suites. Measurements with emerging biological, chemical, and optical sensors are the primary focus of the study. The sensors and systems are being designed for use with a variety of autonomous, unattended sampling platforms including both stationary-type (e.g., moorings, offshore platforms, and towers) and mobile-type (e.g., moored profilers, autonomous underwater vehicles (AUVs), gliders, drifters, and profiling floats). The MOSEAN sensors and systems will be capable of measuring key chemical, biological, and optical variables to complement physical data suites on time scales as short as minutes and space scales down to a meter for periods on order of months and horizontal space scales on order of 100's of kilometers. The sensors are being designed with capabilities of real-time and/or near real-time data telemetry.

DTIC

Detectors; Marine Environments; Oceanography; Oceans

20080036613 Missile Defense Agency, Washington, DC USA

Proposed U.S. Missile Defense Assets in Europe

Jun 2007; 13 pp.; In English

Report No.(s): AD-A482105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Some of the world's most dangerous and unpredictable regimes either have already acquired, or are attempting to acquire, weapons of mass destruction (WMD). These regimes also are developing and/or acquiring ballistic missiles of increasing ranges, payloads, lethality, and sophistication as a means of delivery. In the future, these regimes could use these asymmetric weapons to pursue their objectives through force, coercion, and/or intimidation as they have done in the past. Today's ballistic missile threat from potentially hostile states is fundamentally different from Cold War era threats and risks. In response, the USA is fielding limited and purely defensive capabilities. In our comprehensive strategy to combat WMD, missile defense is just one element of a multi-faceted approach, which includes diplomacy, export controls, threat reduction assistance, nonproliferation regimes, and counter-proliferation programs. At the same time, missile defense is our ultimate insurance policy if the other elements of our strategy fail. History has taught us that the free world will be challenged by military surprises as well as failures in diplomacy, intelligence, and deterrence. Given this reality, missile defenses have become highly desirable because they both reinforce deterrence and hedge against its failure. Because of the expanding ballistic missile threat, it is essential that we develop and deploy missile defenses capable of protecting not only the USA and our deployed forces, but also our friends and allies. Trans-atlantic security is indivisible. If Europe is not secure, the USA is not secure. To ensure our common security, we need defenses stationed and operational in Europe before a threat fully emerges. For this reason, negotiations are currently underway to locate up to 10 silo-based long-range missile defense interceptors in Poland and a midcourse tracking and discrimination radar in the Czech Republic.

DTIC

Antimissile Defense; Ballistic Missiles; Destruction; Europe; Missile Defense; Missile Tracking; Radar Tracking

20080036626 Naval Research Lab., Washington, DC USA

X-Ray Diffraction Analysis of Lateral Composition Modulation in InAs/GaSb Superlattices Intended for Infrared Detector Applications

Stokes, D W; Forrest, R L; Li, J H; Moss, S C; Nosh, B Z; Bennett, B R; Whitman, L J; Goldenberg, M; Aug 2003; 5 pp.; In English

Contract(s)/Grant(s): DMR-0099573

Report No.(s): AD-A482131; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Lateral compositional modulation in a (InAs)₁₃/(GaSb)₁₃ superlattice grown by molecular beam epitaxy for infrared detector applications has been investigated using high resolution X-ray diffraction. X-ray diffraction reciprocal space maps exhibit distinct lateral satellite peaks about the vertical superlattice peaks; however, the pattern is tilted with respect to the (001) direction. This tilt is directly related to the stacking of the layers as revealed by cross-sectional scanning tunnelling microscopy (XSTM) images. XSTM shows the morphology of the structure to consist of InAs- and GaSb-rich regions with a modulation wavelength of ~1200Å and a lateral composition wavelength of 554 ± 3 Å. The modulation only occurs along one in-plane direction, resulting in InAs 'nanowires' along the [11 0] direction, which are several microns long.

DTIC

Gallium Antimonides; Infrared Detectors; Modulation; Superlattices; X Ray Diffraction

20080036640 Naval Research Lab., Bay Saint Louis, MS USA

Turbidity and Suspended Solids Levels and Loads in a Sediment Enriched Stream: Implications for Impacted Lotic and Lentic Ecosystems

Prestigiacomo, Anthony R; Effier, Steven W; O'Donnell, David; Hassett, James M; Michalenko, Edward M; Lee, Zhongping; Weidemann, Alan; Jan 2007; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482164; NRL/JA/7330-06-6310; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The implementation of an automated stream monitoring unit that features four probe-based turbidity (T_n) measurements per hour and the capability to collect frequent (e.g., hourly) samples for total suspended solids (TSS) analyses during runoff events to assess the dynamics of T_n, TSS and corresponding loads in sediment-rich Onondaga Creek, NY, was documented. Major increases in both T_n (maximum of 3,500 NTU) and TSS (maximum of 1630 mg/L) were reported for the stream during runoff events. Relationships between T_n, TSS and stream flow (Q) were developed and applied to support estimates of TSS loading (TSSL). T_n was demonstrated to be a better predictor of TSS than Q, supporting the use of the frequent field T measurements to estimate TSSL. During the year of intensive monitoring, 65% of the TSSL was delivered during the six largest runoff events that represented 18% of the annual flow. The high T_n levels and extensive in-stream deposition have negatively impacted the stream's biota and the esthetics of a downstream harbor. Onondaga Creek is reported to be the dominant allochthonous source of inorganic particulate material to downstream Onondaga Lake. These sediment inputs have important implications for the lake, within the context of two on-going rehabilitation programs aimed at contaminated lake sediments and the effects of extreme cultural eutrophication, by contributing substantially to sedimentation and turbidity. A satellite image documented the occurrence of a conspicuous turbidity plume that emanated from Onondaga Creek following a minor runoff event, suggesting such an effect is common and that related impacts are not spatially uniform.

DTIC

Ecosystems; Enrichment; Loads (Forces); Satellite Imagery; Sediments; Solids; Turbidity

20080036648 Naval Research Lab., Bay Saint Louis, MS USA

Deriving Sea Surface Salinity and Density Variations from Satellite and Aircraft Microwave Radiometer Measurements: Application to Coastal Plumes Using STARRS

Burrage, Derek; Wesson, Joel; Miller, Jerry; Cabarro, C; Font, J; Camps, A; Piola, A; Nov 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-02-1-0295

Report No.(s): AD-A482176; NRL/JA/7330--05-6080; NRL/JA/7330-07-7162; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using brightness temperature T_b measurements from L-band airborne microwave radiometers, with independent sea surface temperature (SST) observations, sea surface salinity (SSS) can be remotely determined with errors of about 1 psu in temperate regions. Nonlinearities in the relationship between T_b, SSS and SST produce variations in the sensitivity of salinity S to variations in T_b and SST. Despite significant efforts devoted to SSS remote sensing retrieval algorithms, little consideration has been given to deriving density D from remotely sensed SSS and SST. Density is related to S and T through the equation of state. It affects the ocean's static stability and its dynamical response to forcings. By chaining together two

empirical relationships (flat-sea emissivity and equation of state) to form an inversion algorithm for sea surface density (SSD) in terms of Tb and SST, we develop a simple L-band SSD retrieval algorithm. We use this to investigate the sensitivity of SSD retrievals to observed Tb and SST and infer errors in D for typical sampling configurations of the airborne Salinity, Temperature, And Roughness Remote Scanner (STARRS) and satellite-borne Soil Moisture and Ocean Salinity (SMOS) and Aquarius radiometers. We then derive D from observations of river plumes obtained using STARRS and demonstrate several oceanographic applications: the observations are used to study variations in T and S effects on D in the Mississippi plume, and the across-shelf density gradient is used to infer surface geostrophic shear and subsurface geostrophic current in the Plata plume. Future basin-scale applications of SSD retrievals from satellite-borne microwave radiometers such as SMOS and Aquarius are anticipated.

DTIC

Coasts; Microwave Radiometers; Ocean Surface; Plumes; Remote Sensors; Salinity; Surface Temperature

20080036653 Center for Signals and Waves, Austin, TX USA

Realizing Sources for Electromagnetic Wavelets and Implementing the Wavelet Radar Concept

Kaiser, Gerald; Jan 4, 2008; 39 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0139

Report No.(s): AD-A482184; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electromagnetic wavelets designed for applications to radar and communications have been constructed and their charge current sources have been computed. It has been suggested that optimal antennas for radiating and receiving such wavelets are oblate spheroidal shells.

DTIC

Antennas; Electromagnetic Radiation; Radar Receivers; Wavelet Analysis

36

LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

20080035237 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Production and Characterization of Femtosecond-Laser-Induced Air Plasma

Armbruster, David R; Mar 2008; 56 pp.; In English

Report No.(s): AD-A481115; AFIT/GAP/ENP-08-M01; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481115>

The purpose of this research was to produce, characterize, and optimize laser-induced air plasma as a preliminary step in using the plasma as a source of terahertz radiation. An 800 nanometer, 50 femtosecond, 0.75 Watt, pulsed Ti:Sapphire laser system was used as the source infrared beam. A beam expander was used to expand the beam to a diameter of approximately 6.5 mm, and the beam was focused through a 25 mm focal length achromatic lens to produce laser-induced plasma in ambient air. A 40 kHz ultrasonic transducer was used to detect the plasma. A second harmonic generation crystal was placed within the beam expander to generate 400 nm blue light, enabling production of THz in the plasma via four wave mixing; a third-order nonlinear process. While plasma-produced THz was not detected, all the preliminary groundwork was accomplished, including full characterization of the plasma, blue light, and alignment of the system to generate and detect THz. The electro-optic detection apparatus was assembled, aligned and used to successfully detect a diagnostic THz signal.

DTIC

Electro-Optics; Infrared Radiation; Laser Applications; Laser Plasmas; Plasmas (Physics)

20080035332 California Univ., Los Angeles, CA USA

Atmospheric Propagation of High Energy Lasers: Modeling, Simulation, Tracking, and Control

Gibson, Steve; Tsao, T C; Roggemann, Michael C; Schulz, Timothy J; Tannenbaum, Allen; Magee, Eric; Whiteley, Matthew; Fitzpatrick, Erick B; Wang, Yun; Belenkii, Mikhail; Apr 29, 2008; 56 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-02-01-0319

Report No.(s): AD-A481241; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Under this MRI funded by HEL JTO and AFOSR, UCLA, in collaboration with Michigan Tech, Georgia Tech, MZA

Associates Corporation, Tempest Technologies, Trex Enterprises Corporation, ATK Mission Research and the Air Force Institute of Technology (AFIT), has established a comprehensive research program in high-performance control of high energy lasers (HEL), modeling and simulation of HEL, wavefront sensing, and target tracking. Under this program, researchers have developed adaptive filtering and control methods for wavefront prediction and correction and precise pointing of laser beams to compensate for the effects of atmospheric turbulence, platform vibration, target motion and sensor noise, all of which degrade the performance of laser weapons and communication systems. The research team for this multidisciplinary research initiative has made a comprehensive, integrated attack on the broad range of modeling and simulation, beam control, and target tracking problems that must be solved to achieve the potential of high energy laser systems. This report discusses the main results of the research.

DTIC

Adaptive Control; High Power Lasers; Simulation; Wave Fronts

20080036327 Lawrence Livermore National Lab., Livermore, CA USA

High-Power Solid-State Laser: Lethality Testing And Modeling

Abbott, R P; Boley, C D; Fochs, S N; Natrass, L A; Parker, J M; Rubenchik, A M; Smith, J A; Yamamoto, R M; Nov 2006; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): AD-A481622; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481622>

We describe a high-power solid-state laser built in our laboratory and its applications to defense missions. We discuss selected target interaction experiments recently performed with this laser. These involve the irradiation of painted aluminum foils at a power of about 25 kW, in the presence of high-speed airflow. The spot sizes were large, covering the range 9-16 cm. Penetration was achieved within a few seconds, depending on the spot size. We present a numerical model which successfully describes the main experimental results.

DTIC

Laser Target Interactions; Lethality; Mathematical Models; Solid State; Solid State Lasers

20080036359 Army Space and Missile Defense Command, Huntsville, AL USA

A Methodology for the Development of a Coupling Model for High Energy Laser Interactions With Metals

LaMar, Chuck; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481679; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481679>

Future Combat Systems are actively considering the use of a high-energy laser (HEL) for various missions. The laser of choice for this mission is likely to be a solid-state laser operating in the one micron wavelength region. Accordingly, lethality studies are underway to assess the utility of these HELs. The potential for dramatic increases in kill efficiency, as a function of various weapons parameters will be an important input to the selection and development of supporting technologies for an HEL weapon. Accordingly, the U.S. Army Space and Missile Defense Command (SMDC) is actively investigating the development of a model for the kill efficiency. This paper will report on the initial phase of this study and emphasizes the methodology for the development of a coupling model for materials of interest to the Army. Using continuous wave (CW) lasers operating at various powers and wavelengths as a source of data, a methodology is developed for inverting the non-linear partial differential equation solution for laser interaction with metals. Experimental studies of this laser interaction with metals has been performed using the 100kW CO₂ Laser at the Laser Hardened Materials Evaluation Laboratory (LHMEL) and the 20 KW solid state fiber laser at the Air Force Research Laboratory located at Kirtland Air Force Base. These experiments included a variety of tests and extensive diagnostics operating at infrared and visible wavelengths. The methodology for developing a coupling model is derived analytically and comparison with experimental data is illustrated.

DTIC

Electromagnetic Interactions; High Power Lasers; Metals; Models

20080036469 Army Research Lab., Adelphi, MD USA

Epi-Side-Down Mounting of Interband Cascade Lasers for Army Applications

Tobin, M S; Monroy, C J; Oliver, K A; Tober, R L; Bradshaw, J L; Bruno, J D; Towner, F J; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481910; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481910>

The interband cascade laser, based on the type II energy band alignment in the InAs/GaSb material system, has great

potential to meet the power and the wall plug efficiency requirements of many Army applications. However, the development of interband cascade lasers has lagged the development of InP-based quantum cascade lasers. These latter devices have recently exhibited high power, room temperature, cw operation at 3.8 μm and at longer wavelengths. Only a few groups are working on the interband cascade lasers, and relatively modest progress has been made in advancing their high-temperature performance. In this paper, we describe our efforts to improve the high temperature performance of these sources using epi-sidedown mounting.

DTIC

High Temperature; Lasers; Mounting; Semiconductor Lasers

20080036595 Massachusetts Univ., Lowell, MA USA

Terahertz Sideband-tuned Quantum Cascade Laser Radiation

Danylov, Andriy A; Waldman, Jerry; Goyette, Thomas M; Gatesman, Andrew J; Giles, Robert H; Li, Jin; Goodhue, William D; Linden, Kurt J; Nixon, William E; Mar 31, 2008; 11 pp.; In English

Report No.(s): AD-A482047; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A compact, tunable, narrowband terahertz source was demonstrated by mixing a single longitudinal mode 2.408 THz, free running quantum cascade laser with a 2-20 GHz microwave sweeper in a conventional corner-cube-mounted Schottky diode. The sideband spectra were characterized with a Fourier transform spectrometer, and the radiation was tuned through several D₂O rotational transitions to estimate the longer term (t greater than or equal to several sec) bandwidth of the source. A spectral resolution of 2 MHz in CW regime was observed.

DTIC

Absorption; Laser Beams; Quantum Cascade Lasers; Semiconductor Lasers; Sidebands; Spectroscopy

20080036617 Massachusetts Univ., Lowell, MA USA

1.56 Terahertz 2-Frames per Second Standoff Imaging

Goyette, Thomas M; Dickinson, Jason C; Linden, Kurt J; Neal, William R; Joseph, Cecil S; Gorveatt, William J; Waldman, Jerry; Giles, Robert; Nixon, William E; Jan 2008; 12 pp.; In English

Contract(s)/Grant(s): DASC0101C0011; W911W406C0020

Report No.(s): AD-A482112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A Terahertz imaging system intended to demonstrate identification of objects concealed under clothing was designed, assembled, and tested. The system design was based on a 2.5 m standoff distance, with a capability of visualizing a 0.5 m by 0.5 m scene at an image rate of 2 frames per second. The system optical design consisted of a 1.56 THz laser beam, which was raster swept by a dual torsion mirror scanner. The beam was focused onto the scan subject by a stationary 50 cm-diameter focusing mirror. A heterodyne detection technique was used to down convert the backscattered signal. The system demonstrated a 1.5 cm spot resolution. Human subjects were scanned at a frame rate of 2 frames per second. Hidden metal objects were detected under a jacket worn by the human subject. A movie including data and video images was produced in 1.5 minutes scanning a human through 180 of azimuth angle at 0.7 increment.

DTIC

Imaging Techniques; Infrared Imagery

20080036665 National Inst. of Standards and Technology, Boulder, CO USA

Quantitative Measurement of Timing and Phase Dynamics in a Mode-Locked Laser

Wahlstrand, J K; Willits, J T; Schibli, T R; Menyuk, C R; Cundiff, S T; Nov 26, 2007; 4 pp.; In English

Report No.(s): AD-A482202; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present results of an experimental study of the timing and phase dynamics in a mode-locked Ti:sapphire laser. By measuring the response of two widely spaced comb lines to a sinusoidal modulation of the pump power, we determine quantitatively the response of both the central pulse time and the phase. Because of the distinct response of the pulse energy, central frequency, and gain to the modulation, we are able to distinguish their contributions to the timing and phase dynamics.

DTIC

Lasers; Pulsed Lasers

20080036699 Optimetrics, Inc., White Sands, NM USA

EOSAEL 87. Volume 28, Nonlinear Aerosol Vaporization and Breakdown Effects Module NOVAE (Upgrades Since 1984)

Gillespie, Patti; Wetmore, Alan E; Apr 1991; 76 pp.; In English

Contract(s)/Grant(s): DAAD07-84-C-0008

Report No.(s): AD-A482301; ASL-TR-0221-28; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The nonlinear aerosol vaporization and breakdown effects (NOVAE) high-energy laser propagation model has had a number of improvements added to it since 1984. Many of these improvements address aspects of vertical or slant path propagation of concern to operators of existing or anticipated laser systems. These upgrades include calculation of stimulated Raman scattering and vertical profiling of turbulence and wind. A wide range of aerosol calculations and rectangular laser apertures are also documented. This document also describes operation of the current NOVAE model.

DTIC

Aerosols; High Power Lasers; Nonlinearity; Novae; Vaporizing

37

MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

20080034701 Christian (Stephen R.), Idaho Falls, ID, USA

Cermet Materials

Kong, P. C., Inventor; 29 Mar 05; 21 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID13727; DE-AC07-05ID14517

Patent Info.: Filed Filed 29 Mar 05; US-Patent-Appl-SN-11-093 345

Report No.(s): PB2008-101230; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A self-cleaning porous cermet material, filter and system utilizing the same may be used in filtering particulate and gaseous pollutants from internal combustion engines having intermetallic and ceramic phases. The porous cermet filter may be made from a transition metal aluminide phase and an alumina phase. Filler materials may be added to increase the porosity or tailor the catalytic properties of the cermet material. Additionally, the cermet material may be reinforced with fibers or screens. The porous filter may also be electrically conductive so that a current may be passed therethrough to heat the filter during use. Further, a heating element may be incorporated into the porous cermet filter during manufacture. This heating element can be coated with a ceramic material to electrically insulate the heating element. An external heating element may also be provided to heat the cermet filter during use.

NTIS

Cermets; Patent Applications

20080034735 National Renewable Energy Lab., Golden, CO USA; Midwest Research Inst., Kansas City, MO USA

Electrodeposition of Biaxial Textured Films

Bhattacharya, R. N., Inventor; Chen, J., Inventor; 20 Dec 02; 21 pp.; In English

Contract(s)/Grant(s): DE-AC36-99GO10337

Patent Info.: Filed Filed 20 Dec 02; US-Patent-Appl-SN-10-535 026

Report No.(s): PB2008-101084; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention provides a method of forming a biaxially textured gold buffer layer on a substrate by electrodeposition. A superconducting material may be deposited onto the biaxially textured gold layer. The biaxial texturing in the gold layer is maintained in the deposited superconductor material to produce high critical current density.

NTIS

Forming Techniques; Electrodeposition; Superconducting Films

20080034800 Honeywell International, Inc., Morristown, NJ, USA

High Speed Rolling Element Bearing Anti-Cavitation Cage

Knorr, R. J., Inventor; Kumar, A., Inventor; 15 Sep 04; 47 pp.; In English

Contract(s)/Grant(s): DMH10-03-2-007

Patent Info.: Filed 15 Sep 04; US-Patent-Appl-SN-10-942 533

Report No.(s): PB2008-101175; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A rolling element bearing anti-cavitation cage is a circular ring with a plurality of cage pockets at predetermined intervals along a circumference of the circular ring. Each of the cage pockets has at least one groove on the leading edge of the cage pocket and at least groove on the trailing edge of the cage pocket. An assembled rolling element bearing is also provided in which the rolling element bearing anti-cavitation cage has rolling elements within the cage pockets and in concentrically disposed between inner and outer races. A method for preventing cavitation during the operation of an assembled rolling element bearing using the cage is also provided.

NTIS

High Speed; Rolling; Bearings; Cavitation Flow

20080034882 NASA Glenn Research Center, Cleveland, OH, USA

GRC Supporting Technology for NASA's Advanced Stirling Radioisotope Generator (ASRG)

Schreiber, Jeffrey G.; Thieme, Lanny G.; July 2008; 19 pp.; In English; Space Technology and Applications International Forum (STAIF 2008), 10-14 Feb. 2008, Albuquerque, NM, USA; Original contains color illustrations

Contract(s)/Grant(s): WBS 138494.04.01.01

Report No.(s): NASA/TM-2008-215196; E-16467; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080034882>

From 1999 to 2006, the NASA Glenn Research Center (GRC) supported a NASA project to develop a high-efficiency, nominal 110-We Stirling Radioisotope Generator (SRG110) for potential use on NASA missions. Lockheed Martin was selected as the System Integration Contractor for the SRG110, under contract to the Department of Energy (DOE). The potential applications included deep space missions, and Mars rovers. The project was redirected in 2006 to make use of the Advanced Stirling Converter (ASC) that was being developed by Sunpower, Inc. under contract to GRC, which would reduce the mass of the generator and increase the power output. This change would approximately double the specific power and result in the Advanced Stirling Radioisotope Generator (ASRG). The SRG110 supporting technology effort at GRC was replanned to support the integration of the Sunpower converter and the ASRG. This paper describes the ASRG supporting technology effort at GRC and provides details of the contributions in some of the key areas. The GRC tasks include converter extended-operation testing in air and in thermal vacuum environments, heater head life assessment, materials studies, permanent magnet characterization and aging tests, structural dynamics testing, electromagnetic interference and electromagnetic compatibility characterization, evaluation of organic materials, reliability studies, and analysis to support controller development.

Author

Stirling Cycle; Radioisotope Heat Sources; Technology Utilization; Generators; Dynamic Structural Analysis; Fabrication

20080035232 National Center for Defense Manufacturing and Machining, Latrobe, PA USA

Florida Turbine Technology (FTT). High Speed Machining of IN100

Perillo, Doug; Jun 2006; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-NP06008403

Report No.(s): AD-A481102; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481102>

Florida Turbine Technology (FTT) has requested the National Center for Defense Manufacturing and Machining (NCDMM) to evaluate two (2) difficult machining procedures of the HPT shaft. The shaft is manufactured from forged IN100 material which is a very hard, nickel based alloy that is extremely difficult to machine. FTT does not have a current process in place to manufacture the rotor shaft. The NCDMM will evaluate methods of manufacturing a .250' diameter hole, 4.0 inches deep in the forged IN100 material. The hole will need to maintain a geometric tolerance of .002' true position. The NCDMM will also evaluate methods for High Speed Machining (HSM) of the rotor blade, fin area. This evaluation will consist of machining two (2) complete blades in the forged IN100 material.

DTIC

High Speed; Machining; Turbines

20080036668 Geo-Centers, Inc., Fort Washington, MD USA

Magnetic Method for DNA Detection on an Arrayed Solid State Device

Tamanaha, C R; Colton, R J; Miller, M M; Piani, M A; Rife, J C; Sheehan, P E; Whitman, L J; Jan 2001; 4 pp.; In English Report No.(s): AD-A482205; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A unique solid-state giant magnetoresistive (GMR) biosensor is the centerpiece of an integrated sample processing system

for the detection of target DNA molecules through hybridization. In addition to the electromagnetic instrumentation, surface chemistries and assays have been developed, as well as a cartridge-based microfluidics network in which pumps and valves are operated by an independent actuation mechanism.

DTIC

Actuators; Bioinstrumentation; Deoxyribonucleic Acid; Magnetoresistivity; Solid State Devices

39

STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structures. For applications see *05 Aircraft Design, Testing and Performance*; and *18 Spacecraft Design, Testing and Performance*.

20080034821 NASA Langley Research Center, Hampton, VA, USA

Ares I-X Upper Stage Simulator Structural Analyses Supporting the NESC Critical Initial Flaw Size Assessment

Knight, Norman F., Jr.; Phillips, Dawn R.; Raju, Ivatury S.; August 2008; 110 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WBS 510505.03.0701.11

Report No.(s): NASA/TM-2008-215336; NESC-RP-08-09/06-081-E; L-19514; Copyright; Avail.: CASI: [A06](#), Hardcopy

The structural analyses described in the present report were performed in support of the NASA Engineering and Safety Center (NESC) Critical Initial Flaw Size (CIFS) assessment for the ARES I-X Upper Stage Simulator (USS) common shell segment. The structural analysis effort for the NESC assessment had three thrusts: shell buckling analyses, detailed stress analyses of the single-bolt joint test; and stress analyses of two-segment 10 degree-wedge models for the peak axial tensile running load. Elasto-plastic, large-deformation simulations were performed. Stress analysis results indicated that the stress levels were well below the material yield stress for the bounding axial tensile design load. This report also summarizes the analyses and results from parametric studies on modeling the shell-to-gusset weld, flange-surface mismatch, bolt preload, and washer-bearing-surface modeling. These analyses models were used to generate the stress levels specified for the fatigue crack growth assessment using the design load with a factor of safety.

Author

Structural Analysis; Ares 1 Upper Stage; Buckling; Stress Analysis; Axial Loads; Loads (Forces); Fatigue (Materials); Crack Propagation; Bolts; Wedges

20080034823 NASA Langley Research Center, Hampton, VA, USA

Critical Initial Flaw Size Analysis

Dawicke, David S.; Raju, Ivatury S.; Cheston, Derrick J.; August 2008; 30 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 510505.03.0701.11

Report No.(s): NASA/TM-2008-215337; NESC-RP-08-09/06-081-E; L-19516; Copyright; Avail.: CASI: [A03](#), Hardcopy

An independent assessment was conducted to determine the critical initial flaw size (CIFS) for the flange-to-skin weld in the Ares I-X Upper Stage Simulator (USS). The USS consists of several 'tuna can' segments that are approximately 216 inches in diameter, 115 inches tall, and 0.5 inches thick. A 6 inch wide by 1 inch thick flange is welded to the skin and is used to fasten adjacent tuna cans. A schematic of a 'tuna can' and the location of the flange-to-skin weld are shown in Figure 1. Gussets (shown in yellow in Figure 1) are welded to the skin and flange every 10 degrees around the circumference of the 'tuna can'. The flange-to-skin weld is a flux core butt weld with a fillet weld on the inside surface, as illustrated in Figure 2. The welding process may create loss of fusion defects in the weld that could develop into fatigue cracks and jeopardize the structural integrity of the Ares I-X vehicle. The CIFS analysis was conducted to determine the largest crack in the weld region that will not grow to failure within 4 lifetimes, as specified by NASA standard 5001 & 5019 [1].

Author

Ares 1 Launch Vehicle; Ares 1 Upper Stage; Cracks; Welded Joints; Structural Failure; Fusion Welding; Defects; Butt Joints

20080034824 NASA Langley Research Center, Hampton, VA, USA

Ares I-X USS Material Testing

Dawicke, David S.; Smith, Stephen W.; Raju, Ivatury S.; August 2008; 38 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 510505.03.0701.11

Report No.(s): NASA/TM-2008-215338; NESC-RP-08-09/06-081-E; L-19517; No Copyright; Avail.: CASI: [A03](#),
Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080034824>

An independent assessment was conducted to determine the critical initial flaw size (CIFS) for the flange-to-skin weld in the Ares I-X Upper Stage Simulator (USS). Material characterization tests were conducted to quantify the material behavior for use in the CIFS analyses. Fatigue crack growth rate, Charpy impact, and fracture tests were conducted on the parent and welded A516 Grade 70 steel. The crack growth rate tests confirmed that the material behaved in agreement with literature data and that a salt water environment would not significantly degrade the fatigue resistance. The Charpy impact tests confirmed that the fracture resistance of the material did not have a significant reduction for the expected operational temperatures of the vehicle.

Author

Ares I Upper Stage; Charpy Impact Test; Crack Propagation; Fracture Strength; Structural Analysis; Fatigue (Materials)

20080034932 Idaho National Engineering Lab., Idaho Falls, ID, USA

Manufactured Home Testing in Simulated and Naturally Occurring High Winds

Tivhind, W. D.; Larson, T. K.; Lacy, J. M.; Kobbe, R. G.; Aug. 2006; 9 pp.; In English

Report No.(s): DE2007-911747; INL/CON-05-00600; No Copyright; Avail.: National Technical Information Service (NTIS)

A typical double-wide manufactured home was tested in simulated and naturally occurring high winds to understand structural behavior and improve performance during severe windstorms. Seven lateral load tests were conducted on a double-wide manufactured home at a remote field test site in Wyoming. An extensive instrumentation package monitored the overall behavior of the home and collected data vital to validating computational software for the manufactured housing industry. The tests were designed to approach the design load of the home without causing structural damage, thus allowing the behavior of the home to be accessed when the home was later exposed to high winds (to 80-mph). The data generally show near-linear initial system response with significant non-linear behavior as the applied loads increase. Load transfer across the marriage line is primarily compression. Racking, while present, is very small. Interface slip and shear displacement along the marriage line are nearly insignificant. Horizontal global displacements reached 0.6 inch. These tests were designed primarily to collect data necessary to calibrate a desktop analysis and design software tool, MH Tool, under development at the Idaho National Laboratory specifically for manufactured housing. Currently available analysis tools are, for the most part, based on methods developed for stick built structures and are inappropriate for manufactured homes. The special materials utilized in manufactured homes, such as rigid adhesives used in the connection of the sheathing materials to the studs, significantly alter the behavior of manufactured homes under lateral loads. Previous full scale tests of laterally loaded manufactured homes confirm the contention that conventional analysis methods are not applicable. System behavior dominates the structural action of manufactured homes and its prediction requires a three dimensional analysis of the complete unit, including tiedowns. This project was sponsored by the US Department of Energy, US Department of Housing and Urban Development, and the Manufactured Housing Institute. The results of this research can lead to savings in annual losses of life and property by providing validated information to enable the advancement of code requirements and by developing engineering software that can predict and optimize wind resistance.

NTIS

Buildings; Loads (Forces); Load Tests; Full Scale Tests

20080035103 TNO Built Environment and Geosciences, Delft, Netherlands

Failure Criteria and Damage Mechanism of Cunifer Pipes with Straub Metal Grip Couplings, Part 1, Tensile and Compression Tests

vanAanhold, J. E.; September 30, 2007; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): A06KM148/DV10590; TNO Proj. 034.67441

Report No.(s): TNO 2008-D-ROO11; TD2007-0009; Copyright; Avail.: Other Sources

Damage reports of shock trials show that piping systems are relatively vulnerable under shock conditions. In most cases, damage occurs at pipe joints and results in leakage. Most piping systems, including the chilled water system, consist of cunifer

(CuNi10FeMn) piping. The most common type of coupling is the Straub Metal Grip coupling. Hence, a series of tensile and compression tests was performed on joints of cunifer pipes with an outer diameter 44.5 and 76 mm, both quasi-static and shock tests. The shock tests result in a 7-29% higher failure load compared to quasi-static test; and show less deviation. The failure modes of the joint consist of local pipe wall buckling, slipping and pull out, and snap through and fracture of the teeth rings. In particular the 44.5 mm pipes often show 'necking' underneath the Straub coupling's teeth rings, which is undesirable. Assembly tests of joints with outer diameter 44.5 and 76 mm pipes showed that tightening the bolts of the Straub coupling only is insufficient to create necking.

Author

Copper Alloys; Pipes (Tubes); Joints (Junctions); Structural Failure; Failure Modes; Damage Assessment; Couplings

20080035104 TNO Built Environment and Geosciences, Delft, Netherlands

Evaluation Structure Joint Support Ship

Bosman, T. N.; March 15, 2008; 114 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 034.87410/01.01

Report No.(s): TNO-2008-D-R0437; TD-2008-0507; Copyright; Avail.: Other Sources

A global strength and stiffness calculation is performed. The strength analysis shows that the structure fulfills the DNV class society rules with respect to allowable stresses. Local fatigue problems are identified. The global natural frequencies including fluid added mass are established. The minimum required natural frequency of decks is defined. A comparison of the structural weight distribution as calculated and modeled is made, showing significant differences

Author

Ships; Joints (Junctions); Structural Stability; Strength; Stiffness; Design Analysis

20080035106 TNO Built Environment and Geosciences, Delft, Netherlands

Thick Plate Test Setup for Close-Proximity UNDEX Testing at FOI

vanAanhold, J. E.; vanEverdinck, C.; August 31, 2007; 30 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): AC05C0155/14100; TNO Proj. 006.58489

Report No.(s): TNO 2007-D-R1334rS; TD2007-0007; Copyright; Avail.: Other Sources

As part of the ITP 'Close Proximity UNDEX effects', a series of close-proximity UNDEX tests will be done on a thick plate at FOI Grindsjon, Sweden. These experiments will be done using an existing thick plate test setup. The purpose of these tests is to obtain measurements, in particular pressures at the plate surface during gas bubble collapse and jetting. These can be compared against results from simulations with a non-responding target. The thick plate test setup was modified for increasing its robustness. Existing pressure gauges were refurbished and new pressure gauges of different types were added. Most pressure gauges were calibrated again before mounting. With the proposed modifications, we expect that the thick plate test setup's robustness is increased while at the same time the redundant instrumentation with different types of pressure gauges allows for a better quality of experimental results.

Author

Thick Plates; Pressure Gages; Bubbles

20080035111 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

V402 Safety of Personnel - Hazard from Glazing under Blast Loading

vanDoormaal, J. C. A. M.; May 2008; 80 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 014.16174

Report No.(s): TNO-DV 2008 A109; TD2008-0041; Copyright; Avail.: Other Sources

In this report, data has been gathered on the hazard from falling glass. More specifically, data has been gathered on the velocity of the glazing, the shard sizes and the shard shapes. It is not claimed here that the gathered data is extensive and complete. However the gathered data appeared to be sufficient to develop or adopt a model for the hazard of the falling glass. With regard to the velocity, quite a bit of data was available. It appeared to be possible to develop several methods for velocity prediction. The available data on shard size and shape is much more limited. However, a probabilistic approach was found appropriate and was adopted. There was no need for developing a new model. The set of hazard quantification models provide a full set for the prediction of the hazard from glazing.

Author

Explosions; Loads (Forces); Hazards; Glass; Industrial Safety; Structural Engineering

20080035179 Naval Research Lab., Washington, DC USA

Enhanced Direct-Drive Implosions with Thin High-Z Ablation Layers

Mostovych, Andrew N; Colombant, Denis G; Karasik, Max; Krauer, James P; Schmitt, Andrew J; Weaver, James L; Jan 2008; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480967; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480967>

New direct-drive spherical implosion experiments with deuterium filled plastic shells have demonstrated significant and absolute (2x) improvements in neutron yield when the shells are coated with a very thin layer (~200-400 Angstrom) of high-Z material such as palladium. This improvement is interpreted as resulting from increased stability of the imploding shell. These results provide for a possible path to control laser imprint and stability in laser-fusion-energy target designs.

DTIC

Ablation; Drives; Implosions; Mechanical Drives

20080035644 Pruet (Nexsen), LLP, Greenville, SC, USA

Expanded Plug Method for Developing Circumferential Mechanical Properties of Tubular Materials

Hendrich, W. R., Inventor; McAfee, W. J., Inventor; Luttrell, C. R., Inventor; 28 Sep 04; 8 pp.; In English

Contract(s)/Grant(s): DE-AC05-96OR22725

Patent Info.: Filed Filed 28 Sep 04; US-Patent-Appl-SN-10-952 503

Report No.(s): PB2008-102000; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method for determining the circumferential properties of a tubular product, especially nuclear fuel cladding, utilizes compression of a polymeric plug within the tubular product to determine strain stress, yield stress and other properties. The process is especially useful in the determination of aging properties such as fuel rod embrittlement after long burn-down.

NTIS

Circumferences; Destructive Tests; Mechanical Properties; Patent Applications; Plugs

20080036142 Intellserv, Inc., Houston, TX, USA

Filter for a Drill String

Hall, D. R., Inventor; Pixton, D. S., Inventor; Briscoe, M., Inventor; McPherson, J., Inventor; 28 Sep 04; 11 pp.; In English

Contract(s)/Grant(s): DE-FC26-01NT41229

Patent Info.: Filed Filed 28 Sep 04; US-Patent-Appl-SN-10-711 596

Report No.(s): PB2008-100684; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A filter for a drill string comprises a perforated receptacle having an open end and a perforated end and first and second mounting surfaces are adjacent the open end. A transmission element is disposed within each of the first and second mounting surfaces. A capacitor may modify electrical characteristics of an LC circuit that comprises the transmission elements. The respective transmission elements are in communication with each other and with a transmission network integrated into the drill string. The transmission elements may be inductive couplers, direct electrical contacts, or optical couplers. In some embodiments of the present invention, the filter comprises an electronic component. The electronic component may be selected from the group consisting of a sensor, a router, a power source, a clock source, a repeater, and an amplifier.

NTIS

Patent Applications; Strings; LC Circuits; Couplers

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photography. For related instrumentation see *35 Instrumentation and Photography*.

20080034761 Federal Emergency Management Agency, Washington, DC USA

Collocation Impacts on the Vulnerability of Lifelines During Earthquakes with Applications to the Cajon Pass, California. Earthquake Hazard Reduction Series 61

Feb. 1992; 110 pp.; In English

Report No.(s): PB2008-101841; FEMA-226; No Copyright; Avail.: CASI: [A06](#), Hardcopy

The purpose of this study was to: develop a management screening tool that can be used by lifeline owners, designers

and providers, operators, users, and regulators to sort through numerous collocation conditions to identify the critical locations and to provide an estimate of the increased risk that results when such collocated facilities are subjected to an earthquake event; and to analyze the Cajon Pass, California, situation to demonstrate how the screening tool can be used and to examine specific conditions at the Pass.

NTIS

Collocation; Hazards; Risk; Vulnerability; Earthquake Resistance

20080035203 Missouri Univ., Columbia, MO USA

Electromagnetic Surveys for 3-D Imaging of Subsurface Contaminants

Gantzer, C J; Anderson, S H; Peyton, R L; Li, Y; May 16, 2000; 77 pp.; In English

Contract(s)/Grant(s): N47408-95-D-0730

Report No.(s): AD-A481025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481025>

This report describes a demonstration sponsored and funded by the Department of Defense's (DoD) Environmental Security Technology Certification Program (ESTCP). GEHM Environmental Corporation and the Center for Environmental Technology at the University of Missouri (Columbia) were contracted by the Naval Facilities Engineering Service Center (NEESC) to investigate the use of quasi-static electromagnetic (EM) resistivity surveys to detect dense non-aqueous phase liquid (DNAPL) contamination in the subsurface at two U.S. DoD installations. This EM resistivity survey technique is a surface to borehole geophysical method that generates a three-dimensional (3-D) image of subsurface features based on their contrasting resistive properties. The two sites selected were the former Naval Air Station Alameda, renamed Alameda Point, and Tinker Air Force Base. They were selected for this pilot study on the basis of having a previously well-documented DNAPL problem, coupled with the fact that they reside in two distinctly different types of geologic settings. These sites also have typical limitations with respect to drilling restrictions and with respect to the high degree of uncertainty in knowing where free-phase DNAPL currently occurs in the subsurface. Alameda Point's subsurface consists of saturated unconsolidated clastic sediments, while Tinker AFB consists of interbedded sands and shales.

DTIC

Contaminants; Contamination; Electromagnetic Radiation; Imaging Techniques; Nonaqueous Electrolytes; Surveys

20080035439 Army Engineer Research and Development Center, Vicksburg, MS USA

Environmental Assessment of Makua Military Reservation in Hawaii

Harrelson, Danny W; Zakikhani, Mansour; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481506; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Army has conducted several site-specific environmental studies to address the major public concerns at Makua Military Reservation (MMR). The monitoring and numerical technologies used at MMR may be of interest for other sites with the similar problems. Past sampling has shown that none of the samples had detectable concentrations of energetics or semi-volatile organic compounds. The nitrate and nitrite concentrations in the samples were below risk-based health criteria and drinking water standards. Detectable levels of barium, chromium, lead, mercury, and nickel were also below risk-based health criteria and drinking water standards. The study concluded that the basal aquifer at MMR was not contaminated.

DTIC

Contamination; Soils

20080036093 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Spacebased Estimation of Moisture Transport in Marine Atmosphere Using Support Vector Regression

Xie, Xiaosu; Liu, W. Timothy; Tang, Benyang; Remote Sensing of Environment; 2007; Volume 112, pp. 1846-1855; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40922>; <http://dx.doi.org/10.1016/j.rse.2007.09.003>

An improved algorithm is developed based on support vector regression (SVR) to estimate horizontal water vapor transport integrated through the depth of the atmosphere ((Theta)) over the global ocean from observations of surface wind-stress vector by QuikSCAT, cloud drift wind vector derived from the Multi-angle Imaging SpectroRadiometer (MISR) and geostationary satellites, and precipitable water from the Special Sensor Microwave/Imager (SSM/I). The statistical relation is established between the input parameters (the surface wind stress, the 850 mb wind, the precipitable water, time and location) and the target data ((Theta)) calculated from rawinsondes and reanalysis of numerical weather prediction model). The results are validated with independent daily rawinsonde observations, monthly mean reanalysis data, and through regional

water balance. This study clearly demonstrates the improvement of (Theta) derived from satellite data using SVR over previous data sets based on linear regression and neural network. The SVR methodology reduces both mean bias and standard deviation compared with rawinsonde observations. It agrees better with observations from synoptic to seasonal time scales, and compare more favorably with the reanalysis data on seasonal variations. Only the SVR result can achieve the water balance over South America. The rationale of the advantage by SVR method and the impact of adding the upper level wind will also be discussed.

Author

Air Water Interactions; Algorithms; Mathematical Models; Moisture; Remote Sensing; Water Balance; Water Vapor; Neural Nets; Atmospheric Moisture

20080036106 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA; Arizona Univ., Tucson, AZ, USA

Dual-Photoelastic-Modulator-Based Polarimetric Imaging Concept for Aerosol Remote Sensing

Diner, David J.; Davis, Ab; Hancock, Bruce; Gutt, Gary; Chipman, Russell A.; Cairns, Brian; Applied Optics; December 3, 2007; Volume 46, No. 35, pp. 8428-8445; In English; Original contains black and white illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40910>

A dual-photoelastic-modulator- (PEM-) based spectropolarimetric camera concept is presented as an approach for global aerosol monitoring from space. The most challenging performance objective is to measure degree of linear polarization (DOLP) with an uncertainty of less than 0.5% in multiple spectral bands, at moderately high spatial resolution, over a wide field of view, and for the duration of a multiyear mission. To achieve this, the tandem PEMs are operated as an electro-optic circular retardance modulator within a high-performance reflective imaging system. Operating the PEMs at slightly different resonant frequencies generates a beat signal that modulates the polarized component of the incident light at a much lower heterodyne frequency. The Stokes parameter ratio $q = Q/I$ is obtained from measurements acquired from each pixel during a single frame, providing insensitivity to pixel responsivity drift and minimizing polarization artifacts that conventionally arise when this quantity is derived from differences in the signals from separate detectors. Similarly, $u = U/I$ is obtained from a different pixel; q and u are then combined to form the DOLP. A detailed accuracy and tolerance analysis for this polarimeter is presented.

Author

Aerosols; Linear Polarization; Remote Sensing; Spectral Bands; Cameras; High Resolution; Imaging Techniques

20080036245 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Development of a Remote Sensor System and Decision Support Systems Architecture to Monitor Resistance Development in Transgenic Crops

Cacas, Joseph; Glaser, John; Copenhaver, Kenneth; May, George; Stephens, Karen; June 2008; 2 pp.; In English; 26th International Symposium on Space Technology and Science, 1-9 Jun. 2008, Hamamatsu City, Japan; Copyright; Avail.:

CASI: [A01](#), Hardcopy

The USA Environmental Protection Agency (EPA) has declared that 'significant benefits accrue to growers, the public, and the environment' from the use of transgenic pesticidal crops due to reductions in pesticide usage for crop pest management. Large increases in the global use of transgenic pesticidal crops has reduced the amounts of broad spectrum pesticides used to manage pest populations, improved yield and reduced the environmental impact of crop management. A significant threat to the continued use of this technology is the evolution of resistance in insect pest populations to the insecticidal Bt toxins expressed by the plants. Management of transgenic pesticidal crops with an emphasis on conservation of Bt toxicity in field populations of insect pests is important to the future of sustainable agriculture. A vital component of this transgenic pesticidal crop management is establishing the proof of concept basic understanding, situational awareness, and monitoring and decision support system tools for more than 133650 square kilometers (33 million acres) of bio-engineered corn and cotton for development of insect resistance. Early and recent joint NASA, US EPA and ITD remote imagery flights and ground based field experiments have provided very promising research results that will potentially address future requirements for crop management capabilities.

Author

Environment Protection; Decision Support Systems; Farm Crops; Toxins and Antitoxins; Remote Sensors; Agriculture; Pesticides; Insects

20080036266 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Ecological Soil Screening Levels for Plants Exposed to Tnt: Supporting Range Sustainability for Training and Testing

Simini, Michael; Checkai, Ronald T; Kolakowski, Jan E; Kuperman, Roman G; Phillips, Carlton T; Kumas, Carl W; Nov 2006; 5 pp.; In English

Report No.(s): AD-A481519; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481519>

Ecological Soil Screening Levels (Eco-SSL) are those screening concentrations of chemicals in soil that present an acceptable risk to ecological receptors. We investigated the ecotoxicity of TNT to the plant species alfalfa (*Medicago sativa* L.), Japanese millet (*Echinochloa crusgalli* L. (Beauv.)), and perennial ryegrass (*Lolium perenne* L.) in five natural soils: Sassafras sandy loam (SSL), Teller sandy loam (TSL), Richfield clay loam (RCL), Kirkland clay loam (KCL), and Webster clay loam (WCL). According to USEPA Eco-SSL criteria, relative bioavailability scores for organic chemicals in these soils were rated high for SSL and TSL, medium for RCL and KCL, and low for WCL soil. We amended TNT into these soils and subjected them to wetting/drying cycles (8 weeks) in order to represent field conditions. Phytotoxicity studies were conducted with each soil separately in environmentally controlled growth chambers. Nonlinear regression models were used to determine 20% (EC20) or 50% (EC50) effect concentration values for seedling emergence, fresh mass, and dry mass. The geometric mean of EC20 values was used to determine draft Eco-SSL for each soil type. Results of these studies will undergo quality assurance before inclusion in the U.S. EPA national Eco-SSL database.

DTIC

Ecology; Education; Soils

20080036478 North Carolina State Univ., Raleigh, NC USA

Computationally Efficient Models of Urban and Natural Terrain by Non-Iterative Domain Decomposition for L1 Smoothing Splines

Lin, Yu-Min; Zhang, Wei; Fang, Shu-Cherng; Wang, Yong; Lavery, John E; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481933; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481933>

In this paper, we propose and validate a computationally efficient non-iterative domain decomposition procedure for calculating bivariate cubic L1 smoothing splines. This domain decomposition procedure involves calculating local L1 smoothing splines individually on overlapping extended subdomains that cover the global domain and then creating the global L1 smoothing spline by patching together the local L1 smoothing splines. Using this procedure, we calculate the global L1 smoothing splines of one urban terrain data set (Baltimore) and one natural terrain data set (Killeen, Texas). The local L1 smoothing splines generally match well at subdomain boundaries but do not always do so. The current hypothesis is that the cases in which the local L1 smoothing splines do not match well at the boundaries of the subdomains are due to limitations in the compressed primal-dual algorithm that is used to calculate the local L1 smoothing splines. The non-iterative nature of this new domain decomposition procedure is in strong contrast to and is a large improvement over the iterative nature of all previously known domain decomposition procedures. With sequential and especially with parallel computation, the non-iterative L1 smoothing spline domain decomposition procedure will be a large factor in reducing computing time so that complex terrain models can be calculated and manipulated in real time.

DTIC

Cubes (Mathematics); Decomposition; Polynomials; Smoothing; Spline Functions; Splines; Terrain

20080036603 Woods Hole Oceanographic Inst., MA USA

Dismantling the Deep Earth: Geochemical Constraints from Hotspot Lavas for the Origin and Lengthscales of Mantle Heterogeneity

Jackson, Matthew G; Feb 2008; 151 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): EAR-0509891; EAR-0652707

Report No.(s): AD-A482075; MIT/WHOI-2008-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Chapter 1 presents the first published measurements of Sr-isotope variability in olivine-hosted melt inclusions. Melt inclusions in just two Samoan basalt hand samples exhibit most of the total Sr-isotope variability observed in Samoan lavas. Chapter 3 deals with the largest possible scales of mantle heterogeneity, and presents the highest magmatic $3\text{He}/4\text{He}$ (33.8 times atmospheric) discovered in Samoa and the southern hemisphere. Along with Samoa, the highest $3\text{He}/4\text{He}$ sample from each southern hemisphere high $3\text{He}/4\text{He}$ hotspot exhibits lower $43\text{Nd}/44\text{Nd}$ ratios than their counterparts in the northern hemisphere. Chapter 2 presents geochemical data for a suite of unusually enriched Samoan lavas. These highly enriched

Samoan lavas have the highest $^{87}\text{Sr}/^{86}\text{Sr}$ values (0.72163) measured in oceanic hotspot lavas to date, and along with trace element ratios (low Ce/Pb and Nb/U ratios), provide a strong case for ancient recycled sediment in the Samoan mantle. Chapter 4 explores whether the eclogitic and peridotitic portions of ancient subducted oceanic plates can explain the anomalous titanium, tantalum and niobium (TITAN) enrichment in high $^3\text{He}/^4\text{He}$ ocean island basalts (OIBs). The peridotitic portion of ancient subducted plates can contribute high $^3\text{He}/^4\text{He}$ and, after processing in subduction zones, a refractory, rutile-bearing eclogite may contribute the positive TITAN anomalies.

DTIC

Earth Mantle; Geochemistry; Heterogeneity; Lava

44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

20080034699 Pandiscio and Pandiscio, PC, Waltham, MA, USA

Apparatus for Mounting Photovoltaic Power Generating Systems on Buildings

Russell, M. C., Inventor; 5 Oct 05; 15 pp.; In English

Contract(s)/Grant(s): NREL-NDO-2-30628-05

Patent Info.: Filed 5 Oct 05; US-Patent-Appl-SN-11-243 758

Report No.(s): PB2008-101232; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Rectangular PV modules are mounted on a building roof by mounting stands that are distributed in rows and columns. Each stand comprises a base plate that rests on the building roof and first and second brackets of different height attached to opposite ends of the base plate. Each bracket comprises dual module-supporting members for supporting two different PV modules, and each PV module has a mounting stud adjacent to each of its four corners. At one end each module is supported by pivotal attachment of two of its mounting studs to module-supporting members of different first brackets. At its other end each module rests on module-supporting members of two different second brackets, whereby the modules assume a predetermined angle of tilt relative to the roof. Two tethers connect the other two mounting studs to the two different second brackets on which the module rests. The tethers allow the modules to pivot up away from the module-supporting members on which they rest to a substantially horizontal position in response to wind uplift forces, thereby enabling the PV modules and their supporting stands to withstand high velocity winds without the base plates being physically attached to the supporting roof structure.

NTIS

Buildings; Electric Generators; Modules; Mounting; Patent Applications; Photovoltaic Conversion; Solar Generators

20080034783 Aerospace Corp., El Segundo, CA, USA

Balanced Lithium Ion Battery,

Zimmerman, A. H., Inventor; 30 Aug 04; 6 pp.; In English

Contract(s)/Grant(s): AF-F04701-00-C-0009

Patent Info.: Filed 30 Aug 04; US-Patent-Appl-SN-10-929 970

Report No.(s): PB2008-101158; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A battery system uses passive nonlinear electronic devices, such as zener diodes, respectively connected in parallel to each of the serially connected battery cells, such as lithium ion battery cells, connected in a string, to maintain all of the cells at a balanced state of charge, and will automatically correct any initial imbalance in the states of charge of individual cells. The passive nonlinear devices are preferably matched to equally force each battery cell to have an exponentially rising rate of internal capacity loss as cell voltage increases, while keeping cell voltages and capacities matched. The devices will not accelerate open circuit losses of the cells as the cells become fully discharged as a consequence of conducting low currents compared to the cell charge and discharge currents without generating excessive heat for improved safety.

NTIS

Electric Batteries; Lithium; Metal Ions; Patent Applications

20080034788 Emrich and Dithmar, LLC, Chicago, IL, USA

Manganese Oxide Composite Electrodes for Lithium Batteries (PAT-APPL-11-204 512)

Johnson, C. S., Inventor; Kang, S. H., Inventor; Thackeray, M. M., Inventor; 16 Aug 05; 25 pp.; In English

Contract(s)/Grant(s): W-31-109-ENG-38

Patent Info.: Filed Filed 16 Aug 05; US-Patent-Appl-SN-11-204 512

Report No.(s): PB2008-101134; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An activated electrode for a non-aqueous electrochemical cell is disclosed with a precursor thereof a lithium metal oxide with the formula $x\text{Li}(\text{sub } 2)\text{MnO}(\text{sub } 3)(1-x)\text{LiMn}(\text{sub } 2)-y\text{M}(\text{sub } y)\text{O}(\text{sub } 4)$ for $0.5 < x < 1.0$ such that the spinel component constitutes less than 50 mole % of the precursor electrode and 0 less than or equal to 1 in which the $\text{Li}(\text{sub } 2)\text{MnO}(\text{sub } 3)$ and $\text{LiMn}(\text{sub } 2)-y\text{M}(\text{sub } y)\text{O}(\text{sub } 4)$ components have layered and spinel-type structures, respectively, and in which M is one or more metal cations. The electrode is activated by removing lithia, or lithium and lithia, from the precursor. A cell and battery are also disclosed incorporating the disclosed positive electrode. An activated electrode for a non-aqueous electrochemical cell is disclosed with a precursor of a lithium metal oxide with the formula $x\text{Li}(\text{sub } 2)\text{MnO}(\text{sub } 3).(1-x)\text{LiMn}(\text{sub } 2)-y\text{M}(\text{sub } y)\text{O}(\text{sub } 4)$ for $0 < x < 1$ and $0 < y < 1$ in which the $\text{Li}(\text{sub } 2)\text{MnO}(\text{sub } 3)$ and $\text{LiMn}(\text{sub } 2)-y\text{M}(\text{sub } y)\text{O}(\text{sub } 4)$ components have layered and spinel-type structures, respectively, and in which M is one or more metal cations. The electrode is activated by removing lithia, or lithium and lithia, from the precursor. A cell and battery are also disclosed incorporating the disclosed positive electrode.

NTIS

Electrochemical Cells; Electrodes; Lithium Batteries; Manganese Oxides; Patent Applications

20080034789 Emrich and Dithmar, LLC, Chicago, IL, USA; Chicago Univ., Chicago, IL USA

Manganese Oxide Composite Electrodes for Lithium Batteries (PAT-APPL-11-057 790)

Thackeray, M. M., Inventor; Johnson, C. S., Inventor; Li, N., Inventor; 14 Feb 05; 21 pp.; In English

Contract(s)/Grant(s): W-31-109-ENG-38

Patent Info.: Filed Filed 14 Feb 05; US-Patent-Appl-SN-11-057 790

Report No.(s): PB2008-101133; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An activated electrode for a non-aqueous electrochemical cell is disclosed with a precursor of a lithium metal oxide with the formula $x\text{Li}(\text{sub } 2)\text{MnO}(\text{sub } 3).(1-x)\text{LiMn}(\text{sub } 2)-y\text{M}(\text{sub } y)\text{O}(\text{sub } 4)$ for $0 < x < 1$ and $0 < y < 1$ in which the $\text{Li}(\text{sub } 2)\text{MnO}(\text{sub } 3)$ and $\text{LiMn}(\text{sub } 2)-y\text{M}(\text{sub } y)\text{O}(\text{sub } 4)$ components have layered and spinel-type structures, respectively, and in which M is one or more metal cations. The electrode is activated by removing lithia, or lithium and lithia, from the precursor. A cell and battery are also disclosed incorporating the disclosed positive electrode.

NTIS

Electrochemical Cells; Electrodes; Lithium Batteries; Manganese Oxides; Patent Applications

20080035192 Army Research Lab., Adelphi, MD USA

Enhanced Low Temperature Performance Of Li-Ion Batteries Using Nanophase Materials

Wolfenstine, J; Jow, T R; Allen, J L; Nov 1, 2006; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480998; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480998>

One major problem that limits the rate capability at low temperatures of the current Li-ion batteries is the anode material, graphite. In order to overcome the limitations associated with graphite, new anode materials must be developed. One such potential new anode material that could lead to higher rates at the low temperatures required by the Future Army Combat and Force Warrior Systems is $\text{Li}_4\text{Ti}_5\text{O}_{12}$ with a nanophase particle size. At present, no information on the rate capability at low temperature of nanophase $\text{Li}_4\text{Ti}_5\text{O}_{12}$ is available. Hence, such information is needed. Two different nanophase $\text{Li}_4\text{Ti}_5\text{O}_{12}$ particle sizes were investigated, 350 and 700 nm, over the temperature range 20, 0, -10, -20, and -30 C at low rates (0.1 C, C=theoretical capacity) to high rates (5C). Electrochemical testing revealed that the 350 nm $\text{Li}_4\text{Ti}_5\text{O}_{12}$ material exhibited higher capacity compared to the 700 nm $\text{Li}_4\text{Ti}_5\text{O}_{12}$ at all rates tested at room temperature and at low rates at low temperatures (< 0 C). This expected behavior is a result of the shorter diffusion lengths and higher number of lithium insertion sites in the smaller particle size material. This result also reveals the importance of reducing the $\text{Li}_4\text{Ti}_5\text{O}_{12}$ particle size as small (i.e., from micron to nano) as possible for enhancing low temperature performance. However, at high rates at low temperatures (< 0 C) a change in behavior was observed, in that the larger particle size $\text{Li}_4\text{Ti}_5\text{O}_{12}$ exhibited the higher capacity. It was observed that as the temperature was decreased the rate at which this transition occurred was also lowered. It is believed that the origin of this transition behavior is that as temperature is lowered the resistance of the $\text{Li}_4\text{Ti}_5\text{O}_{12}$ interparticle contacts increases and controls the discharge rate. This result was unexpected and suggests that at low temperatures and high rates just

reducing the Li₄Ti₅O₁₂ particle size to the nanoscale is not enough to enhance low temperature performance.

DTIC

Electric Batteries; Ion Temperature; Lithium; Lithium Batteries; Lithium Oxides; Low Temperature; Metal Ions; Nanotechnology; Titanium Oxides

20080035276 Hawaii Univ., Honolulu, HI USA

Hawaii Energy and Environmental Technologies (HEET) Initiative

Rocheleau, Richard E; Moore, Robert M; Turn, Scott Q; Antal, Jr , Michael J; Cooney, Michael J; Liaw, Bor-Yann; Masutani, Stephen M; Nov 2007; 205 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-1-0086; Proj-07PR08492-00

Report No.(s): AD-A481211; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481211>

This report covers efforts by the Hawaii Natural Energy Institute of the University of Hawaii under the ONR-funded HEET Initiative that addresses critical technology needs for exploration/utilization of seabed methane hydrates and development/testing of advanced fuel cells and fuel cell systems. Methane hydrates work included: laboratory and analytical investigations of hydrate destabilization phenomena; characterization of the microbial community in marine hydrate beds; development of models to predict the fate of methane released from the seafloor into the water column; and the promotion of international R&D partnerships. In the fuel cell area, accomplishments included: addition of two fuel cell test cells to the Hawaii Fuel Cell Test Facility; improved capabilities for fuel/oxidizer impurity testing; and improved performance of the dynamic HiL test stand. Under the hydrogen production area, efforts were focused on sulfur removal from fuel gas and construction of a reformer system for seafloor methane work. Further work was also carried out with novel fuel cell concepts including biocarbons and bio-fuel cells.

DTIC

Energy Technology; Fuel Cells

20080035383 Protonex Technology Corp., Southborough, MA USA

Advanced Chemical Hydride-Based Fuel Cell Systems for Portable Military Applications

Osenar, Paul; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481395; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The modern military continues to introduce advanced electronic devices such as night vision equipment, global positioning systems, laser range finders and target designators, digital communications systems, remote networking and intelligence gathering sensors. These new technologies are generating ever-increasing power requirements for the modern soldier, and today's state-of-the-art batteries and other traditional power generation sources are failing to keep pace with these growing power needs. New technologies are emerging as possible solutions to this problem, with fuel cell technology considered the most promising. Hydrogen fuel cells are of particular interest due to low temperature operation, prompt cold start-up and relative technology readiness, among other benefits. Paired with silent, reliable hydrogen fuel cell power systems, chemical hydrides can provide very high energy density for use in demanding portable applications. Sodium borohydride, which is currently employed in Protonex systems, is also non-toxic, nonflammable, and cost-effective. These integrated systems are well-suited for military applications, as they are able to meet demanding performance targets such as ultra-low weight, wide operating temperature range, and low heat and noise profiles.

DTIC

Chemical Fuels; Fuel Cells; Hydrides; Hydrogen Oxygen Fuel Cells; Military Technology; Portable Equipment

20080035435 Minnesota Univ., Minneapolis, MN USA

PSS: Predictive Energy-Efficient Sensing Scheduling in Wireless Sensor Networks

Liu, Haiyang; Chandra, Abhishek; Srivastava, Jaideep; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481494; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Wireless sensor networks are being widely deployed for providing physical measurements to diverse applications that have wide variety of data quality requirements. Energy is a precious resource in such networks as sensor nodes are typically powered by batteries with limited power and high replacement cost. This paper presents PSS: an energy-efficient stochastic sensing framework for wireless sensor platforms. PSS is a node-level framework that utilizes knowledge of the underlying data streams as well as application data quality requirements to conserve energy on a sensor node. PSS employs a stochastic scheduling algorithm to dynamically control the operating modes of the sensor node components. This scheduling algorithm

enables an adaptive sampling strategy that aggressively conserves power by adjusting sensing activity to the application requirements. Using experimental results obtained on Power-TOSSIM with a real-world data trace, we demonstrate that our approach reduces energy consumption by 29-36% while providing strong statistical guarantees on data quality.

DTIC

Algorithms; Detection; Energy Consumption; Predictions; Scheduling

20080035510 Energy Information Administration, Washington, DC, USA

Solar Thermal and Photovoltaic Collector Manufacturing Activities 2006

Oct. 2007; 41 pp.; In English

Report No.(s): PB2008-101850; No Copyright; Avail.: National Technical Information Service (NTIS)

The Energy Information Administration (EIA) reports detailed historical data on solar manufacturing activities annually in its report, the Renewable Energy Annual. This report, Solar Thermal and Photovoltaic Collector Manufacturing Activities, provides an overview and tables with historical data spanning 1997-2005, including revisions, and data for 2006. These tables correspond to similar tables to be presented in Renewable Energy Annual 2006 and are numbered accordingly.

NTIS

Accumulators; Manufacturing; Photovoltaic Cells; Solar Cells; Supplying

20080036229 Army Research Lab., Adelphi, MD USA

Power and Energy Architecture for Army Advanced Energy Initiative

Shaffer, Edward C; Massie, Darrell D; Cross, James B; Nov 1, 2006; 43 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481011>

The Army Research, Development, and Engineering Command's (RDECOM) Power & Energy Integrated Product Team (P&E IPT) has initiated the Army Advanced Energy Initiative (AAEI) concept. Although there are multiple reasons driving the need for this program, foremost is an urgent requirement to address the need for better integration among programs developing advanced power and energy technologies for the Army. The current P&E architecture is an amalgam of independent programs, which traditionally have been developed in stovepipe organizations, and often as an afterthought to the development of other advanced technologies. The requirement for power and energy in a rapidly modernized, highly digital, and network-centric Army is growing exponentially. Simultaneously the ability to provide these growing depends imposes significant logistic penalties -- fuel consumption, size and weight, reliability, and environmental issues.

DTIC

Energy Technology; Military Technology; Energy Sources

20080036295 Army Research Lab., Adelphi, MD USA

High Energy Lithium-Air Batteries for Soldier Power

Foster, D L; Read, J R; Shichtman, M; Balagopal, S; Watkins, J; Gordon, J; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481576; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481576>

High energy lithium-air cells are being developed with the use of LISICON membranes (a dense lithium ion conductor). The LISICON membrane allows cells to be divided into separate compartments, one containing the anode and the other the cathode, each with a different electrolyte. This is particularly important for the lithium/air cell where a LISICON membrane can be used to separate an organic non-aqueous anolyte from an aqueous catholyte. The LISICON membranes were evaluated for LiP + P ion conductivity. The construction and performance testing of laboratory type Li-air cells was conducted to determine rate capability, stability, and impedance characteristics of the Li-air cell.

DTIC

Lithium Batteries; Metal Air Batteries

20080036326 Air Univ., Maxwell AFB, AL USA

Department of Defense Energy Strategy. Teaching an Old Dog New Tricks

Lengyel, Gregory J; Jan 2008; 90 pp.; In English

Report No.(s): AD-A481621; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481621>

The USA has a national security problem that involves energy security, and the Department of Defense 'DOD' has a

unique interest in this problem. The USA imports 26 percent of its total energy supply and 56 percent of its oil. The DOD is the largest single consumer of energy in the USA, and energy is the key enabler of USA 'US' military combat power. Huge energy consumption, increased competition for limited energy supplies, ever-increasing energy costs, and no comprehensive energy strategy or oversight of energy issues in the DOD have created vulnerabilities. These include potential fuel and electricity supply disruptions and foreign policy and economic vulnerability. The DOD needs a comprehensive energy strategy and an organizational structure to implement a strategy to improve national security by decreasing US dependence on foreign oil, ensure access to critical energy requirements maintain or improve combat capability, promote research for future energy security, be fiscally responsible to the American taxpayer, and protect the environment. This strategy can be implemented through leadership and culture change, innovation and process efficiencies, reduced demand, and increased/diversified energy sources.

DTIC

Defense Program; Dogs; Education; Energy Consumption

20080036329 Congressional Budget Office, Washington, DC USA

Nuclear Power's Role in Generating Electricity

Falk, Justin; May 2008; 46 pp.; In English

Report No.(s): AD-A481626; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481626>

This study assesses the commercial viability of advanced nuclear technology as a means of meeting future demand for electricity by comparing the costs of producing electricity from different sources under varying circumstances. The Congressional Budget Office (CBO) estimated the cost of producing electricity using a new generation of nuclear reactors and other base-load technologies under a variety of assumptions about prospective carbon dioxide charges, EPA incentives, and future market conditions. This study compares the cost of advanced nuclear technology with that of other major sources of base-load capacity that are available throughout the country including both conventional and innovative fossil-fuel technologies. Because the study focuses only on technologies that can be used as base-load capacity in most parts of the country, it does not address renewable energy technologies that are intermittent (such as wind and solar power) or technologies that use resources readily available only in certain areas (such as geothermal or hydroelectric power).

DTIC

Costs; Electric Generators; Electric Power Plants; Electricity; Energy Policy; Nuclear Power Plants

20080036400 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Lithium Carbon Monofluoride: The Next Primary Chemistry for Soldier Portable Power Sources

Suszko, Arek; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481761; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481761>

The US Army is interested in a low cost, high energy density primary lithium power source for use as the energy source for field charging units, for use in advanced man portable electronic equipment, and for unmanned and unattended systems. Lithium metal can provide a theoretical 13 Kilowatt-hours/ kilogram based on the metal. This is ten times greater than the theoretical specific energy of zinc. It is imperative that the government invests in this chemistry and reduces the burden on the soldiers. Current lithium-ion rechargeable battery technologies have a specific energy of 170 Watt-hours/ kilogram and state-of-the-art primary lithium-based systems have a specific energy approaching 200 Watt-hours/kilogram. A weight burden is added to the user as a result of this low specific energy and additional logistic support is required for recharging. It is imperative that the novel lithium power energy source have a superior specific energy (>400 Watt-hours/kilogram) and a moderate specific power (>50 Watts/kilogram).

DTIC

Carbon; Lithium; Lithium Batteries

ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20080034723 University of Southern Illinois, Carbondale, IL, USA

Value-Added Products from FGD Sulfite-Rich Scrubber Materials. Final Technical Report. Reporting Period, October 1, 2004 through September 30, 2006

Malhotra, V. M.; Dec. 01, 2006; 32 pp.; In English

Contract(s)/Grant(s): DE-FG26-04NT42179

Report No.(s): DE2007-914709; No Copyright; Avail.: National Technical Information Service (NTIS)

Massive quantities of sulfite-rich flue gas desulfurization (FGD) scrubber materials are produced every year in the USA. In fact, at present, the production of wet sulfite-rich scrubber cake outstrips the production of wet sulfate-rich scrubber cake by about 6 million tons per year. However, most of the utilization focus has centered on FGD gypsum. Therefore, we have recently initiated research on developing new strategies for the economical, but environmentally-sound, utilization of sulfite-rich scrubber material. In this exploratory project (Phase I), we attempted to ascertain whether it is feasible to develop reconstituted wood replacement products from sulfite-rich scrubber material. In pursuit of this goal, we characterized two different wet sulfite-rich scrubber materials, obtained from two power plants burning Midwestern coal, for their suitability for the development of value-added products. The overall strategy adopted was to fabricate composites where the largest ingredient was scrubber material with additional crop materials as additives. Our results suggested that it may be feasible to develop composites with flexural strength as high as 40 MPa (5800 psi) without the addition of external polymers. We also attempted to develop load-bearing composites from scrubber material, natural fibers, and phenolic polymer. The polymer-to-solid ratio was limited to = 0.4. The formulated composites showed flexural strengths as high as 73 MPa (10,585 psi). We plan to harness the research outcomes from Phase I to develop parameters required to upscale our value-added products in Phase II.

NTIS

Desulfurizing; Flue Gases; Pollution Control; Scrubbers; Sulfites

20080034727 National Energy Technology Lab., Pittsburgh, PA USA

Ranking of Enabling Technologies for Oxy-Fuel Based Carbon Capture

Ochs, T.; Oryshchyn, D.; Ciferno, J.; Summers, C.; Jun. 2007; 12 pp.; In English

Report No.(s): DE2007-915510; No Copyright; Avail.: National Technical Information Service (NTIS)

The USDOE National Energy Technology Laboratory (NETL) has begun a process to identify and rank enabling technologies that have significant impacts on pulverized coal oxy-fuel systems. Oxy-fuel combustion has been identified as a potential method for effectively capturing carbon in coal fired power plants. Presently there are a number of approaches for carbon capture via oxy-fuel combustion and it is important to order those approaches so that new research can concentrate on those technologies with high potentials to substantially lower the cost of reduced carbon electricity generation. NETL evaluates these technologies using computer models to determine the energy use of each technology and the potential impact of improvements in the technologies on energy production by a power plant. Near-term sub-critical boiler technologies are targeted for this analysis because: most of the world continues to build single reheat sub-critical plants; the overwhelming number of coal fired power plants requiring retrofit for CO₂ capture are sub-critical plants. In addition, even in the realm of new construction, subcritical plants are common because they are well understood, easy to operate and maintain, fuel tolerant, and reliable.

NTIS

Carbon; Carbon Dioxide; Coal; Fossil Fuels; Fuels; Oxygen; Ranking

20080034728 National Energy Technology Lab., Pittsburgh, PA USA; Pittsburgh Univ., PA, USA

Carbon Dioxide Capture and Separation Techniques for Gasification-Based Power Generation Point Sources

Pennline, H. W.; Luebke, D. R.; Jones, K. L.; Morsi, B. I.; Heintz, Y. J.; Jun. 2007; 14 pp.; In English

Report No.(s): DE2007-915509; No Copyright; Avail.: Department of Energy Information Bridge

The capture/separation step for carbon dioxide (CO₂) from large-point sources is a critical one with respect to the technical feasibility and cost of the overall carbon sequestration scenario. For large-point sources, such as those found in power generation, the carbon dioxide capture techniques being investigated by the in-house research area of the National Energy Technology Laboratory possess the potential for improved efficiency and reduced costs as compared to more

conventional technologies. The investigated techniques can have wide applications, but the research has focused on capture/separation of carbon dioxide from flue gas (post-combustion from fossil fuel-fired combustors) and from fuel gas (precombustion, such as integrated gasification combined cycle or IGCC). With respect to fuel gas applications, novel concepts are being developed in wet scrubbing with physical absorption; chemical absorption with solid sorbents; and separation by membranes. In one concept, a wet scrubbing technique is being investigated that uses a physical solvent process to remove CO₂ from fuel gas of an IGCC system at elevated temperature and pressure. The need to define an ideal solvent has led to the study of the solubility and mass transfer properties of various solvents. Pertaining to another separation technology, fabrication techniques and mechanistic studies for membranes separating CO₂ from the fuel gas produced by coal gasification are also being performed. Membranes that consist of CO₂-philic ionic liquids encapsulated into a polymeric substrate have been investigated for permeability and selectivity. Finally, dry, regenerable processes based on sorbents are additional techniques for CO₂ capture from fuel gas.

NTIS

Carbon Dioxide; Coal Gasification; Gasification; Point Sources

20080034729 Fluor Daniel Hanford, Inc., Richland, WA, USA

Lessons Learned from Cleaning Out the Sludge from the Spent Fuel Storage Basins at Hanford

Aug. 2007; 9 pp.; In English

Report No.(s): DE2007-915494; HNF-34947-FP; No Copyright; Avail.: Department of Energy Information Bridge

Until 2004, the K Basins at Hanford, in southeastern Washington State, held the largest collection of spent nuclear fuel in the USA Department of Energy (DOE) complex. The K East and K West Basins are massive pools each holding more than 4 million liters of water--that sit less than 450 meters from the Columbia River. In a significant multi-year campaign that ended in 2004, Fluor Hanford removed all of the fuel from the two Basins, over 2,300 metric tons (4.6 million pounds), dried it, and then placed it into dry storage in a specially designed facility away from the River. Removing the fuel, however, did not finish the cleanup work at the K Basins. The years of underwater storage had corroded the metallic uranium fuel, leaving behind a thick and sometimes hard-packed layer of sludge that coated the walls, floors and equipment inside the Basins. In places, the depth of the sludge was measured in feet rather than inches, and its composition was definitely not uniform. Together the Basins held an estimated 50 cubic meters of sludge (42 cubic meters in K East and 8 cubic meters in K West). The K East sludge retrieval and transfer work was completed in May 2007.

NTIS

Cleaning; Lessons Learned; Sludge; Spent Fuels

20080034730 West Virginia Univ., Morgantown, WV, USA; National Energy Technology Lab., Morgantown, WV, USA

Influence of Shrinkage and Swelling Properties of Coal on Geologic Sequestration of Carbon Dioxide

Siriwardane, H. J.; Gondle, R.; Smith, D. H.; January 2007; 44 pp.; In English

Report No.(s): DE2007-915489; No Copyright; Avail.: National Technical Information Service (NTIS)

The potential for enhanced methane production and geologic sequestration of carbon dioxide in coalbeds needs to be evaluated before large-scale sequestration projects are undertaken. Geologic sequestration of carbon dioxide in deep unmineable coal seams with the potential for enhanced coalbed methane production has become a viable option to reduce greenhouse gas emissions. The coal matrix is believed to shrink during methane production and swell during the injection of carbon dioxide, causing changes in the cleat porosity and permeability of the coal seam. However, the influence of swelling and shrinkage, and the geomechanical response during the process of carbon dioxide injection and methane recovery, are not well understood. A three-dimensional swelling and shrinkage model based on constitutive equations that account for the coupled fluid pressure-deformation behavior of a porous medium was developed and implemented in an existing reservoir model. Several reservoir simulations were performed at a field site located in the San Juan basin to investigate the influence of swelling and shrinkage, as well as other geomechanical parameters, using a modified compositional coalbed methane reservoir simulator (modified PSU-COALCOMP). The paper presents numerical results for interpretation of reservoir performance during injection of carbon dioxide at this site.

NTIS

Carbon Dioxide; Coal; Shrinkage; Swelling

20080034755 ARCADIS Geraghty and Miller, Inc., Durham, NC, USA

Evaluation of Fugitive Emissions Using Ground-Based Optical Remote Sensing Technology

Feb. 2007; 111 pp.; In English

Report No.(s): PB2008-101559; EPA/600/R-07/032; No Copyright; Avail.: National Technical Information Service (NTIS)

EPA has developed and evaluated a method for characterizing fugitive emissions from large area sources. The method,

known as radial plume mapping (RPM), uses multiple-beam, scanning, optical remote sensing (ORS) instrumentation such as open-path Fourier transform infrared spectroscopy, ultraviolet differential absorption spectroscopy, open-path tunable diode spectroscopy, and open-path tunable diode laser absorption spectroscopy in unique radial configurations and optimization algorithms providing essential spatial data for emission calculations. The RPM method can be used for characterizing emissions from a wide range of area sources, including landfills, wastewater treatment plants, and agricultural operations. This report represents a three-year effort conducted to evaluate the feasibility of using ORS instrumentation to measure landfill gas emissions, which include methane, volatile organic compounds, and air toxics.

NTIS

Plumes; Remote Sensing; Spectroscopy; Technologies; Ground Based Control; Optics

20080034760 Colorado Dept. of Public Health and Environment, Denver, CO, USA

Health Consultation: Crown Market, Public Health Implications of Indoor Air Residential Exposures via Vapor Intrusion and Outdoor Occupational Exposures via Soil Vapor. Evaluation of Former Leaking Underground Storage Tanks at Crown Market, Denver, Denver County, Colorado

Jun. 12, 2007; 50 pp.; In English

Report No.(s): PB2008-101351; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The Colorado Department of Public Health and Environments (CDPHE) Environmental Epidemiology Section has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the US Department of Health and Human Services and is the principal federal public health agency responsible for the health issues related to hazardous waste. This health consultation was prepared in accordance with the methodologies and guidelines developed by ATSDR. The purpose of this health consultation is to identify and prevent harmful health effects resulting from exposure to hazardous substances in the environment. Health consultations focus on health issues associated with specific exposures so that the state or local department of public health can respond quickly to requests from concerned citizens or agencies regarding health information on hazardous substances. The Environmental Epidemiology Section (EES) evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur in the future, reports any potential harmful effects, and then recommends actions to protect public health. The findings in this report are relevant to conditions at the site during the time this health consultation was conducted and should not necessarily be relied upon if site conditions or land use changes in the future.

NTIS

Colorado; Consulting; Exposure; Health; Indoor Air Pollution; Intrusion; Public Health; Soils; Storage Tanks; Underground Storage; Vapors

20080034767 North Dakota Univ., Grand Forks, ND, USA; National Energy Technology Lab., Pittsburgh, PA USA

JV Task-5 Evaluation of Residual Oil Fly Ash as a Mercury Sorbent for Coal Combustion Flue Gas

Galbreath, K. C.; Jan. 2007; 11 pp.; In English

Report No.(s): DE2007-915434; REPT-2007-EERC-01-05; No Copyright; Avail.: Department of Energy Information Bridge

The mercury adsorption capacity of a residual oil fly ash (ROFA) sample collected from Florida Power and Light Company's Port Everglades Power Plant was evaluated using a bituminous coal combustion flue gas simulator and fixed-bed testing protocol. A size-segregated (>38 μ g) fraction of ROFA was ground to a fine powder and brominated to potentially enhance mercury capture. The ROFA and brominated-ROFA were ineffective in capturing or oxidizing the Hg(sup 0) present in a simulated bituminous coal combustion flue gas. In contrast, a commercially available DARCO FGD initially adsorbed Hg(sup 0) for about an hour and then catalyzed Hg0 oxidation to produce Hg(sup 2+). Apparently, the unburned carbon in ROFA needs to be more rigorously activated in order for it to effectively capture and/or oxidize Hg(sup 0).

NTIS

Adsorbents; Air Pollution; Coal; Coal Derived Gases; Combustion; Combustion Products; Flue Gases; Fly Ash; Oils; Pollution Control; Sorbents

20080034792 Conley Rose, P.C., Houston, TX, USA; North Dakota Univ., Grand Forks, ND, USA

Sorbents for the Oxidation and Removal of Mercury

Olson, E. S., Inventor; Holmes, M. J., Inventor; Pavlish, J. H., Inventor; 22 Aug 05; 23 pp.; In English

Contract(s)/Grant(s): R 827649-01; CR 830929-01

Patent Info.: Filed Filed 22 Aug 05; US-Patent-Appl-SN-11-209 163

Report No.(s): PB2008-101131; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A promoted activated carbon sorbent is described that is highly effective for the removal of mercury from flue gas streams. The sorbent comprises a new modified carbon form containing reactive forms of halogen and halides. Optional components may be added to increase reactivity and mercury capacity. These may be added directly with the sorbent, or to the flue gas to enhance sorbent performance and/or mercury capture. Mercury removal efficiencies obtained exceed conventional methods. The sorbent can be regenerated and reused. Sorbent treatment and preparation methods are also described. New methods for in-flight preparation, introduction, and control of the active sorbent into the mercury contaminated gas stream are described.

NTIS
Activated Carbon; Air Pollution; Flue Gases; Oxidation; Patent Applications; Pollution Control; Sorbents

20080034854 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Review of On-Site Air Monitoring Data During the Removal Action at Le Mars Coal Gas Site, Le Mars Coal Gas Plant, Le Mars, Plymouth County, Iowa. EPA Facility ID: IA0001032556

Jul. 27, 2005; 13 pp.; In English

Report No.(s): PB2008-101831; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The Iowa Department of Public Health (IDPH), Hazardous Waste Site Health Assessment Program was asked by the US Environmental Protection Agency (EPA) to review a round of air sampling data. The air data was collected and analyzed during a removal action at the Le Mars Coal Gas Site in Le Mars, Iowa. EPA asked IDPH to determine from the air data if additional monitoring is necessary throughout the removal action to protect nearby residents from exposure.

NTIS

Air Pollution; Air Quality; Coal Derived Gases; Environmental Monitoring; Environmental Surveys; Health; Iowa; Pollution Monitoring; Public Health

20080034925 National Inst. for Occupational Safety and Health, Washington, DC, USA

Waste Anesthetic Gases: Occupational Hazards in Hospitals

Sep. 2007; 16 pp.; In English

Report No.(s): PB2008-100198; DHHS/PUB/NIOSH-2007-151; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Waste anesthetic gases are small amounts of volatile anesthetic gases that leak from the patient's anesthetic breathing circuit into the air of operating rooms during delivery of anesthesia. These gases may also be exhaled by patients recovering from anesthesia. Waste anesthetic gases include both nitrous oxide and halogenated anesthetics such as halothane, enflurane, isoflurane, desflurane, sevoflurane, and methoxyflurane (no longer used in the USA). The halogenated anesthetics are often administered in combination with nitrous oxide. Nitrous oxide and some of the halogenated anesthetics may pose a hazard to hospital workers. The purpose of this brochure is to do the following: (1) Increase awareness about the adverse health effects of waste anesthetic gases; (2) Describe how workers are exposed to waste anesthetic gases; (3) Recommend work practices to reduce these exposures; (4) Identify methods to minimize leakage of anesthetic gases into the work environment.

NTIS

Anesthetics; Hazards; Hospitals; Medical Personnel

20080034998 Wilmer Cutler Pickering Hale and Dorr, LLP, Boston, MA, USA

Method and System for SCR Optimization

Lefebvre, W. C., Inventor; Kohn, D. W., Inventor; 15 Dec 04; 21 pp.; In English

Contract(s)/Grant(s): DE-FC26094NT-41768

Patent Info.: Filed Filed 15 Dec 04; US-Patent-Appl-SN-11-012 630

Report No.(s): PB2008-100750; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods and systems are provided for controlling SCR performance in a boiler. The boiler includes one or more generally cross sectional areas. Each cross sectional area can be characterized by one or more profiles of one or more conditions affecting SCR performance and be associated with one or more adjustable desired profiles of the one or more conditions during the operation of the boiler. The performance of the boiler can be characterized by boiler performance parameters. A system in accordance with one or more embodiments of the invention can include a controller input for receiving a performance goal for the boiler corresponding to at least one of the boiler performance parameters and for receiving data values corresponding to boiler control variables and to the boiler performance parameters. The boiler control variables include one or more current profiles of the one or more conditions. The system also includes a system model that relates one or more profiles of the one

or more conditions in the boiler to the boiler performance parameters. The system also includes an indirect controller that determines one or more desired profiles of the one or more conditions to satisfy the performance goal for the boiler. The indirect controller uses the system model, the received data values and the received performance goal to determine the one or more desired profiles of the one or more conditions. The system model also includes a controller output that outputs the one or more desired profiles of the one or more conditions.

NTIS

Air Pollution; Boilers; Coal; Control Equipment; Nitrogen Oxides; Patent Applications

20080035002 UT-Battelle, LLC, Oak Ridge, TN, USA

NO_x Sensing Devices Having Conductive Oxide Electrodes

Montgomery, F. C., Inventor; West, D. L., Inventor; Armstrong, T. R., Inventor; Maxey, L. C., Inventor; 24 Sep 04; 52 pp.; In English

Contract(s)/Grant(s): DE-AC05-00OR22725

Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-949 854

Report No.(s): PB2008-102153; No Copyright; Avail.: CASI: [A04](#), Hardcopy

A NO(sub x) sensing device includes at least one pair of spaced electrodes, at least one of which is made of a conductive oxide, and an oxygen-ion conducting material in bridging electrical communication with the electrodes.

NTIS

Detection; Electrodes; Exhaust Emission; Nitrogen Oxides; Oxides; Patent Applications; Remote Sensing

20080035004 David S. Resnick and Nixon Peabody, LLP, Boston, MA, USA

Electro-Optical Nucleic Acid-Based Sensor Array and Method for Detecting Analytes

White, J. E., Inventor; Kauer, J. S., Inventor; 25 Nov 03; 41 pp.; In English

Contract(s)/Grant(s): N00014-95-1-1340; DAAK60-97-K-9502

Patent Info.: Filed Filed 25 Nov 03; US-Patent-Appl-SN-10-535 748

Report No.(s): PB2008-102169; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention is directed to methods of detection, identification and monitoring of vapor phase analytes by using sensor arrays comprising fluorophore labeled nucleic acids, dried onto a substrate which react with vapor phase analytes. Methods of using and preparing such sensor arrays are also provided.

NTIS

Detection; Electro-Optics; Nucleic Acids; Patent Applications; Vapor Phases

20080035005 Craig G. Cochenour, Esq. and Buchanan Ingersoll, PC, Pittsburgh, PA, USA

Enzyme-Based Device for Environmental Monitoring

LeJeune, K. E., Inventor; Mysliwczyk, R. J., Inventor; Holzapfel, P. L., Inventor; Erbedinger, M., Inventor; 6 Oct 04; 11 pp.; In English

Contract(s)/Grant(s): DMI0319086

Patent Info.: Filed Filed 6 Oct 04; US-Patent-Appl-SN-10-959 744

Report No.(s): PB2008-102171; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A sensor for the intermittent or continuous detection of the presence of at least one analyte in an environmental sample includes at least one enzyme that is selected to either (i) catalyze a reaction of the analyte to chemically convert the analyte to a product compound or (ii) be inhibited by the analyte in the presence of a substrate compound. The sensor also includes at least one sensor for monitoring or at least one indicator compound selected to produce a measurable change of state as a result of the interaction of the analyte and the enzyme. Optionally, each of the enzyme and the indicator compound are incorporated within a single polymer.

NTIS

Environmental Monitoring; Enzymes; Patent Applications

20080035011 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Environmental Data Evaluation, Chillum Perc (a/k/a Chillum Perchloroethylene), Chillum, Prince George's County, Maryland. EPA Facility ID: MDN000305887

Nov. 24, 2004; 40 pp.; In English

Report No.(s): PB2008-102327; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Environmental Protection Agency (EPA) Region 3 office asked the Agency for Toxic Substances and Disease

Registry (ATSDR) to review indoor air, active soil vapor, ground water, and drinking water sampling data collected during summer 2003 for the Chillum, Maryland perc (perchloroethylene or PCE) site. A mixed gasoline and perc plume originated on the site. In January 2004, ATSDR released a health consultation that reviewed active soil gas data collected from January 2002 through December 2002, and reviewed preliminary indoor air data collected in April 2003. This health consultation analyzes additional environmental data collected from July 2003 through September 2003 and determines whether the on-site contamination poses a public health hazard through an inhalation pathway.

NTIS

Health; Maryland; Toxic Diseases

20080035012 Louisiana Dept. of Health and Hospitals, Baton Rouge, LA, USA

Health Consultation: Post-Hurricane Groundwater Sampling Evaluation, Cleve Reber Superfund Site, Ascension Parish, Louisiana. EPA Facility ID: LAD980501456

Nov. 01, 2006; 14 pp.; In English

Report No.(s): PB2008-102328; No Copyright; Avail.: National Technical Information Service (NTIS)

On August 29 and September 24, 2005, hurricanes Katrina and Rita made landfall along the Gulf Coast. From September 29, 2005 through October 14, 2005, a team of U.S. Environmental Protection Agency (EPA) contractors collected samples at the National Priority List (NPL) sites in Louisiana to assess any potential impacts that the hurricanes may have had on remedies completed at those sites. On October 12, 2005, EPA collected groundwater samples from two monitoring wells at the Cleve Reber site, located in Ascension Parish, Louisiana. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) has performed a review of the post-hurricane groundwater data. The primary goal of this health consultation is to determine whether the Cleve Reber groundwater monitoring wells contained chemicals at levels that could pose a threat to human health and, if such levels are found, to establish what further public health actions, if any, may be needed.

NTIS

Environmental Cleanup; Health; Hurricanes; Priorities; Sampling; Toxic Diseases

20080035013 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: 'Armen Cleaners' Dry Cleaners, City of Ann Arbor, Washtenaw County, Michigan. EPA Facility ID: MIN000508741

Apr. 20, 2005; 37 pp.; In English

Report No.(s): PB2008-102335; No Copyright; Avail.: National Technical Information Service (NTIS)

In 2002, the Michigan Department of Environmental Quality (MDEQ) requested that the Michigan Department of Community Health (MDCH) conduct a health consultation on a property adjacent to the Armen Cleaners facility, located at 630 S. Ashley Street in Ann Arbor. This smaller health consultation (MDCH 2002) was completed in the same year but the collection of additional environmental data from the area led to the present consultation, which is larger in scope than the original (as mandated by the additional data). Several residential buildings immediately surrounding the site in downtown Ann Arbor (Washtenaw County, Michigan) are being impacted by releases of the dry cleaning solvent perchloroethylene (PCE, perchloroethene, or perc). There is evidence presented within this health consultation that shows several possible exposure scenarios to the surrounding neighborhood, both currently and in the future.

NTIS

Cleaners; Drying; Hazards; Health; Michigan; Public Health; Risk Assessment

20080035014 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: EQ Resource Recovery Explosion and Fire Romulus, Wayne County, Michigan. EPA Facility ID: MID060975844

Mar. 01, 2006; 58 pp.; In English

Report No.(s): PB2008-102337; No Copyright; Avail.: National Technical Information Service (NTIS)

On August 9, 2005, a hazardous waste tank at the EQ Resource Recovery plant in Romulus (Wayne County), Michigan exploded and burned, setting off fires in surrounding tanks. The U.S. Environmental Protection Agency (EPA) assisted local hazmat teams with response activities and contamination assessment. EPA and the Wayne County Health Department requested an assessment of the air, soot, and fire-related debris analyses. The federal Agency for Toxic Substances and Disease Registry (ATSDR) and the Michigan Department of Community Health (MDCH) provided toxicological expertise in assessing

public health implications of the contamination. The explosion and fire at the facility posed an urgent public health hazard, warranting the evacuation that was ordered by local officials. Concentrations of volatile organic compounds (VOCs) in the air, polycyclic aromatic hydrocarbons (PAHs) in soot, and metals in soot and debris posed no apparent short-term public health hazard. Additionally, any residual contaminant concentrations pose no apparent current or future public health hazard. The cause of the explosion and fire should be investigated and steps taken to ensure the future safety of the community surrounding the facility.

NTIS

Explosions; Fires; Hazardous Wastes; Health; Michigan; Polycyclic Aromatic Hydrocarbons; Volatile Organic Compounds

20080035471 Forest Service, Missoula, MT, USA

Laboratory Evaluation of Two Optical Instruments for Real-Time Particulate Monitoring of Smoke

Feb. 1999; 14 pp.; In English

Report No.(s): PB2008-101864; FS-9925-2806-MTDC; No Copyright; Avail.: CASI: [A03](#), Hardcopy

In March and July of 1998, the Missoula Technology and Development Center (MTDC) and the Fire Sciences Laboratory (FSL) evaluated two real-time optical instruments that estimate particulate concentrations by comparing them with two gravimetric devices. The March laboratory tests were conducted to determine whether the optical and gravimetric instruments showed significant differences when measuring smoke particles produced from burning wood under controlled conditions in an indoor chamber. Analysis of the data from these tests showed considerable differences between the two measurement techniques. Further laboratory tests in July gathered data to develop a correction curve for the optical instruments and to determine if there were significant differences in the optical properties of smoke based on the type of fuel generating it.

NTIS

Air Pollution; Monitors; Optical Equipment; Particulates; Real Time Operation; Smoke

20080035484 Environmental Protection Agency, Washington, DC, USA

Final Report of the Small Business Advocacy Review Panel on EPA's Planned Proposed Rule. Mobile Source Air Toxics: Control of Hazardous Air Pollutants from Mobile Sources

Nov. 2005; 107 pp.; In English

Report No.(s): PB2008-101844; EPA/420/R-05/901; No Copyright; Avail.: CASI: [A06](#), Hardcopy

This report is presented by the Small Business Advocacy Review Panel (SBAR Panel or Panel) convened for the proposed rulemaking on the Control of Hazardous Air Pollutants from Mobile Sources, currently being developed by the U.S. Environmental Protection Agency (EPA). Under Section 609(b) of the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), a Panel is required to be convened prior to publication of the initial regulatory flexibility analysis (IRFA) that an agency may be required to prepare under the RFA. In addition to EPA's Small Business Advocacy Chairperson, this Panel will consist of the Director of EPA's Assessment and Standards Division within the Office of Transportation and Air Quality (OTAQ), the Administrator of the Office of Information and Regulatory Affairs within the Office of Management and Budget, and the Chief Counsel for Advocacy of the Small Business Administration. This report includes the following: background information on the proposed rule under development; information on the types of small entities that would be subject to the proposed rule; a summary of the Panel's outreach activities; and, the comments and recommendations of the Small Entity Representatives (SERs). Section 609(b) of the RFA directs the Panel to report on the comments of small entity representatives and its findings on issues related to identified elements of an IRFA under section 603 of the RFA.

NTIS

Air Pollution; Commerce; Pollution Control

20080035486 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

Guideline on the Meaning and the Use of Precision and Bias Data Required by 40 CFR Part 58, Appendix A

Camalier, L.; Eberly, S.; Miller, J.; Papp, M.; Oct. 2007; 37 pp.; In English

Report No.(s): PB2008-101565; EPA/454/B-07/001; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The objective of this new Guideline is to provide the data user with a brief history of the establishment of the ambient air monitoring quality system, the quality control techniques that have been in place up until the promulgation of the new monitoring rule, and to provide the guidance and spreadsheets necessary to understand and implement these new statistics. This document is intended to replace the 1983 Guideline.

NTIS

Air Sampling; Ambience; Bias; Environmental Monitoring

20080035627 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: Mid-Michigan Mercury Floor, Middleton, Gratiot County, Michigan

May 06, 2004; 10 pp.; In English

Report No.(s): PB2008-102261; No Copyright; Avail.: CASI: [A02](#), Hardcopy

On March 11, 2004 the MDCH received a call from the Superintendent for the Fulton Elementary School located at 8060 Ely Highway in Middleton, Michigan, approximately 30 miles north of Lansing. The school was in the process of replacing the surface of their gymnasium floor and had submitted samples of the material for analysis following the directions of the Michigan Department of Environmental Quality. The vinyl-like floor surface was approximately 35 years old and had been formulated and poured with mercury as an ingredient to facilitate the liquids spreading and leveling. The MDEQ required a Toxicity Characteristic Leaching Procedure (TCLP) test on the floor surface material since it is considered a toxic waste. It is not ignitable, corrosive or reactive but its toxicity needs to be known in order to determine if it could be sent to a type II or type III landfill, or must go to a hazardous waste landfill. The test showed the material exceeded the 0.200 milligram per liter (mg/L) standard for mercury with a sample result of 1.5 mg/L. The school was already in the process of making arrangements with a contractor who would remove, transport and dispose of the flooring in an approved manner. The Superintendent was calling MDCH to seek our advice and assistance in determining if the floor and the removal process posed any health hazard to the children and staff of the school. The potential for current and future exposure to mercury vapors emanating from the floor were the health issues that prompted the request for this consultation.

NTIS

Consulting; Floors; Health; Indoor Air Pollution; Michigan; Toxicity

20080035628 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: Kerosene Soot Contamination of Residential Homes, Harrisville, Alcona County, Michigan

Apr. 30, 2004; 13 pp.; In English

Report No.(s): PB2008-102263; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Owners of a home accidentally burned non-smokeless kerosene in lamps during an electrical outage, contaminating the interior of the home with soot. Working with their insurance company and the Michigan Department of Community Health, they have taken steps toward remediation of the premises. No apparent public health hazard exists. The purpose of this health consultation is to address the health concerns of the occupants of a home in which non-smokeless kerosene had been burned in lamps overnight, resulting in contamination of the interior of the home with soot. While there were hazards associated with the kerosene lamps burning while the occupants were asleep, the primary concern was dermal exposure to and incidental ingestion of soot resulting from the use of the kerosene.

NTIS

Buildings; Consulting; Contamination; Health; Indoor Air Pollution; Kerosene; Michigan; Soot

20080035629 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Holtrachem Manufacturing Company, Orrington, Penobscot County, Maine. EPA Facility ID: MED000242701

Aug. 21, 2006; 25 pp.; In English

Report No.(s): PB2008-102280; No Copyright; Avail.: National Technical Information Service (NTIS)

The Agency for Toxic Substances and Disease Registry (ATSDR) was asked by the Maine Department of Health and Human Services (ME DHHS) and Maine Department of Environmental Protection (ME DEP) to provide public health advice regarding public exposure to mercury during the demolition and remediation of the HoltraChem Manufacturing Company site (HoltraChem) in Orrington, Maine. ATSDR staff reviewed the Air Monitoring Program mercury emission values set by ME DEP and we agree that 300 nanograms per cubic meter (0.300 micrograms per cubic meter) mercury at the property line will be protective of public health. Staff also reviewed the Industrial Source Complex Short Term version 3 (ISCST3) modeling by ME DEP Air Program of the potential off-site mercury concentrations during the 6 phases of site remediation. Based on the modeled concentrations at off-site receptors, ATSDR classifies current and potential future off-site mercury concentrations during remediation as no apparent public health hazard. Air monitoring will be conducted during remediation.

NTIS

Exposure; Hazards; Health; Maine; Manufacturing; Public Health

20080036125 Agency for Toxic Substances and Disease Registry, Atlanta, GA USA

Health Consultation: Bourne Bridge, Cape Cod Canal, Massachusetts

Aug. 18, 2005; 9 pp.; In English

Report No.(s): PB2008-102312; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The U.S. Army Corps of Engineers (Corps) operates the Bourne bridge, which spans the Cape Cod Canal and connects Buzzards Bay on the Massachusetts mainland with the town of Bourne on Cape Cod. Since 2004, the Corps has been removing existing paint from the bridge. Work began first on the lower span of the north side of the bridge and was completed at the end of August 2004. In early September 2004, work began on the lower span of the south side of the bridge and was completed at the end of June 2005. At present, work is ongoing on the upper span of the south side of the bridge and will continue to the north side. The remaining work on the bridge is expected to last 1520 weeks. The U.S. Environmental Protection Agency (EPA) became involved at the bridge site during the week of July 5, 2005, in response to citizens complaints. Earlier complaints were filed with the Massachusetts Department of Environmental Protection (MA DEP) who then contacted EPA. The complaints focused on debris, which allegedly results from the ongoing lead paint abatement and repainting operations on the bridge. Gritty material has been deposited on vehicles and exposed surfaces in the area.

NTIS

Bays (Topographic Features); Canals; Engineers; Health; Massachusetts

20080036127 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: Eastern Clinic Mercury Spill, Grand Rapids, Kent County, Missouri

Nov. 05, 2003; 13 pp.; In English

Report No.(s): PB2008-102315; No Copyright; Avail.: CASI: [A03](#), Hardcopy

On July 18, 2003, a wall-mounted sphygmomanometer fell to the floor in an examining room of the Eastern Clinic (EC), located in Grand Rapids, Michigan. Elemental mercury spilled from the device onto the carpet. The physician who owns the clinic contacted the Poison Control Center (PCC) in Grand Rapids. The Kent County Health Department (KCHD) also provided the doctor clinical advice regarding cleaning up the spill and other measures necessary to make the room and surrounding areas usable once again. As of July 29, 2003, the doctor and his office manager had not carried out PCCs and KCHDs recommendations, and concerned clinic staff called the Michigan Department of Community Health for assistance. After consulting with the agencies already involved, a staff member from MDCHs Toxicology and Response Section called the physician. They discussed the health hazards associated with the vapors that emanate from elemental mercury, especially in small enclosed areas. The doctor explained that he had been gathering information on sphygmomanometers and mercury from a number of sources, including the Internet. He had not acted upon PCCs and KCHDs cleanup advice and recommendations because the other sources had led him to believe that the mercury used in the device was less toxic and more easily managed than the health agencies had told him. The MDCH representative offered to visit the clinic that day and bring a Lumex RA 914+ Mercury Vapor Analyzer to characterize the impacted areas of the facility, and the doctor accepted.

NTIS

Health; Missouri; Spilling

20080036128 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: Potential Health Effects at a Clandestine Methamphetamine Laboratory Using the Red Phosphorus Production Method, Harrison, Clare County, Michigan

January 2007; 46 pp.; In English

Report No.(s): PB2008-102323; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A meth lab employing the Red P method was discovered in the city of Harrison in January 2004, located within an eight-unit apartment building. In addition to leaving residual contamination within the portion of the apartment used for the manufacture of meth, the clandestine drug production is implicated in health effects experienced by several neighbors of the apartment.

NTIS

Health; Methamphetamine; Michigan; Phosphorus; Production Engineering

20080036129 Michigan Dept. of Community Health, Lansing, MI, USA

Health Consultation: Benton Harbor Residential Mercury Spill Event, Benton Harbor, Berrien County, Michigan

Oct. 26, 2004; 15 pp.; In English

Report No.(s): PB2008-102316; No Copyright; Avail.: CASI: [A03](#), Hardcopy

MDCH received a call from a young mother whose child had broken a blood pressure cuff in the home she was renting.

She had been given advice by the Poison Control Center and the local health department for cleaning up the spill and ventilating the vapors from the home. When the local health department and MDCH visited to perform the clearance test, they found extremely high levels of mercury vapor, evacuated the occupants, and sealed the house against reuse until the situation was ameliorated.

NTIS

Harbors; Health; Michigan; Spilling

46

GEOPHYSICS

Includes Earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.

20080035204 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Ionospheric Response to Solar Flares Using an Improved Version of SAMI2

Reich, III, Joseph P; Mar 2008; 102 pp.; In English

Report No.(s): AD-A481032; AFIT/GAP/ENP/08-M08; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481032>

Solar flare-induced disturbances in the ionosphere can affect the propagation of electromagnetic waves, causing errors in GPS navigation, false radar echoes, and loss of HF radio communications. Accurately modeling the ionospheric response to flares is the first step in predicting, and eventually mitigating their effects. Sami2 is Another Model of the Ionosphere (SAMI2) is a 2-D ionospheric model, which, in its standard form, is ill-suited for studying solar flare effects because it lacks adequate temporal resolution of the solar irradiance, and does not account for photoelectron effects. These deficiencies are addressed, and the modified version is successfully used to model the response to the 28 October, 2003 X17.2 solar flare, along a 2-D hemispheric domain. The response to the flare varied significantly between the low and mid-latitudes, and between high and low altitudes.

DTIC

Atmospheric Models; Earth Ionosphere; Electromagnetic Wave Transmission; Ionospheres; Navigation; Photoelectrons; Solar Flares

20080035228 British Columbia Univ., Vancouver, British Columbia Canada

Evaluating the Effects of Magnetic Susceptibility in UXO Discrimination Problems (SERDP SEED Project UX-1285)

Pasion, Leonard R; Billings, Stephen D; Oldenburg, Douglas W; Sinex, David; Li, Yaoguo; Aug 4, 2003; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-SERDP-SEED-UX-1285

Report No.(s): AD-A481094; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481094>

Using numerical simulations based on magnetic susceptibility properties observed at Kaho'olawe, Hawaii, we have examined the effect of magnetic soil on static magnetic method and time-domain electromagnetic (TEM) method in UXO discrimination problems. We have demonstrated that the static magnetic susceptibility can be effectively modeled using a correlated random process, and that Wiener optimal filter can be used as a preprocessing tool to remove the effect of soil response and improve the reliability of dipole inversions. The frequency-dependent susceptibility in TEM method can be modeled using a complex susceptibility having a broad range of relaxation times. A layer of soil with such susceptibility produces the characteristic $t(-1)$ decay of the voltage measured in TEM at Kaho'olawe. The horizontal component of central loop TEM data is not sensitive to the presence of magnetic soil if it is sufficiently 1D. This provides a preprocessing tool for removing the soil effect from the vertical component data and improving the result of two-dipole inversion. The research project has therefore accomplished the four stated goals of (1) developing and verifying software for simulating soil responses, (2) characterizing the effect of soil susceptibility, (3) determining the applicability of two inversion algorithms, and (4) developing methods for removing the soil effect.

DTIC

Detection; Magnetic Anomalies; Magnetic Induction; Magnetic Permeability; Seeds; Soils

20080035260 Washington Univ., Seattle, WA USA

WindSAT Data Analysis for Cal/Val

Foster, Ralph C; Brown, Robert A; May 2008; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00173-04-1-G024

Report No.(s): AD-A481178; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481178>

We investigated the accuracy, capabilities and limitations of surface wind vectors from the first release of WindSAT passive microwave radiometer data using atmospheric boundary layer models and comparisons with NASA QuikSCAT scatterometer winds. Our methods allowed both point by point vector comparisons and integrated, non-local comparisons through derived sea level pressure fields. We found that the preliminary WindSAT winds were surprisingly good and that the combined vector wind and integrated water vapor (CWV) and cloud liquid water (CLW) data would be a valuable product for storms analyses over the ocean if the quality of the wind product could be raised to QuikSCAT levels. For higher winds, WindSAT was comparable to QuikSCAT. In terms of direction, WindSAT vector fields were quite noisy and either got the direction completely wrong or selected the wrong ambiguity about 10% of the time. We found no correlation between the bad vectors and either CLW or CWV. We concluded that incorporating sea-level pressure into the surface wind retrievals has promise as a means to improve the WindSAT model function.

DTIC

Atmospheric Models; Storms

20080035262 Army Research Lab., Aberdeen Proving Ground, MD USA

Use of High Performance Computing to Conduct Fine Scale Numerical Simulations of Atmospheric Flow in Complex Terrain

Grove, D J; Haines, P A; Sun, W; Hsu, W; Nov 1, 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481181; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481181>

Numerous observational and modeling studies have revealed a wide variety of atmospheric flows around, through and above terrain obstacles. Most such studies, however, have considered fairly simple terrain such as an isolated summit or an infinite perpendicular barrier exposed to uniform or relatively simple atmospheric conditions. Real terrain and real atmospheric conditions are considerably more complex than those used in the above mentioned studies and the resulting atmospheric flow is even more complicated and diverse. This paper highlights the results from a series of high resolution (1.0 km grid spacing) numerical simulations using the National Taiwan University (NTU) / Purdue model for a variety of flow situations such as hydraulic jump, lee waves, juxtaposition of supercritical and sub-critical flows, etc. To complete these computations in a reasonable amount of time, the NTU/Purdue model simulations were run on a 1024-node Linux Network Evolocity II cluster at the Army Research Laboratory (ARL) Major Shared Resource Center (MSRC). The parallelized NTU/Purdue model's scalability characteristics were evaluated for a fixed grid size, with the number of processors ranging from 4 to 128; the model scales very well up to at least 128 processors on the ARL MSRC's Linux cluster.

DTIC

Air Flow; Atmospheric Circulation; Terrain

20080035263 Naval Research Lab., Washington, DC USA

Doppler Asymmetric Spatial Heterodyne Spectroscopy (DASH): Concept and Experimental Demonstration

Englert, Christoph R; Babcock, David D; Harlander, John M; Oct 10, 2007; 12 pp.; In English

Report No.(s): AD-A481185; XB-NRL/7600; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481185>

We describe the concept of Doppler asymmetric spatial heterodyne spectroscopy (DASH) and present a laboratory Doppler-shift measurement using an infrared laser line. DASH is a modification of spatial heterodyne spectroscopy optimized for high precision, high accuracy Doppler-shift measurements of atmospheric emission lines either from the ground or a satellite. We discuss DASH design considerations, field widening, thermal stability and tracking, noise propagation, advantages, and trade-offs. DASH interferometers do not require moving optical parts and can be built in rugged, compact packages, making them suitable for space flight and mobile ground instrumentation.

DTIC

Asymmetry; Doppler Effect; Heterodyning; Spectroscopy; Wind Velocity

20080035392 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Implications of Atmospheric Temperature Fluctuations on Passive Remote Sensing of Chemicals

Ben-David, Avishai; Holland, Stephen K; Laufer, Gabriel; Baker, Jason D; Nov 2006; 4 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481409; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Passive remote sensing of airborne chemicals at infrared wavelengths may be limited by temporal fluctuations in atmospheric brightness temperatures ΔT (Delta t). The fluctuations ΔT increase the minimum detectable chemical vapor concentration-pathlength product (CL) given by the noise-equivalent-CL (NECL) of the measurements scenario. Brightness temperatures in two infrared spectral bands were measured on clear and cloudy days along three lines of sights. For time windows $\Delta t < 3-5$ s, ΔT (Delta t) remained constant at the sensor noise-level and rapidly increased as Δt increased. The fluctuation time scale for the cloudy day was longer than those for the clear day and the magnitude of the fluctuations was smaller. At the conditions of clear day tests, passive remote sensing of airborne chemicals would have reached its maximum sensitivity with an integration interval $\Delta t = 3-5$ s with sensitivity diminishing fast with longer detection time-windows.

DTIC

Atmospheric Temperature; Detection; Remote Sensing; Variations

20080035489 Air Force Research Lab., Tyndall AFB, FL USA

Atmospheric Chemistry of Toxic Industrial Chemicals (Briefing Slides)

Henley, Michael V; Jan 11, 2007; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F08637-03-C-6006; Proj-DODT

Report No.(s): AD-A481423; AFRL-RX-TY-TP-2008-4568; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Large releases of volatile toxic industrial chemicals (TICs), either intentionally or unintentionally, pose serious threats to both military and civilian populations and operations. To predict and model the transport of any TIC requires some detailed information about its reactivity in the atmosphere. To understand the ultimate fate of a TIC, it is important to know how it is transformed during atmospheric transport and dispersion. Reactivity and fate can be addressed by answering the following two questions: (1) What is the atmospheric lifetime of the airborne TIC and (2) What are the reaction products and their yields resulting from atmospheric degradation of the TIC? The answer to these questions is ultimately grounded in understanding the reaction kinetics and mechanisms of these compounds when subjected to atmospheric oxidants and other loss mechanisms.

DTIC

Atmospheric Chemistry; Chutes; Reaction Kinetics; Toxicity

20080036076 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Impact of Surface Emissions to the Zonal Variability of Tropical Tropospheric Ozone and Carbon Monoxide for November 2004

Bowman, K. W.; Jones, D.; Logan, J.; Worden, H.; Boersma, F.; Chang, R.; Kulawik, S.; Osterman, G.; Worden, J.; Atmospheric Chemistry and Physics Discussions; January 29, 2008; Volume 8, pp. 1505-1548; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40923>

The chemical and dynamical processes governing the zonal variability of tropical tropospheric ozone and carbon monoxide are investigated for November 2004 using satellite observations, in-situ measurements, and chemical transport models in conjunction with inverse-estimated surface emissions. Vertical ozone profile estimates from the Tropospheric Emission Spectrometer (TES) and ozone sonde measurements from the Southern Hemisphere Additional Ozonesondes (SHADOZ) network show the so called zonal 'wave-one' pattern, which is characterized by peak ozone concentrations (70-80 ppb) centered over the Atlantic, as well as elevated concentrations of ozone over Indonesia and Australia (60-70 ppb) in the lower troposphere. Observational evidence from TES CO vertical profiles and Ozone Monitoring Instrument (OMI) NO₂ columns point to regional surface emissions as an important contributor to the elevated ozone over Indonesia. This contribution is investigated with the GEOS-Chem chemistry and transport model using surface emission estimates derived from an optimal inverse model, which was constrained by TES and Measurements Of Pollution In The Troposphere (MOPITT) CO profiles (Jones et al., 2007). These a posteriori estimates, which were over a factor of 2 greater than climatological emissions, reduced differences between GEOS-Chem and TES ozone observations by 30-40% and led to changes in GEOS-Chem upper tropospheric ozone of up to 40% over Indonesia. The remaining residual differences can be explained in part by upper tropospheric ozone produced from lightning NO_x in the South Atlantic. Furthermore, model

simulations from GEOS-Chem indicate that ozone over Indonesian/Australian is more sensitive to changes in surface emissions of NO_x than ozone over the tropical Atlantic.

Author

Tropical Regions; Tropical Meteorology; Troposphere; Ozone; Carbon Monoxide; Atmospheric Chemistry; Variability

20080036090 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Ross Sea Polynyas: Response of Ice Concentration Retrievals to Large Areas of Thin Ice

Kwok, R.; Comiso, J. C.; Martin, S.; Drucker, R.; Journal of Geophysical Research; December 21, 2007; Volume 112; 13 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNG04GM69G; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40930>; <http://dx.doi.org/10.1029/2006JC003967>

For a 3-month period between May and July of 2005, we examine the response of the Advanced Microwave Scanning Radiometer (AMSR-E) Enhanced NASA Team 2 (NT2) and AMSR-E Bootstrap (ABA) ice concentration algorithms to large areas of thin ice of the Ross Sea polynyas. Coincident Envisat Synthetic Aperture Radar (SAR) coverage of the region during this period offers a detailed look at the development of the polynyas within several hundred kilometers of the ice front. The high-resolution imagery and derived ice motion fields show bands of polynya ice, covering up to approximately 105 km (sup 2) of the Ross Sea, that are associated with wind-forced advection. In this study, ice thickness from AMSR-E 36 GHz polarization information serves as the basis for examination of the response. The quality of the thickness of newly formed sea ice (<10 cm) from AMSR-E is first assessed with thickness estimates derived from ice surface temperatures from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument. The effect of large areas of thin ice in lowering the ice concentration estimates from both NT2/ABA approaches is clearly demonstrated. Results show relatively robust relationships between retrieved ice concentrations and thin ice thickness estimates that differ between the two algorithms. These relationships define the approximate spatial coincidence of ice concentration and thickness isopleths. Using the 83% (ABA) and 91% (NT2) isopleths as polynya boundaries, we show that the computed coverage compares well with that using the estimated 10-cm thickness contour. The thin ice response characterized here suggests that in regions with polynyas, the retrieval results could be used to provide useful geophysical information, namely thickness and coverage.

Author

Polynyas; Sea Ice; Thickness; Antarctic Regions; Ross Ice Shelf

20080036288 Army Space and Missile Defense Command, Huntsville, AL USA

Angle of Arrival of a Focused Gaussian Beam in Atmospheric Turbulence

McMillan, R W; Nov 1, 2006; 6 pp.; In English

Report No.(s): AD-A481560; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481560>

The angles of arrival (AOA) of plane waves, spherical waves, and focused beams perturbed by atmospheric turbulence in the geometrical optics limit have been calculated by others [1]. Since geometrical optics theory allows beams to be focused to an infinitesimal point, the AOA of a focused beam in this limit becomes infinite because of a D^{-1/3} dependence of this parameter, where D is the beam diameter. If we apply Gaussian optics theory to this problem, the AOA is no longer infinite at the focal point because the beam size at focus is not infinitesimally small. In this paper we use Gaussian optics theory to show that the AOA varies according to the diameter and focal length of the focusing element and the wavelength of the radiation being focused, as well as the range. Calculated results are given.

DTIC

Atmospheric Circulation; Atmospheric Turbulence

20080036323 Network Computing Services, Inc., Adelphi, MD USA

Mesoscale Forecast Analysis of Atmospheric Boundary Layer Structure and Electromagnetic Signal Attenuation During the Terrain-Induced Rotor Experiment (T-REX)

Colon, E; Dumais, R E; Henmi, T; Flanigan, R; Nov 2006; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-D-0001

Report No.(s): AD-A481618; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481618>

With the increased importance of high bandwidth microwave communication and remote sensing capabilities in Army battlefield operations, the need arises in being able to quantify the impact of microwave signal attenuation sources such as

turbulence-driven fluctuations in the atmospheric refractive index and gaseous absorption. An assessment of attenuation effects in the atmospheric boundary layer was afforded by the Terrain-Induced Rotor Experiment (T-REX), which was a large-scale, observational study involving participants from several research agencies and academic institutions with the goal of examining the structure and evolution of atmospheric rotors and waves that develop over regions of complex terrain. A statistical analysis is presented in which the forecast accuracy of the Weather Research and Forecasting (WRF) Advance Research WRF (ARW) model employed by the Army Research Laboratory's Battlefield Environment Division is quantified using data collected from the Integrated Sounding System (ISS) Multiple Antenna Profiler Radar (MAPR) during T-REX Intensive Observation Periods (IOPs). It was found that vertical profiles of attenuation fields obtained from both model and observational sources were strongly correlated for gaseous absorption contributions but only a weak statistical relationship exists for scintillation contributions. This outcome suggests that mesoscale numerical weather prediction (NWP) models that are run at high spatial resolutions may potentially be used to generate forecasts that are tailored towards predicting EM attenuation effects over battlefield environments.

DTIC

Atmospheric Boundary Layer; Atmospheric Circulation; Atmospheric Turbulence; Attenuation; Electromagnetic Wave Transmission; Mesometeorology; Mesoscale Phenomena; Rotors; Scintillation; Terrain; Weather Forecasting

20080036562 NASA Marshall Space Flight Center, Huntsville, AL, USA

Dial Measurements of Free-Tropospheric Ozone Profiles in Huntsville, AL

Newchurch, Mike; Kuang, Shi; Burris, John; Johnson, Steve; Long, Stephanie; June 23, 2008; 4 pp.; In English; 24th International Laser Radar Conference (ILRC), 23-27 Jun. 2008, Fort Lauderdale, FL, USA; Original contains black and white illustrations; Copyright; Avail.: CASI: [A01](#), Hardcopy

A tropospheric ozone Differential Absorption Lidar (DIAL) system has been developed jointly by NASA and the University of Alabama at Huntsville (UAH). Two separated Nd:YAG pumped dye laser systems produce the laser pulses with wavelengths of 285 and 291 nm at 20 Hz frequency. The receiver is a Newtonian telescope with a 40 cm primary and a two-channel aft optics unit. The detection system currently uses photon counting to facilitate operations at the maximum achievable altitude. This lidar measures free-tropospheric ozone profiles between 4-10 km at Regional Atmospheric Profiling Laboratory for Discovery (RAPCD) in UAH campus (ASL 206 m) under both daytime and nighttime conditions. Frequent coincident ozonesonde flights and theoretical calculations provide evidence to indicate the retrieval accuracy ranges from approx.5% at 4 km to approx.60% at 10 km with 750-m vertical resolution and 30-minute integration. Three Hamamatsu 7400 PMTs and analog detection technique will be added on the current system to extend the measurement to approx.100 m above ground to monitor the PBL and lower tropospheric ozone variations.

Author

Troposphere; Ozone; Optical Radar; Differential Absorption Lidar; YAG Lasers; Detection; Dye Lasers; Neodymium Lasers

20080036681 Army War Coll., Carlisle Barracks, PA USA

Global Warming, Africa and National Security

Hinkley, John C; Jan 15, 2008; 55 pp.; In English

Report No.(s): AD-A482240; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Global warming and the resulting climate change is an issue with far reaching security ramifications for the USA. The US has vested interests in regional stability in many critical areas throughout the world. Few of these areas are growing in importance as quickly as Africa. The USA's interests in Africa include reliable access to resources, support against extremist groups, and cooperation on regional security issues to name a few. The effects of climate change will likely have the most devastating impact on the nations least able to adapt and cope due to current instability, weak central governments, external pressures or other challenges. This characterizes many countries in Africa. What are the likely effects of climate change on Africa? How should the USA, and specifically the new USAFRICOM Headquarters, prepare for the inevitable crises associated with climate change? This essay explores many of these issues.

DTIC

Africa; Global Warming; Greenhouse Effect; Security

20080036819 NASA Marshall Space Flight Center, Huntsville, AL, USA

3D PIC Simulation of the Magnetosphere during IMF Rotation from North to South: Signatures of Substorm Triggering in the Magnetotail

Nishikawa, Ken-Ichi; Cao, D/ S/; Lembege, B.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

Three dimensional PIC simulations are performed in order to analyse the dynamics of the magnetotail as the

interplanetary magnetic field (IMF) rotates from northward to southward direction. This dynamics reveals to be quite different within meridian/equatorial planes over two successive phases of this rotation. First, as IMF rotates from North to Dawn-Dusk direction, the X-Point (magnetic reconnection) evidenced in the magnetotail (meridian plane) is moving earthward (from $x=-35 R_E$ to $x=-17.5 R_E$) distance at which it stabilizes. This motion is coupled with the formation of 'Crosstail-S' patterns (within the plane perpendicular to the Sun-Earth line) through the neutral sheet in the nearby magnetotail. Second, as IMF rotates from dawn-dusk to South, the minimum B field region is expanding within the equatorial plane and forms a ring. This two-steps dynamics is analyzed in strong association with the cross field magnetotail current J_y , in order to recover the signatures of substorms triggering.

Author

Three Dimensional Models; Interplanetary Magnetic Fields; Rotation; Magnetic Storms; Magnetotails

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20080034753 Hoefler Consulting Group, Anchorage, AK, USA

Study Final Report for the Nearshore Beaufort Sea Meteorological Monitoring and Data Synthesis Project

Veltkamp, B.; Wilcox, J. R.; Sep. 2007; 107 pp.; In English

Contract(s)/Grant(s): OCS-1435-01-05-CT-39037

Report No.(s): PB2008-101763; No Copyright; Avail.: National Technical Information Service (NTIS)

This report summarizes meteorological data collected from five Minerals Management Service (MMS) stations, along with existing data from supplemental stations along the Beaufort Sea coast. Data were collected for the MMS stations from January 2001 through September 2006 spanning a 100 km stretch of the Beaufort Sea coast centered on Prudhoe Bay, Alaska. The MMS meteorological monitoring stations were located at Milne Point F Pad, Cottle Island, Northstar Island, Endicott Satellite Drilling Island, and Badami. Data from the five MMS meteorological monitoring stations, along with wind data from 29 third party supplemental monitoring stations dating to 1984 has been compiled in the MMS Nearshore Beaufort Sea Weather Database, 1984-2006. The database contains nearly 1.7 million hours of meteorological data and spans from Barrow to Hershel Island, Yukon Territory. For this study, eight of the 29 supplemental stations were selected for wind speed and direction comparison and data analysis with the five MMS stations. Supplemental stations were selected for comparison based on the stations location, operational history, and data quality.

NTIS

Beaufort Sea (North America); Data Acquisition; Meteorological Parameters; Minerals; Multimission Modular Spacecraft

20080034923 USA Climate Change Science Program, Washington, DC, USA

Preview of Our Changing Planet: The U.S. Climate Change Science Program for Fiscal Year 2008

January 2007; 32 pp.; In English

Report No.(s): PB2008-101866; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This FY 2008 Preview highlights recent advances supported by CCSP-participating agencies in each of the programs research and observational elements, as called for in the Strategic Plan for the U.S. Climate Change Science Program. The Preview includes an analysis of the significant recent progress that CCSP has made toward its overarching goals. The document describes the coordination of research and overall program management, and the eight key interagency implementation priorities for FY 2008. The document also outlines how CCSP plans to continue implementation of the Strategic Plan during FY 2008, emphasizing work on 21 scientific synthesis and assessment reports integrating research results focused on key issues and related questions of interest to decisionmakers. The purpose of this document is to provide a timely and brief preview of plans for FY 2008 as well as a summary of recent accomplishments. A more comprehensive reporting of accomplishments, plans, and budgets will be published later in 2007 as the full Our Changing Planet Annual Report.

NTIS

Climate Change; Decision Making; Project Management

20080035010 Louisiana Dept. of Health and Hospitals, Baton Rouge, LA, USA

Health Consultation: Hurricane Response Sampling Assessment for Delatte Metals, Ponchatoula, Tangipahoa Parish, Louisiana. EPA Facility ID: LAD052510344

Sep. 26, 2006; 18 pp.; In English

Report No.(s): PB2008-102325; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The August 29, 2005 landfall of Hurricane Katrina and the September 24, 2005 landfall of Hurricane Rita resulted in

extensive flooding throughout southern Louisiana. Following the hurricanes, a number of National Priorities Listing (NPL) sites throughout southern Louisiana were visited and sampled. The objectives of these events were to identify any damage that these sites suffered from the hurricanes, to determine whether the remedial actions at these sites remained effective, and to determine whether any contaminant levels had increased at the sites following hurricane-related flooding. The USA Environmental Protection Agency (US EPA), in coordination with the Louisiana Department of Environmental Quality (LDEQ), sampled groundwater from two monitoring wells at the Delatte Metals site. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and Toxicology (LDHH/OPH/SEET) has developed the following health consultation to review these groundwater samples. The primary goals of this document are to determine whether any contaminants that would pose a public health hazard had leached from residual soils into the sites ground water following Hurricane Katrina and to establish what further public health actions, if any, may be needed.

NTIS

Health; Hurricanes; Metals; Priorities; Sampling; Toxic Diseases

20080035149 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: April 2008

April 2008; In English; Copyright; Avail.: Other Sources

These CD-ROMs contain the Monthly Report of observation data derived from MTSAT-1R and the polar orbital meteorological satellite NOAA. This Monthly Report contains image data observed by the following 4 channels and processed satellite product data from the observation data. IR:Infrared (10.3-11.3um), VS:Visible (0.55-0.90um), WV:Water Vapor (6.5-7.0um), SW:3.8 micron image (3.5-4.0um). These CD-ROMs contain the following data. 'Full Disk Earth's Cloud Image'; 'Cloud Image of Japan and its Vicinity'; 'Cloud Motion Wind'; 'Water Vapor Motion Wind'; 'HRIT Image Data Catalog'; 'TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water'; 'TOVS Total Ozone Amount'; 'Aerosol Optical Thickness'; 'Snow and Ice Index'; 'Sea Surface Temperature'; and 'Cloud Grid Information'.

Author

Meteorological Satellites; Atmospheric Sounding; Satellite Observation; Data Acquisition; Satellite Imagery; Satellite Sounding

20080035185 Army War Coll., Carlisle Barracks, PA USA

Global Climate Change: National Security Implications

Pumphrey, Carolyn; May 2008; 455 pp.; In English

Report No.(s): AD-A480984; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480984>

1 INTRODUCTION Carolyn Pumphrey Triangle Institute for Security Studies The Evolution of a Problem. Until fairly recent times no one thought climate changed, let alone was influenced by human activities. By the 19th century, scientists were theorizing that temperatures were affected by what we now call greenhouse gasses. And in the late 19th century, the Swedish scientist Arrhenius suggested that human industry might cause the planet to warm. But this notion was generally scoffed at. Over the course of the 20th century, the scientific community gradually came to terms with this theory and began to regard climate change even rapid climate change as more than a distant possibility. Interest in climate change as a national security issue developed even later. Although the Central Intelligence Agency (CIA) did commission a study to look into the security implications of climate change in the late 1970s, the issue had little resonance until the late 1990s when the Senate Armed Services Committee declared that environmental destruction, including global warming, was a growing national security threat. The Intergovernmental Panel on Climate Change (IPCC) was created in 1995 in part to allay fears. And then, in 2003, the rather notorious report commissioned by the Pentagon, An Abrupt Climate Change Scenario and its Implications for USA National Security, provided a worst-case scenario, which suggested that climate change might have a catastrophic impact, leading to rioting and nuclear war.

DTIC

Climate; Climatology; Security

20080035321 Karlsruhe Univ., Germany

The Predictability of Extratropical Transition and of its Impact on the Downstream Flow

Jones, Sarah C; Anwender, Doris; Riemer, Michael; Mar 28, 2008; 39 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-1-0432

Report No.(s): AD-A481224; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this project we investigated the basic mechanisms that determine the predictability of tropical cyclones undergoing extratropical transition (ET) and of their impact on the downstream flow. The analysis of ensemble forecasts for five ET cases showed that uncertainty is associated with the location and amplitude of a characteristic upper-level trough-ridge-trough pattern consisting of the trough that interacts with the tropical cyclone, a ridge directly downstream and a second trough downstream of the ridge. Experiments for Typhoon Tokage (2004) with the ensemble prediction system of the European Centre for Medium Range Weather Forecasts showed that targeted perturbations led to increased spread around and shortly after ET time whereas the spread due to stochastic physics increased at a later time as the influence of the targeted perturbations decreased. Idealized modelling combined with potential vorticity inversion was used to quantify the mechanisms responsible for this variability. Furthermore, dropsonde data in the vicinity of tropical cyclones were shown to reduce the medium-range forecast error for the downstream flow.

DTIC

Cyclones; Predictions; Tropical Storms

20080035373 Library of Congress, Washington, DC USA

Cyclone Nargis and Burma's Constitutional Referendum

Martin, Michael F; Margesson, Rhoda; May 9, 2008; 24 pp.; In English

Report No.(s): AD-A481355; CRS-RL34481; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cyclone Nargis struck the coast of Burma in the evening of May 2, 2008 and cut a path of destruction across the southern portion of the country. The storm left in its wake at least 22,000 dead, 41,000 more missing, and extensive damage to the nation's premier agricultural areas. Some have speculated that the final number of dead could reach 100,000. Vital infrastructure was destroyed by the storm, severely limiting the ability to assess the loss of life and provide assistance to the survivors. In addition, much of Burma's most productive agricultural land has been severely damaged. Burma's ruling military junta quickly faced both domestic and international criticism for its response to Cyclone Nargis, including accusations that it failed to provide adequate warning, its slow emergency response, and its reluctance to allow international relief workers into the country. The USA has offered \$3.25 million in relief aid, and is willing to send in relief teams, if they can secure the necessary visas from the junta. Even before Cyclone Nargis struck, the junta was already facing a highly controversial referendum on a proposed constitution scheduled for May 10, 2008 that could shape U.S. and other countries' policies toward Burma. As a consequence, the evolution and implications of the humanitarian crisis are inextricably linked to Burma's political situation and its relations with the international community. In addition, some experts are speculating that Cyclone Nargis may precipitate major political change in Burma, including the destabilization of Burma's military regime. Local dissatisfaction with the speed and quality of the junta's provision of emergency assistance may heighten domestic opposition to the junta and its proposed constitution. This report examines the scope of and response to the disaster, as well as its links to Burma's political situation and U.S. policy.

DTIC

Burma; Cyclones; Disasters; Foreign Policy

20080036132 Louisiana Dept. of Health and Hospitals, Baton Rouge, LA, USA

Health Consultation: Hurricane Response Sampling Assessment for D.L. Mud, Inc., Abbeville, Vermilion Parish, Louisiana. EPA Facility ID: LAD981058019

Aug. 30, 2006; 17 pp.; In English

Report No.(s): PB2008-102324; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The August 29, 2005 landfall of Hurricane Katrina and the September 24, 2005 landfall of Hurricane Rita resulted in extensive flooding throughout southern Louisiana. Following the hurricanes, a number of National Priorities Listing (NPL) sites throughout southern Louisiana were visited and sampled to identify any damage that these sites suffered, to determine whether the remedial actions at these sites remained effective, and to determine whether any contaminant levels had increased at the sites following hurricane-related flooding. The USA Environmental Protection Agency (US EPA), in coordination with the Louisiana Department of Environmental Quality (LDEQ), sampled groundwater from two monitoring wells at the D.L. Mud, Inc. site. Through a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), the Louisiana Department of Health and Hospitals/Office of Public Health/Section of Environmental Epidemiology and

Toxicology (LDHH/OPH/SEET) has developed the following health consultation to review these groundwater samples. The primary goals of this document are to determine whether any contaminants, that would pose a health hazard to exposed individuals, infiltrated the sites groundwater following Hurricane Rita and to establish what further public health actions, if any, may be needed.

NTIS

Health; Hurricanes; Louisiana; Mud; Priorities; Sampling; Toxic Diseases

20080036248 NASA Marshall Space Flight Center, Huntsville, AL, USA

Assimilation of Atmospheric InfraRed Sounder (AIRS) Profiles using WRF-Var

Zavodsky, Brad; Jedlovec, Gary J.; Lapenta, William; June 23, 2008; 1 pp.; In English; 9th Weather Research and Forecasting (WRF) Model Users' Workshop, 23-27 Jun. 2008, Boulder, Co, USA; Copyright; Avail.: Other Sources; Abstract Only

The Weather Research and Forecasting (WRF) model contains a three-dimensional variational (3DVAR) assimilation system (WRF-Var), which allows a user to join data from multiple sources into one coherent analysis. WRF-Var combines observations with a background field traditionally generated using a previous model forecast through minimization of a cost function. In data sparse regions, remotely-sensed observations may be able to improve analyses and produce improved forecasts. One such source comes from the Atmospheric Infrared Sounder (AIRS), which together with the Advanced Microwave Sounding Unit (AMSU), represents one of the most advanced space-based atmospheric sounding systems. The combined AIRS/AMSU system provides radiance measurements used as input to a sophisticated retrieval scheme which has been shown to produce temperature profiles with an accuracy of 1 K over 1 km layers and humidity profiles with accuracy of 15% in 2 km layers in both clear and partly cloudy conditions. The retrieval algorithm also provides estimates of the accuracy of the retrieved values at each pressure level, allowing the user to select profiles based on the required error tolerances of the application. The purpose of this paper is to describe a procedure to optimally assimilate high-resolution AIRS profile data into a regional configuration of the Advanced Research WRF (ARW) version 2.2 using WRF-Var. The paper focuses on development of background error covariances for the regional domain and background field type using *gen_be* and an optimal methodology for ingesting AIRS temperature and moisture profiles as separate overland and overwater retrievals with different error characteristics in the WRF-Var. The AIRS thermodynamic profiles are obtained from the version 5.0 Earth Observing System (EOS) science team retrieval algorithm and contain information about the quality of each temperature layer. The quality indicators are used to select the highest quality temperature and moisture data for each profile location and pressure level. Analyses are run to produce quasi-real-time regional weather forecasts over the continental U.S. The preliminary assessment of the impact of the AIRS profiles will focus on intelligent use of the quality indicators, optimized tuning of the WRF-Var, and comparison of analysis soundings to radiosondes.

Author

Advanced Microwave Sounding Unit; Earth Observing System (EOS); Atmospheric Sounding; Real Time Operation; Remote Sensing; Temperature Profiles; Thermodynamics; Assimilation; Radiosondes

20080036283 Army Engineer Research and Development Center, Vicksburg, MS USA

Effects of Local Meteorological Variability on Surface and Subsurface Seismic-Acoustic Signals

McKenna, Jason R; McKenna, Mihan H; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481553; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481553>

We present both seismic and acoustic data collected during recent tests to monitor subsurface activity that show a significant increase in the recorded signal amplitude before and after 36 hrs of steady precipitation to illustrate the effects of meteorological variations on seismic and acoustic signals.

DTIC

Meteorology; Signal Transmission; Sound Waves; Variability

20080036618 Naval Postgraduate School, Monterey, CA USA

East Asian Marginal Seas Prediction Using a Coastal Atmosphere-Ocean Coupled System (CAOCS)

Chu, Peter C; Lu, Shihua; Jan 2001; 4 pp.; In English

Report No.(s): AD-A482117; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The South China Sea (SCS), Yellow/East China Sea (YES), and Japan/East Sea (JES) are major East Asian marginal seas (EAMS). The complex topography includes the broad shallows of the Sunda Shelf in the south/southwest of SCS; the continental shelf of the Asian landmass in the north, extending from the Gulf of Tonkin to the YES; deep, elliptical shaped

SCS and JES basins, and numerous reef islands and underwater plateaus scattered throughout the basins. The shelf that extends from the Gulf of Tonkin to the YES is consistently near 70 meters deep, and averages 150 km in width. The EAMS is subjected to a seasonal monsoon system. From April to August, the weaker southwesterly summer monsoon winds result in a wind stress of just over 0.1 N/sq m. From November to March, the stronger northeasterly winter monsoon winds correspond to a maximum wind stress of nearly 0.3 N/sq m. Recent observational studies show that the EAMS is energetic and has multi-eddy structure. For example, the eddy spatial and temporal scales in the YES were identified using the Navy's Master Oceanographic Observational Data Set (MOODS) during 1929-1991. The fundamental scientific issues are as follows: What are the dynamical balances controlling mesoscale eddy variations in EAMS? What are the effects of surface wind and thermohaline forcing, coastline geometry and topographic slope on the coastal dynamics including wave processes and current instabilities? What is the role of coastal air-ocean coupling on the oceanic and atmospheric dynamics of mesoscale eddies? To study these problems, a coastal atmosphere-ocean coupled system (CAOCS) was developed at the Naval Postgraduate School. The model domain covers the whole EAMS and surrounding land and islands. The surface fluxes of water, heat (excluding solar radiation), and momentum are applied synchronously with opposite signs in the atmosphere and ocean. Flux adjustments are not used.

DTIC

Air Currents; Air Water Interactions; Asia; Atmospheric Models; China; Coasts; Japan; Mesoscale Phenomena; Ocean Models; Seas

20080036635 Miami Univ., FL USA

Real-Time Forecasting System of Winds, Waves and Surge in Tropical Cyclones

Graber, Hans C; Donelan, Mark A; Brown, Michael G; Slinn, Donald N; Hagen, Scott C; Thompson, Donald R; Jensen, Robert E; Black, Peter G; Powell, Mark D; Guiney, John L; Jan 2005; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-02-1-0150

Report No.(s): AD-A482153; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long-term goal of this partnership is to establish an operational forecasting system of the wind field and resulting waves and surge impacting the coastline during the approach and landfall of tropical cyclones. The results of this forecasting system would provide real-time information to the National Hurricane Center during the tropical cyclone season in the Atlantic for establishing improved advisories for the general public and federal agencies including military and civil emergency response teams.

DTIC

Computer Programs; Cyclones; Forecasting; Hurricanes; Ocean Surface; Real Time Operation; Surges; Tropical Storms; Water Waves; Wind (Meteorology)

48

OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics; and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

20080036074 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Ocean-Atmosphere Interaction Over Agulhas Extension Meanders

Liu, W. Timothy; Xie, Xiaosu; Niiler, Pearn P.; Journal of Climate; March 15, 2007; Volume 20, Issue 23; 14 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40904>

Many years of high-resolution measurements by a number of space-based sensors and from Lagrangian drifters became available recently and are used to examine the persistent atmospheric imprints of the semi-permanent meanders of the Agulhas Extension Current (AEC), where strong surface current and temperature gradients are found. The sea surface temperature (SST) measured by the Advanced Microwave Scanning Radiometer-Earth Observing System (AMSR-E) and the chlorophyll concentration measured by the Sea-viewing Wide Field-of-view Sensor (SeaWiFS) support the identification of the meanders and related ocean circulation by the drifters. The collocation of high and low magnitudes of equivalent neutral wind (ENW) measured by Quick Scatterometer (QuikSCAT), which is uniquely related to surface stress by definition, illustrates not only the stability dependence of turbulent mixing but also the unique stress measuring capability of the scatterometer. The observed rotation of ENW in opposition to the rotation of the surface current clearly demonstrates that the scatterometer measures stress rather than winds. The clear differences between the distributions of wind and stress and the possible inadequacy of turbulent

parameterization affirm the need of surface stress vector measurements, which were not available before the scatterometers. The opposite sign of the stress vorticity to current vorticity implies that the atmosphere spins down the current rotation through momentum transport. Coincident high SST and ENW over the southern extension of the meander enhance evaporation and latent heat flux, which cools the ocean. The atmosphere is found to provide negative feedback to ocean current and temperature gradients. Distribution of ENW convergence implies ascending motion on the downwind side of local SST maxima and descending air on the upwind side and acceleration of surface wind stress over warm water (deceleration over cool water); the convection may escalate the contrast of ENW over warm and cool water set up by the dependence of turbulent mixing on stability; this relation exerts a positive feedback to the ENW-SST relation. The temperature sounding measured by the Atmospheric Infrared Sounder(AIRS) is consistent with the spatial coherence between the cloud-top temperature provided by the International Satellite Cloud Climatology Project (ISCCP) and SST. Thus ocean mesoscale SST anomalies associated with the persistent meanders may have a long-term effect well above the midlatitude atmospheric boundary layer, an observation not addressed in the past.

Author

Air Water Interactions; Ocean Currents; Meanders; Remote Sensing; Atmospheric Boundary Layer; Sea Surface Temperature

20080036082 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Three-Dimensional Variational Data Assimilation Scheme for the Regional Ocean Modeling System: Implementation and Basic Experiments

Li, Zhijin; Chao, Yi; McWilliams, James C.; Ide, Kayo; Journal Of Geophysical Research; May 3, 2008; Volume 113; 19 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40919>; <http://dx.doi.org/10.1029/2006JC004042>

A three-dimensional variational data assimilation scheme for the Regional Ocean Modeling System (ROMS), named ROMS3DVAR, has been described in the work of Li et al. (2008). In this paper, ROMS3DVAR is applied to the central California coastal region, an area characterized by inhomogeneity and anisotropy, as well as by dynamically unbalanced flows. A method for estimating the model error variances from limited observations is presented, and the construction of the inhomogeneous and anisotropic error correlations based on the Kronecker product is demonstrated. A set of single observation experiments illustrates the inhomogeneous and anisotropic error correlations and weak dynamic constraints used. Results are presented from the assimilation of data gathered during the Autonomous Ocean Sampling Network (AOSN) experiment during August 2003. The results show that ROMS3DVAR is capable of reproducing complex flows associated with upwelling and relaxation, as well as the rapid transitions between them. Some difficulties encountered during the experiment are also discussed.

Author

Oceanography; Three Dimensional Models; Data Acquisition; Data Integration; Variational Principles; Error Analysis

20080036107 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Mechanisms of Interannual Variations of the Meridional Overturning Circulation of the North Atlantic Ocean

Cabanes, Cecile; Lee, Tong; Fu, Lee-Lueng; Journal of Physical Oceanography; February 2008; Volume 38, Issue 2, pp. 467-480; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40915>; <http://dx.doi.org/10.1175/2007JPO3726.1>

The authors investigate the nature of the interannual variability of the meridional overturning circulation (MOC) of the North Atlantic Ocean using an Estimating the Circulation and Climate of the Ocean (ECCO) assimilation product for the period of 1993-2003. The time series of the first empirical orthogonal function of the MOC is found to be correlated with the North Atlantic Oscillation (NAO) index, while the associated circulation anomalies correspond to cells extending over the full ocean depth. Model sensitivity experiments suggest that the wind is responsible for most of this interannual variability, at least south of 40(deg)N. A dynamical decomposition of the meridional streamfunction allows a further look into the mechanisms. In particular, the contributions associated with 1) the Ekman flow and its depth-independent compensation, 2) the vertical shear flow, and 3) the barotropic gyre flowing over zonally varying topography are examined. Ekman processes are found to dominate the shorter time scales (1.5-3 yr), while for longer time scales (3-10 yr) the MOC variations associated with vertical shear flow are of greater importance. The latter is primarily caused by heaving of the pycnocline in the western subtropics associated with the stronger wind forcing. Finally, how these changes in the MOC affect the meridional heat transport (MHT) is examined. It is found that overall, Ekman processes explain a larger part of interannual variability (3-10 yr) for MHT (57%) than for the MOC (33%).

Author

Annual Variations; Time Series Analysis; Climate; Orthogonal Functions; Heat Transfer; Atlantic Ocean; Ocean Surface; Barotropism

20080036110 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Evaluation of High-Resolution Ocean Surface Vector Winds Measured by QuikSCAT Scatterometer in Coastal Regions

Tang, Wenqing; Liu, W. Timothy; Stiles, Bryan W.; IEEE Transactions On Geoscience And Remote Sensing; August 8, 2004; Volume 42, Issue 8, pp. 1762-1769; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40909>

The SeaWinds scatterometer onboard QuikSCAT covers approximately 90% of the global ocean under clear and cloudy condition in 24 h, and the standard data product has 25-km spatial resolution. Such spatial resolution is not sufficient to resolve small-scale processes, especially in coastal oceans. Based on range-compressed normalized backscatter and a modified wind retrieval algorithm, a coastal wind dataset at 12.5-km resolution was produced. Even with larger error, the high-resolution winds, in medium to high strength, would still be useful over coastal ocean. Using measurements from moored buoys from the National Buoy Data Center, the high-resolution QuikSCAT wind data are found to have similar accuracy as standard data in the open ocean. The accuracy of both high- and standard-resolution winds, particularly in wind directions, is found to degrade near shore. The increase in error is likely caused by the inadequacy of the geophysical model function/ambiguity removal scheme in addressing coastal conditions and light winds situations. The modified algorithm helps to bring the directional accuracy of the high-resolution winds to the accuracy of the standard-resolution winds in near-shore regions, particularly in the nadir and far zones across the satellite track.

Author

Ocean Surface; Wind (Meteorology); Wind Direction; Ground Wind; High Resolution; Marine Meteorology; Geophysics; Wind Measurement

51

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

20080034806 Fish and Richardson, P.C., Minneapolis, MN, USA

Tissue-Like Phantoms (PAT-APPL-11-222 949)

Frangioni, J. V., Inventor; De Grand, A. M., Inventor; 9 Sep 05; 16 pp.; In English

Contract(s)/Grant(s): NCI-R21/33-CA-88245; NCI-R21-CA-88870

Patent Info.: Filed Filed 9 Sep 05; US-Patent-Appl-SN-11-222 949

Report No.(s): PB2008-101170; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The invention is based, in part, on the discovery that by combining certain components one can generate a tissue-like phantom that mimics any desired tissue, is simple and inexpensive to prepare, and is stable over many weeks or months. In addition, new multi-modal imaging objects (e.g., beads) can be inserted into the phantoms to mimic tissue pathologies, such as cancer, or merely to serve as calibration standards. These objects can be imaged using one, two, or more (e.g., four) different imaging modalities (e.g., x-ray computed tomography (CT), positron emission tomography (PET), single photon emission computed tomography (SPECT), and near-infrared (NIR) fluorescence) simultaneously.

NTIS

Tissues (Biology); Tissue Engineering; Bioengineering; Biomimetics; Imaging Techniques

20080034807 Hoag (Foley), LLP, Boston, MA, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA

Radiation-Induced Cellular Adaptive Response

Engelward, B. P., Inventor; 23 Aug 05; 22 pp.; In English

Contract(s)/Grant(s): NIH-CA84740

Patent Info.: Filed Filed 23 Aug 05; US-Patent-Appl-SN-11-210 252

Report No.(s): PB2008-101169; No Copyright; Avail.: CASI: [A03](#), Hardcopy

One aspect of the present invention relates to a method for determining an adaptive response of a tumor during radiation therapy. A second aspect of the present invention relates to a method for determining a substantially optimal dose of radiation therapy based on a cells ability to undergo an adaptive response. Another aspect of the present invention relates to a method

for identifying small molecule compounds that are effective chemotherapeutic agents for use during and after radiation therapy.

NTIS

Tumors; Radiation Therapy; Chemotherapy; Cells (Biology); Adaptation; Dosage

20080035189 RAND Corp., Santa Monica, CA USA

Invisible Wounds of War. Summary and Recommendations for Addressing Psychological and Cognitive Injuries

Tanielian, Terry; Haycox, Lisa H; Schell, Terry L; Marshall, Grant N; Burnam, M A; Eibner, Christine; Karney, Benjamin R; Meredith, Lisa S; Ringel, Jeanne S; Vaiana, Mary E; Jan 2008; 67 pp.; In English

Report No.(s): AD-A480992; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480992>

Since October 2001, approximately 1.64 million U.S. troops have deployed as part of Operation Enduring Freedom (OEF; Afghanistan) and Operation Iraqi Freedom (OIF; Iraq). The pace of the deployments in these current conflicts is unprecedented in the history of the all-volunteer force (Belasco, 2007; Bruner, 2006). Not only is a higher proportion of the armed forces being deployed, but deployments have been longer, redeployment to combat has been common, and breaks between deployments have been infrequent (Hosek, Kavanagh, and Miller, 2006). At the same time, episodes of intense combat notwithstanding, these conflicts have produced casualty rates of killed or wounded that are historically lower than in earlier prolonged conflicts, such as Vietnam and Korea. Advances in both medical technology and body armor mean that more servicemembers are surviving experiences that would have led to death in prior wars (Regan, 2004; Warden, 2006). However, casualties of a different kind-invisible wounds, such as mental health conditions and cognitive impairments resulting from deployment experiences- are just beginning to emerge. Recent reports and increasing media attention have prompted intense scrutiny and examination of these injuries.

DTIC

Cognition; Injuries; Warfare

20080035210 General Accounting Office, Washington, DC USA

VA and DOD Health Care: Progress Made on Implementation of 2003 President's Task Force Recommendations on Collaboration and Coordination, but More Remains to Be Done

Apr 2008; 22 pp.; In English

Report No.(s): AD-A481047; GAO-08-495R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481047>

Improving collaboration and health resource sharing between the Department of Veterans Affairs (VA) and the Department of Defense (DOD) has been the focus of numerous efforts by Congress and the executive branch for more than two decades. In 1982, Congress passed the Veterans' Administration and Department of Defense Health Resources Sharing and Emergency Operations Act (Sharing Act), which authorized VA and DOD health care facilities to partner and enter into sharing agreements to buy, sell, and barter medical and support services. Since then, Congress has passed additional legislation to continue to promote VA and DOD health resource sharing. However, in previous work we have pointed out continuing barriers to such efforts, including incompatible computer systems that affect the exchange of patient health information, inconsistent reimbursement and budgeting policies, and burdensome processes for approving agreements between the departments. On May 28, 2001, the President established the 15-member President's Task Force to Improve Health Care Delivery for Our Nation's Veterans. The task force's mission was to identify ways to improve coordination and sharing between VA and DOD in order to improve health care for servicemembers and veterans. The task force reviewed barriers and challenges in several areas related to coordination, including leadership, transition to veteran status, and improving quality of health care. In May 2003, it made recommendations to VA and DOD to increase collaboration and coordination between the two departments to improve health care delivery. The task force also recommended that the administration take action through the Department of Health and Human Services (HHS) to help improve VA and DOD collaboration, and that Congress take additional action to improve such collaboration. Other more recent task force and commission reports have voiced similar concerns and identified more areas for improvement.

DTIC

Coordination; Health; Medical Services

20080035211 Defence Research and Development Canada, Toronto, Ontario Canada

Target Detection, Identification, and Marksmanship Under Various Types of Physiological Strain

Tikuisis, Peter; Nov 2006; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481048; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481048>

The advent of high resolution interactive simulation has made it possible to bring greater realism into the laboratory where experimental rigour is more easily controlled than in a field setting. Using a small arms trainer (SAT), target detection, identification, and engagement were tested under a variety of conditions including heat and cold exposure, fatiguing exercise, and sleep deprivation, with caffeine intervention applied in the latter two trials. Target presentations were random and varied from standing pop-ups to moving figures of both foe and friendly types appearing seldom or frequently. Performance was judged according to the number of targets detected, correct identifications, and marksmanship. The main findings suggest that target detection is susceptible to fatigue, which can be alleviated with caffeine. However, once a target has been detected with or without fatigue, its engagement, which requires intense but short-term focus (i.e., 6 s or less), can be competently managed under significant levels of physiological strain, as if no strain was present.

DTIC

Detection; Physiological Effects; Physiology; Target Acquisition

20080035212 Walter Reed Army Inst. of Research, Silver Spring, MD USA

A Double-Blind, Placebo Controlled Study to Evaluate the Safety and Immunogenicity of the New, Live, Oral Type-4 and Type-7 Adenovirus Vaccines in Military Trainees

Lyons, Arthur; Longfield, Jenice; Kuschner, Robert; Straight, Timothy; Binn, Leonard; Seriwatana, Jitvimol; Reitsstetter, Raven; Froh, Irma B; Craft, David; McNabb, Kevin; Sep 27, 2006; 57 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481049; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481049>

Adenoviruses have been an important cause of febrile acute respiratory disease(ARD) in military recruits since they were first implicated as a cause of ARD in 1953 in an epidemic at Fort Leonard Wood, MO. Since then, adenovirus type 4 and 7 have been the most important cause of ARD among military recruits in the USA, resulting in significant morbidity, loss of training time, and in rare instances, mortality. Prior to the introduction of live, oral adenovirus vaccines in 1971, adenoviral infections caused the hospitalizations of 10% of military recruits, 90% of pneumonia hospitalizations, and more than 67% of all respiratory diseases in basic training. Outbreaks in the civilian population, though rare, have occurred.

DTIC

Adenoviruses; Infectious Diseases; Respiratory Diseases; Safety; Students; Vaccines

20080035223 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Molecular Identification of the Biowarfare Simulant *Serratia Marcescens* From a 50-Year-Old Munition Buried at Fort Detrick, Maryland

Whitehouse, Chris A; Baldwin, Carson; Wasieloski, Leonard; Kondig, John; Scherer, John; Aug 2007; 6 pp.; In English
Report No.(s): AD-A481073; TR-07-048; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481073>

Serratia marcescens are gram-negative bacteria that were often used by the U.S. military and others to track movement of bacteria in the environment. As part of ongoing construction at Fort Detrick, what appeared to be a small bomblet was found buried in the ground at the site of an old test grid. A sample of clear, straw-colored liquid was aseptically removed from the plastic reservoir and routine culture on standard bacteriological media was negative. DNA was extracted from the sample and found to be 99% identical to *S. marcescens*. These results demonstrate the ability to identify the contents of a biological munition that had been buried for approximately 50 years.

DTIC

Bacteria; Biological Weapons; Bombs (Ordnance); Extraction; Serratia

20080035226 Army Research Lab., Aberdeen Proving Ground, MD USA

Demonstration of Military Composites with Low Hazardous Air Pollutant Content

LaScala, John J; Levine, Felicia; Myers, Philip; Sands, James M; Andersen, Stephen; Gillespie, Jr, John; Patterson, Ken; Coulter, Lawrence; Crane, Roger; Starks, Michael; Nov 1, 2006; 50 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481085; ESTCP-WP-0617; SERDP-WP-1271; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481085>

Liquid resins used for molding composite structures are a significant source of volatile organic compounds (VOC) and hazardous air pollutant (HAP) emissions. One method of reducing styrene emissions from vinyl ester (VE) resins is to replace some or all of the styrene with fatty acid-based monomers. Fatty acid monomers are ideal candidates because they are inexpensive, have low volatilities, and promote global sustainability because they are derived from renewable resources. This patent pending technology allows for the formulation of high performance composite resins with no more than 25 wt% styrene. These resins have low viscosities suitable for vacuum infusion methods, and have excellent polymer and composite properties. As a result, these resins are currently being demonstrated/validated for DoD use on Army tactical vehicles, including HMMWV hoods, HMMWV helmet hardtops, T-38 dorsal covers, and composite rudders for the Navy.

DTIC

Air Pollution; Combat; Composite Structures; Fatty Acids; Monomers

20080035234 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Genome-Wide Survey of Host Responses: Use of Computational Analysis to Classify Exposures and Extract Signatures of Unconventional Versus Common Viral Exposures

Hammamieh, Rasha; Jett, Marti; Nov 1, 2006; 51 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481106; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481106>

Exposures to many unconventional pathogenic agents result in flu-like illness that are initially indistinguishable from common respiratory illnesses and early diagnosis to distinguish among the severe vs common viral infections depends on pathogen proliferation to dangerous, near-untreatable levels. Assessing exposure to a pathogen, in advance of onset of illness or at various stages post-exposure, is invaluable among the diagnostic options. Lymphocytes serve as 'whistle blower' indicators as they encounter pathogenic agents even early during the course of infection, registering the encounters in their mRNA and developing patterns of expression that correspond to each specific pathogen. Time series of gene expression patterns relate to the stage or severity of the infection and are unique for each pathogen. We are using the host blood for determination of whole genome regulation in response to various viral agents to extract features and signatures that can be used for point-of-care diagnosis of various viral infections (common respiratory, arena, flavi-, alpha- and other viruses). These data also have the potential to provide stage-appropriate therapeutic targets. These studies utilized exposure time sequences of host gene expression. The 'training sets' were constructed from in vitro exposures to purified peripheral blood leukocytes from ~6 human leukapheresis donors for each virus described above. Numerous modeling / mathematical techniques were applied to these datasets in order to identify signature patterns indicative of each. The 'shrink/grow' modeling approaches were used as well as other algorithms that have shown success for signature extraction. For the 'grow' algorithm, genes are individually selected that have the best discriminating power and the first of those frequently show properties unique for specific viral infections.

DTIC

Analysis (Mathematics); Biomarkers; Exposure; Extraction; Genome; Responses; Signatures; Surveys; Viruses

20080035235 Argonne National Lab., IL USA

Classifying Noisy Protein Sequence Data: A Case Study of Immunoglobulin Light Chains

Yu, Chenggang; Zavaljevski, Nela; Stevens, Fred J; Yackovich, Kelly; Reifman, Jaques; Jan 2005; 9 pp.; In English
Contract(s)/Grant(s): DK43957; AG18001

Report No.(s): AD-A481112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481112>

Summary: The classification of protein sequences obtained from patients with various immunoglobulin-related conformational diseases may provide insight into structural correlates of pathogenicity. However, clinical data are very sparse and, in the case of antibody-related proteins, the collected sequences have large variability with only a small subset of variations relevant to the protein pathogenicity (function). On this basis, these sequences represent a model system for development of strategies to recognize the small subset of function-determining variations among the much larger number of

primary structure diversifications introduced during evolution. Under such conditions, most protein classification algorithms have limited accuracy. To address this problem, we propose a support vector machine (SVM)-based classifier that combines sequence and 3D structural averaging information. Each amino acid in the sequence is represented by a set of six physicochemical properties: hydrophobicity, hydrophilicity volume, surface area, bulkiness and refractivity. Each position in the sequence is described by the properties of the amino acid at that position and the properties of its neighbors in 3D space or in the sequence. A structure template is selected to determine neighbors in 3D space and a window size is used to determine the neighbors in the sequence. The test data consist of 209 proteins of human antibody immunoglobulin light chains, each represented by aligned sequences of 120 amino acids. The methodology is applied to the classification of protein sequences collected from patients with and without amyloidosis, and indicates that the proposed modified classifiers are more robust to sequence variability than standard SVM classifiers, improving classification error between 5 and 25% and sensitivity between 9 and 17%. The classification results might also suggest possible mechanisms for the propensity of immunoglobulin light chains to amyloid formation.

DTIC

Antibodies; Chains; Diseases; Globulins; Pathogenesis; Proteins; Sequencing

20080035256 John Wayne Inst. for Cancer Treatment and Research, Santa Monica, CA USA

Mechanisms of Chemoresistance in Breast Cancer Cells

Gouaze-Andersson, Valerie; Feb 2008; 43 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0491

Report No.(s): AD-A481169; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481169>

One of the most persistent factors accounting for the continuing mortality in cancer patients is the development of multidrug resistance (MDR). In this study we have shown that over expression of glucosylceramide synthase (GCS) is not a consistent characteristic in breast cancer cells. We have determined that in order for GCS to be over expressed cells must be selected to grow in the presence of anticancer agents that activate ceramide formation. This abundance of ceramide enhances GCS message which results in increases in glucosylceramide (GC). We found this to be the case with Adriamycin but not with cisplatin or etoposide. This study also showed that limiting GCS activity down regulated the expression of MDR1. In assessing P-gp status in the MCF-7-AdrR cells transfected with GCS antisense we observed a dramatic decrease in the level of MDR1 expression (80% down by RT-PCR) which translated into a similar decrease in P-gp protein levels (Western-blot). These findings demonstrated an interesting yet ambiguous relationship between GCS which regulates ceramide metabolism and the expression of P-gp. To gain insight into the relationship of GCS and MDR1 we studied the influence of sphingolipids on MDR1 expression. When cells MCF-7 and MDA-MB-231 challenged with high levels of ceramide utilize a glycosylation route to limit ceramide's residence time this action promotes enhanced expression of the multidrug resistant phenotype in cancer cells through what we propose is a GC intermediate.

DTIC

Breast; Cancer; Drugs; Mammary Glands

20080035258 Arizona State Univ., Tempe, AZ USA

DNA Computing

Frasch, Wayne D; Mar 21, 2008; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-1-0424

Report No.(s): AD-A481176; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481176>

A microscopy system was acquired for molecular detection using molecular motor-driven nanodevices. This state of the art system incorporates a motorized stage that can move to successive adjacent fields of view, and stitch the digital color photos for analysis. The detection system utilizes the molecular motor attached to a slide and a gold nanorod that is visible by darkfield microscopy. Assembly of each nanodevice is dependent upon the presence of one molecule of target that bridges between motor and nanorod. Zeptomole sensitivity of target DNA is achieved without PCR or other means of amplification via molecular motor-dependent rotation. We have now demonstrated simultaneous, multiplexed detection of sequence specific DNA, RNA, and proteins unique to MRSA on the same platform with three separate colors of gold nanorods each having a different functionalization. We have also demonstrated the ability to differentiate between *Staphylococcus aureus* and MRSA as well as detection of target from crude cell lysate. We have written algorithms that can analyze the stitched digital photos of fields of view, correctly identify red, green, and yellow nanorods used to detect DNA, RNA, and proteins, respectively, then

rapidly quantify the amount of each target present. Assembly of a commercial prototype of the detection device is underway.
DTIC

Biotechnology; Deoxyribonucleic Acid; Nanotechnology

20080035261 Maryland Univ., Baltimore, MD USA

Magnetic Resonance Imaging of Polymeric Drug Delivery Systems in Breast Cancer Solid Tumors

Zarabi, Bahar; Dec 2007; 25 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0341

Report No.(s): AD-A481180; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481180>

This study describes the synthesis, characterization and in vitro evaluation of N-(2-hydroxypropyl) methacrylamide(HPMA) copolymer-gadolinium(Gd)-doxorubicin (Dox) conjugates. Copolymers of HPMA were derivatized to incorporate side chains for Gd chelation and Dox conjugation. The conjugates were characterized by their side chain contents T1 relaxivity (r1) stability, and in vitro cytotoxicity. High stability and relaxivity of these conjugates coupled with low toxicity show their potential for monitoring the in vivo fate of HPMA-based drug delivery systems by magnetic resonance imaging techniques.

DTIC

Breast; Cancer; Drugs; Imaging Techniques; Magnetic Resonance; Mammary Glands; Tumors

20080035264 Physical Sciences, Inc., Andover, MA USA

Development of Cell Type-Specific Contrast Agents for Magnetic Resonance Imaging of Breast Tumors

Chestukhin, Anton; Jan 2008; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0769

Report No.(s): AD-A481192; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481192>

Magnetic Resonance Imaging is an emerging diagnostic tool for breast cancer that provides high-resolution three-dimensional images of tissues. A significant increase of specificity of detection of cancerous lesions could be achieved by use of tumor specific contrast agents (CA). Currently, tumor-specific targeting of CA is achieved by antibodies (Ab) or fragments thereof. The major disadvantages of Ab are their large size and ability to induce immune response. We proposed to use DNA aptamers for tumor-specific targeting of CA because short DNA molecules are smaller than Ab, have better tissue penetration and are non-toxic and non-immunogenic. During the study, PSI developed an experimental system and generated essential reagents for selection of DNA aptamers. Expression constructs encoding human EGF receptor (EGF-R) fusion protein were produced and used for generation of stable cell lines expressing this protein at suitable levels. EGF-R was used for isolation of DNA aptamers from combinatorial synthetic library. A group of structurally related aptamers was identified. In the course of the program a variety of technical challenges were identified and alternative approaches were undertaken. Full characterization and validation of the isolated EGF-R-specific aptamers was not completed. PSI research effort generated valuable reagents and technical knowledge for further development of the proposed technology.

DTIC

Breast; Cancer; Detection; Imaging Techniques; Magnetic Resonance; Mammary Glands; Tumors

20080035265 Virginia Univ., Charlottesville, VA USA

Structural Characterization of the Interdomain Features of the Estrogen Receptor

Rastinejad, Fraydoon; Mar 2008; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): WB1XWH-07-1-0245

Report No.(s): AD-A481193; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481193>

The nuclear hormone receptor (NR) superfamily consists of 48 distinct transcription factors in humans. These proteins generally consist of inter-connected functional domains. The Nterminal A/B domain is poorly conserved in size and sequence. The DNA-binding domain (DBD) resides in the center of the polypeptide and binds to DNA response elements upstream of target genes. A hinge region connects the DBD to the ligand binding domain (LBD). The LBD is responsible for binding to the receptor ligand and to some coregulator proteins. There are no three-dimensional structures available for any intact nuclear receptors, or of an A/B domain or hinge region. By contrast, the isolated DBDs and LBDs have been studied by X-ray crystallography in many cases. In the case of the estrogen receptor (ER)-alpha, crystal structures are available for the LBD

and DBD as single domains. Since structures consisting of intact or nearly intact polypeptides are entirely absent for this protein family, there is no conceptual framework to help understand their domain-domain interactions. We have therefore undertaken studies to crystallize full-length nuclear receptors including the ER-alpha, and at the same time of PPAR-gamma/RXR-alpha, in several different protein and DNA complexes. Our recent structure determination of the PPAR-gamma/RXR-alpha heterodimer on DNA have revealed important new biological insights for the nuclear receptor family as a whole, including the estrogen receptor sub-family. We are currently employing several approaches are to help produce a similar crystal structure for ER.

DTIC

Crystal Structure; Deoxyribonucleic Acid; Estrogens

20080035266 Case Western Reserve Univ., Cleveland, OH USA

Exploiting Novel Calcium-Mediated Apoptotic Processes for the Treatment of Human Breast Cancers with Elevated Nqo1 Levels

Bentle, Melissa S; Boothman, David A; Mar 2008; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0301

Report No.(s): AD-A481194; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481194>

We demonstrate that the NQO1-dependent reduction of Beta-lap caused ROS generation, DNA breaks, and triggered calcium (Ca²⁺)- dependent Upsilon-H2AX formation and PARP-1 hyperactivation. PARP-1 hyperactivation was an integral part of cell death caused by this compound, causing NAD⁺ and ATP losses that suppressed DNA repair and caused cell death. PARP-1 inhibition or intracellular Ca²⁺ chelation protected cells from Beta-lap-induced cell death. Similarly, hydrogen peroxide (H₂O₂), but not N-Methyl-N -nitro-N-nitrosoguanidine (MNNG), caused Ca²⁺-mediated PARP-1 hyperactivation and death. Thus, Ca²⁺-mediated PARP-1 hyperactivation and death. Thus, Ca²⁺ appears to be an important co-factor in PARP-1 hyperactivation after ROS-induced DNA damage. To further explore DNA repair as a resistance factor(s) that might impede cell death, we explored the contribution of DNA double-strand break (DSB) repair following Beta-lap exposure. Beta-Lap treatment resulted in the NQO1-dependent activation of the MRE11-Rad50-Nbs-1 (MRN) complex, as well as ATM Serine 1981, DNA-PKcs Theronine 2609, and Chk1 Serine 345 phosphorylation, indicative of ATR activation. These data suggested the simultaneous activation of both homologous recombination (HR) and non-homologous end joining (NHEJ) pathways. However, inhibition of NHEJ potentiated Beta-lap lethality.

DTIC

Apoptosis; Breast; Calcium; Cancer; Mammary Glands

20080035267 Library of Congress, Washington, DC USA

Radiological Dispersal Devices: Select Issues in Consequence Management

Shea, Dana A; Mar 10, 2004; 7 pp.; In English

Report No.(s): AD-A481195; CRS-RS21766; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481195>

The threat of terrorist detonation of a dirty bomb, one type of radiological dispersal device (RDD), has focused public attention on efforts to counter the use of this weapon. RDDs are devices, other than a nuclear explosive device, designed to disseminate radioactive material to cause destruction, damage, or injury. A dirty bomb is a type of RDD in which explosives disperse the radioactive material, but in general RDDs do not require explosives. An RDD attack might cause casualties, economic damage, and, potentially, public panic, though experts disagree on the likely magnitude of each of these effects. The impact of an RDD attack would depend on many variables, such as meteorological conditions, type and amount of radiological material, duration of exposure, and method of dispersal. Issues of potential congressional interest include the level of federal funding for research and development of medical countermeasures against RDDs and the appropriateness of current standards for environmental decontamination following an RDD attack. The possibility that terrorist groups might use an RDD in a civilian setting has increased government and public concern about such weapons. This report addresses the controversies surrounding the health effects of low-level radiation, concerns related to decontamination following an RDD attack, and the issue of federal research into RDD countermeasures. The report will be updated as events warrant.

DTIC

Decontamination; Dispersing; Explosives; Radiation Effects; Radioactive Materials; Radiology; Terrorism; Therapy

20080035316 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Discovery and Characterization of Novel Signatures from the *Ricinus communis* L. (Castor Bean) Genome

O'Connell, Kevin P; Skowronski, Evan W; Dretchen, Kenneth L; Leshin, Jonathan A; Weeks, Andrea; Nov 2006; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481218; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Given the infamous toxicity of ricin and the industrial usefulness of castor oil, there is a surprising lack of information about the genetic diversity of the species that produces both, the castor bean plant (*Ricinus communis* L.). The extent of DNA sequence variation in the gene that encodes ricin (preproricin) is also poorly understood. This lack of knowledge hampers the ability to make effective assays, or to associate ricin toxin from sites of release with suspect production labs. Without this basic genetic understanding, assays for ricin may not positively react with genomic DNA from *R. communis* derived from any source. We are remedying this shortfall by pursuing a genetic characterization of members of *R. communis* collected from around the world. Preliminary data from the amplification and sequencing of preproricin genes from 63 members of this collection indicate the presence of a large number of nucleotide polymorphisms, and the possible presence in some varieties of a previously unreported, shorter-length paralog of the preproricin gene.

DTIC

Deoxyribonucleic Acid; Genome; Nucleotides; Polymorphism; Signatures; Toxicity; Vegetables

20080035317 Harvard Univ., Cambridge, MA USA

Engineering Bony Hybrid Organs In Vitro

Mooney, D J; Krebsbach, P; Linderman, J; Morrison, S; Takayama, S; Wang, C Y; Nov 2006; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-1-0168

Report No.(s): AD-A481219; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hybrid bony organs containing mineralized tissue, marrow and microcirculatory compartments could provide extremely novel and life-saving biosensors and tissue replacements. Previous progress in engineering distinct elements of bone suggests this more complex goal is feasible, but the challenges of integrating these elements into a single organ remain to be addressed. We are exploiting recent advances in stem cell biology, materials sciences, and microfabrication to create complex, multi-component bony organs. Materials presenting nanoscale-organized cell adhesion ligands and localized availability of growth factors have been developed, based on a combination of theoretical and experimental studies, to control the proliferation and differentiation of multipotent stem cells. This control is being exploited to create tissues in vitro within microfluidic systems that compartmentalize the cells and regulate their access to nutrients and waste exchange. Hematopoietic stem cells (HSCs) are being subsequently introduced into the engineered bony organs in an effort to establish functional blood cell forming organs. These engineered bone marrow organs could provide an unusually sensitive physiological biosensor for the presence of various toxic agents. Moreover, these organs could be customized for transplantation into individual soldiers requiring reconstitution of their bone marrow. The technologies developed to create these organs may also provide a template for the engineering of other complex, hybrid organs comprised of multiple cell types (e.g., liver, neural tissues) that would be useful for directly addressing trauma or promoting regeneration of damaged tissues and organs.

DTIC

Biological Effects; Bone Marrow; Bones; Detection; In Vitro Methods and Tests; Organs

20080035319 Naval Research Lab., Washington, DC USA

The BARC Biosensor Applied to the Detection of Biological Warfare Agents

Edelstein, R L; Tamanaha, C R; Sheehan, P E; Miller, M M; Baselt, D R; Whitman, L J; Colton, R J; Jan 2000; 10 pp.; In English

Report No.(s): AD-A481221; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Bead ARray Counter (BARC) is a multi-analyte biosensor that uses DNA hybridization, magnetic microbeads, and giant magnetoresistive (GMR) sensors to detect and identify biological warfare agents. The current prototype is a table-top instrument consisting of a microfabricated chip 'solid substrate' with an array of GMR sensors, a chip carrier board with electronics for lock-in detection, a fluidics cell and cartridge, and an electromagnet. DNA probes are patterned onto the solid substrate chip directly above the GMR sensors, and sample analyte containing complementary DNA hybridizes with the probes on the surface. Labeled, micron-sized magnetic beads are then injected that specifically bind to the sample DNA. A magnetic field is applied, removing any beads that are not specifically bound to the surface. The beads remaining on the surface are detected by the GMR sensors, and the intensity and location of the signal indicate the concentration and identity of pathogens present in the sample. The current BARC chip contains a 64-element sensor array, however, with recent advances

in magnetoresistive technology, chips with millions of these GMR sensors will soon be commercially available, allowing simultaneous detection of thousands of analytes. Because each GMR sensor is capable of detecting a single magnetic bead, in theory, the BARC biosensor should be able to detect the presence of a single analyte molecule.

DTIC

Bioinstrumentation; Biological Effects; Biological Weapons; Deoxyribonucleic Acid; Detection

20080035324 Moffitt (H. Lee) Cancer Research Inst., Tampa, FL USA

A Direct Synergistic Effect of Immunotherapy and Chemotherapy as a New Paradigm in Treatment of Breast Cancer

Gabrilovich, Dmitry; Apr 2008; 10 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0315

Report No.(s): AD-A481229; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Treatment of patients with advanced stages of breast cancer remains an unresolved clinical problem. The main objectives of this study are to determine whether immunotherapy sensitizes tumor to chemotherapy and to identify some of the main mechanisms of this effect. We investigated the possibility of a direct synergy between immunotherapy and chemotherapy in vitro. We found that pre-treatment of tumor target cells with doxorubicin or paclitaxel significantly increased cytotoxic effect of T-lymphocytes. Importantly, that effect was antigen-specific, since it was observed only in tumor cells loaded with specific but not a control peptide. In contrast, pre-treatment of splenocytes did not result in enhancement of target cell killing. In parallel experiments we have determined that both drugs increased the expression of p53 in tumor cells. However, that increase observed only after 48 hr of treatment and therefore could not contribute to observed sensitization of tumor cells to CTLs. To determine the effect of the combined treatment in vivo, mammary carcinoma TUBO was established s.c. in BALB/c mice. Dendritic cell vaccine alone slowed down tumor growth, which was consistent with previous results obtained by many laboratories. Paclitaxel had similar effect. However, in both cases tumor growth resumed in about a week after end of the treatment. In a sharp contrast, tumor size was substantially reduced in mice treated with combination of DC vaccine and chemotherapy. Most of the mice rejected tumor. Thus, this data indicates that a direct combination of chemotherapy with cancer vaccine provides substantial antitumor effect via sensitization of tumor cells to CTLs. These experimental models will be used for investigation the mechanisms of this phenomenon.

DTIC

Breast; Cancer; Chemotherapy; Lymphocytes

20080035338 Library of Congress, Washington, DC USA

The Global Fund to Fight AIDS, Tuberculosis, and Malaria: Progress Report and Issues for Congress

Salaam-Blyther, Tiaji; Apr 25, 2006; 18 pp.; In English

Report No.(s): AD-A481248; CRS-RL33396; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Global Fund to Fight AIDS, Tuberculosis, and Malaria, headquartered in Geneva, Switzerland, is an independent foundation intended to attract and rapidly disburse new resources in developing countries for countering the three diseases. The Fund is a financing vehicle, not a development agency, and its grants are intended to complement existing efforts rather than replace them. The origins of the concept of an independent funding mechanism to fight AIDS and other diseases lie partly in a French proposal made in 1998, in ideas developed in the 106th Congress, and in recommendations made by U.N. Secretary General Kofi Annan in April 2001. President Bush made the founding pledge of \$200 million for a disease fund in May 2001. The Global Fund was established in January 2002, following negotiations involving donor and developing country governments, nongovernmental organizations (NGOs), the private sector, and the United Nations. The Global Fund has approved more than 350 grants totaling nearly \$5.2 billion for projects in 131 countries, of which about \$2.1 billion has been disbursed in 127 countries. To date there have been five rounds of funding, with the Board approving proposals in April 2002, January 2003, October 2003, June 2004, and September 2005. However, in September 2005, due to a lack of available funding from donors, only a portion of proposals recommended for approval in Round 5 were officially approved. The remaining tentatively approved proposals received final approval in December 2005 after additional contributions were made. The Global Fund will make grants only if it has funds on hand to cover the first two years of the proposed projects an approach known as the Comprehensive Funding Policy. The policy is designed to avoid disruptions to projects due to funding shortages.

DTIC

Estimates; Parasitic Diseases; Signs and Symptoms; Tuberculosis

20080035352 General Accounting Office, Washington, DC USA

Health Care Cost Growth and Demographic Trends Drive the Long-Term Fiscal Challenge

Apr 2008; 15 pp.; In English

Report No.(s): AD-A481278; GAO-08-783R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our updated simulations continue to illustrate that the long-term fiscal outlook is unsustainable. (See fig. 1) Despite some improvement in the long-term outlook for federal health and retirement spending, the federal government still faces large and growing structural deficits driven primarily by rising health care costs and known demographic trends. In fact, the oldest members of the baby boom generation are now eligible for Social Security retirement benefits and will be eligible for Medicare benefits in less than 3 years. According to the Social Security Administration nearly 80 million Americans will become eligible for Social Security retirement benefits over the next two decades an average of more than 10,000 per day. Although Social Security is important because of its size, the real driver of the long-term fiscal outlook is health care spending. Medicare and Medicaid are both large and projected to continue growing rapidly in the future.

DTIC

Costs; Health; Medical Services; Trends

20080035355 Army War Coll., Carlisle Barracks, PA USA

The Shortage of Dentists: A Risk to National Security?

Grimes, Donn A; Mar 19, 2008; 49 pp.; In English

Report No.(s): AD-A481296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The USA military relies on dental readiness as a key component of a service members' medical readiness status. Excellent oral health is a force multiplier because the dental emergency rate diminishes when the oral health status of the force increases. In recent years the Army's dental accessions have dropped to all time lows and there are an insufficient number of dentists in the Corp to handle the current workload. At the present time there are sufficient numbers to accomplish the dental readiness mission. The threat of a national shortage of dentists is rising and the ratio of dentists to the general US population continues to decline as the population increases faster than new dentists enter the field. Factors contributing to a potential national dental care crisis and its effect on the dental readiness of the USA military are outlined in this paper. Specific areas considered are oral disease as it relates to the nation and by extension to the military mission to maintain dental readiness; delineation of the recruiting pool; and an analysis on why the military is unsuccessful in attracting and retaining dental officers. The discussion will include a number of recommendations and a conclusion.

DTIC

Personnel Management; Risk; Security

20080035376 Library of Congress, Washington, DC USA

The National Bio- and Agro-Defense Facility: Issues for Congress

Shea, Dana A; Monke, Jim; Gottron, Frank; Nov 15, 2007; 21 pp.; In English

Report No.(s): AD-A481366; CRS-RL34160; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The agricultural and food infrastructure of the USA is potentially susceptible to terrorist attack using biological pathogens. In addition to the impacts of such an attack on the economy, some animal diseases could potentially be transmitted to humans. (These diseases are known as zoonotic diseases.) Scientific and medical research on plant and animal diseases may lead to the discovery and development of new diagnostics and countermeasures, reducing the risk and impact of a successful terrorist attack. To safeguard the USA against animal disease, Congress has appropriated funds to the U.S. Department of Agriculture (USDA) to engage in research at the Plum Island Animal Disease Center (PIADC), off the coast of New York, on animal diseases not native to the USA. When creating the Department of Homeland Security (DHS) in 2003, Congress transferred the PIADC facility from USDA to DHS, though USDA continues its own research programs at the facility. However, the DHS, in cooperation with USDA, has established a foreign animal disease research program at PIADC. The DHS has identified PIADC as outdated and too limited to continue as the primary research facility. Homeland Security Presidential Directive 9 tasks the Secretaries of Agriculture and Homeland Security to develop a plan to provide safe, secure, and state-of-the-art agriculture biocontainment laboratories for research and development of diagnostic capabilities and medical countermeasures for foreign animal and zoonotic diseases. To partially meet these obligations, DHS has requested appropriations to construct a new facility, the National Bio- and Agro-Defense Facility (NBAF). This facility would house high-containment laboratories able to handle the pathogens currently under investigation at PIADC, as well as other pathogens of interest. The DHS plans to select the site in 2008 and open NBAF in 2014.

DTIC

Agriculture; Biological Effects; Contamination; Diseases; Economics; Infectious Diseases; Security

20080035378 Library of Congress, Washington, DC USA

The National Bio- and Agro-Defense Facility: Issues for Congress

Shea, Dana A; Monke, Jim; Gottron, Frank; Apr 3, 2008; 24 pp.; In English

Report No.(s): AD-A481383; CRS-RL34160; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The agricultural and food infrastructure of the USA is potentially susceptible to terrorist attack using biological pathogens. In addition to the impacts of such an attack on the economy, some animal diseases could potentially be transmitted to humans. (These diseases are known as zoonotic diseases.) Scientific and medical research on plant and animal diseases may lead to the discovery and development of new diagnostics and countermeasures, reducing the risk and impact of a successful terrorist attack. To safeguard the USA against animal disease, Congress has appropriated funds to the U.S. Department of Agriculture (USDA) to engage in research at the Plum Island Animal Disease Center (PIADC), off the coast of New York, on animal diseases not native to the USA. When creating the Department of Homeland Security (DHS) in 2003, Congress transferred the PIADC facility from USDA to DHS. Both USDA and DHS, in cooperation with USDA, conduct foreign animal disease research at PIADC, but PIADC has been identified as outdated and too limited to continue as the primary facility for this research. Homeland Security Presidential Directive 9 tasks the Secretaries of Agriculture and Homeland Security to develop a plan to provide safe, secure, and state-of-the-art agriculture biocontainment laboratories for research and development of diagnostic capabilities and medical countermeasures for foreign animal and zoonotic diseases. To partially meet these obligations, DHS has requested Congress to appropriate funds to construct a new facility, the National Bio- and Agro-Defense Facility (NBAF). This facility would house high-containment laboratories able to handle the pathogens currently under investigation at PIADC, as well as other pathogens of interest. Six candidate sites have been identified, one of which is Plum Island. The DHS plans to select the site in 2008 and open NBAF in 2014.

DTIC

Agriculture; Biological Effects; Contamination; Diseases; Microorganisms; Pathogens; Terrorism

20080035380 California Univ., Berkeley, CA USA

Functional Analysis of BORIS, a Novel DNA Binding Protein

Yaswen, Paul; Apr 2008; 12 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0283

Report No.(s): AD-A481387; No Copyright; Avail.: Defense Technical Information Center (DTIC)

BORIS (cT6FL) is a paralog of the gene encoding CTCF, a multifunctional DNA binding protein that utilizes different sets of zinc fingers to mediate distinct gene regulatory functions, including those involved in cell growth regulation. Unlike CTCF the expression of BORIS is normally restricted to specific cells in testes (the only cells where CTCF is not expressed) where it may play a role in reprogramming the methylation pattern of male germ line DNA. To define the possible consequences of aberrant BORIS expression in human breast cancers we have used a well-characterized human mammary epithelial cell (HMEC) culture model. Our results indicate that in most breast cancer cells endogenous BORIS is unlikely to be expressed at sufficient levels to interfere with CTCF functions, and that BORIS expression alone is not an efficient immortalizing factor. However, under certain conditions BORIS may cooperate with other changes (e.g. p53 inactivation) to destabilize the genomes of the cells in which it is aberrantly expressed. BORIS expression may cause genomic instability through aberrant effects on centrosome duplication during the cell cycle, and through effects on the regulation of several key early growth response genes.

DTIC

Breast; Cancer; Chemical Bonds; Coding; Deoxyribonucleic Acid; Functional Analysis; Genes; Mammary Glands; Proteins

20080035381 Children's Hospital, Boston, MA USA

Prevention of the Angiogenic Switch in Human Breast Cancer

Folkman, Judah; Mar 2008; 123 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0316

Report No.(s): AD-A481388; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our overall goal is to determine if human breast cancer can be prevented from becoming angiogenic when it is still at a microscopic size (< ~ 1 mm³). Some of our key research accomplishments this year are: (i) Heat shock protein-27 (HSP-27) was identified as a gene that was upregulated 27-fold in the angiogenic breast cancer cells MDA-MB-436 as compared to the non-angiogenic dormant breast cancer cells. (ii) Increased expression of HSP-27 was validated by Western blot analysis. (iii) Confirmation of decreased expression of the endogenous angiogenesis inhibitors thrombospondin-1 and endostatin in breast cancer cell lines with a BRCA1 mutation (HCC937). (iv) Demonstration by immunofluorescence of decreased thrombospondin-1 and endostatin expression in sections from human breast tumors with BRCA1 mutations as compared to

sections from sporadic breast tumors with wild-type BRCA1. (v) Identification of high levels of prosaposin expression by the non-metastatic breast cancer cell line MDA-MB-231 as compared to the highly metastatic derivatives of this breast cancer cell line that metastasize to bone and lung. (vi) Identification of the secreted protein prosaposin as a regulator of thrombospondin-1 expression in stromal cells. Our studies have potential therapeutic implications to target specific genes that regulate the angiogenic switch, tumor mass expansion, and metastatic disease.

DTIC

Angiogenesis; Breast; Cancer; Health; Mammary Glands; Prevention; Switches

20080035386 Michigan Univ., Ann Arbor, MI USA

Identification of Potential Therapeutic Mechanisms for HIP1 Inhibition in Breast Cancer

Ross, Theodora; May 2007; 72 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0534

Report No.(s): AD-A481402; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first hypothesis we tested in this grant is that HIP1 expression is necessary for breast tumorigenesis. The ongoing experiments show that HIP1 deficiency does indeed inhibit the formation of breast tumors. This result is similar to our work that demonstrated that HIP1 is necessary for prostate tumorigenesis (Bradley et al., 2005 Ca Res). These HIP1 deficient/MMTV-Myc experiments have taken an interesting turn as a few tumors have developed in the Hip1 deficient mice. To understand how these tumors might develop we have examined the tumors for unpredicted expression of HIP1 polypeptides. We have discovered the presence of a 105 kDa form of HIP1 (slightly truncated from the 116 kDa wild type). Upon sequencing of Hip1 DNA and message from these cells, we determined that this 105 kDa form of HIP1 is the product of splicing of a cryptic U12-type AT-AC intron. This event results in the insertion of an AG dinucleotide between exons 2 and 6 and restoration of the original reading frame. Remarkably, this mutant protein retains its capacity to bind lipids, endocytic proteins and EGFR. The expression of this mutant form of HIP1 in breast cancer cells provides clues for future investigations into the contribution of HIP1 to the homeostasis of normal and neoplastic tissues as different stages of development (Graves et al., 2007, submitted). We think that this discovery emphasizes the value of how sequencing the transcript that is actually produced by an engineered knock-out allele can reveal novel types of molecular compensation in cancer cells at the level of splicing. These data also indicate that the expression of HIP1 is necessary for the survival of Myc-induced breast cancers. The second hypothesis we have been testing is that dysregulation of endocytosis of EGFR by HIP1 is a mechanism by which HIP1 promotes breast cancer evolution.

DTIC

Breast; Cancer; Mammary Glands; Therapy

20080035388 Meharry Medical Coll., Nashville, TN USA

Dietary Fat and Vitamin E in Prostate Cancer Risk Among African Americans and Africans: A Case-Control Study

Ukoli, Flora A M; Feb 2007; 131 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-0068

Report No.(s): AD-A481404; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A pilot study to investigate prostate cancer dietary risk factors was initiated at the Howard University Cancer Center, Washington DC, in 2000, and recruited study participants from rural Nigeria. In 2002 the scope of the study was expanded to include African-Americans and African migrants in the USA so as to investigate the role of dietary nutrients associated with increased prostate cancer risk (fatty acids) and antioxidants associated with reduced risk for prostate cancer (vitamin E), and to study how the process of migration may impact exposure to dietary risk factors for this cancer. African-Americans and African migrants study participants were recruited from the Washington D.C. metropolitan area while Nigerians were recruited from two rural and two urban communities, the health centers situated there, and one referral hospital. IRB approvals were obtained both from Howard University and the University of Benin Teaching Hospital, Nigeria. In 2003 the PI moved to Meharry Medical College, and this grant was transferred from Howard University Cancer Center. New consent forms were developed and IRB approval were obtained from this institution. Nigerian participants continued to be recruited as in the past while African-American and African migrants were recruited from Nashville, TN. The study protocol, survey, and procedures remained the same. The main objective of the study is to locate prostate cancer cases and select community based controls who were from the same socio-economic status and age groups in both countries in a case-control design. The various demographic, medical history, dietary patterns, and nutrient levels will be compared between cases and controls to determine the fatty acid risk factors for prostate cancer among men of African ancestry in both countries. The specific nutrients of interest

are fatty acids some of which have been proposed as risk factors for prostate carcinogenesis, and vitamin E, a protective antioxidant.

DTIC

Africa; Cancer; Diets; Nutrition; Prostate Gland; Risk; Tocopherol

20080035389 Alabama Univ., Birmingham, AL USA

A Controlled Trial of Chemoprevention Using COX-2 Inhibitors in an Avian Model of Spontaneous Ovarian Carcinogenesis

Barnes, Mack N; Sep 2007; 43 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0322

Report No.(s): AD-A481405; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this study was to determine in a controlled chemoprevention trial the ability of a COX-2 inhibitor to inhibit the development of spontaneously arising genital tract adenocarcinoma in the laying hen (*Gallus Domesticus*) animal model of ovarian cancer. Following a dose finding study for the COX-2 inhibitor Rimadyl 480 hens were utilized in a controlled trial of this agent to determine the subsequent development of genital tract adenocarcinoma by histologic examination. Assessment of egg count data suggests no reduction in the number of eggs produced in the animals treated exposed to COX-2 inhibitor. There was no evidence of a reduction of reproductive tract adenocarcinoma. In this study no reduction in the incidence of genital tract adenocarcinoma was observed in the laying hen model following exposure to a COX-2 inhibitor. It is of significant interest that no effect on ovulatory activity was observed. This study potentially helps shed light on the importance of reducing ovulatory activity in the pursuit of ideal chemopreventive agents for ovarian cancer.

DTIC

Birds; Cancer; Inhibitors; Ovaries

20080035398 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Spreading Depolarizations of Cerebral Cortex After Brain Injury: Mechanism of Injury Progression and Relevance to Military Neurotrauma

Hartings, J A; Tortella, F C; Strong, A J; Bhatia, R; Bullock, M R; Fabricius, M; Vo, A H; Bell, R S; Armonda, R A; Ecklund, J M; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481426; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Based on media reports, neurotrauma has emerged as the signature wound in the Global War on Terrorism (GWOT). Brain trauma is frequently the result of blast injury, producing a unique syndrome with a high incidence of traumatic sub-arachnoid hemorrhage (SAH) and vasospasm. Cortical spreading depolarizations (CSD) are a pathologic short-circuiting of brain function that cause secondary brain damage in animal models of cerebral ischemia. We investigated the role of CSD as a novel pathogenic mechanism in civilians with SAH and traumatic brain injury (TBI). In both diseases, CSD occurs with a high incidence (>50%) and is associated with progressive cerebral metabolic compromise, tissue infarction, and poor neurologic recovery. Results suggest CSD may be mitigated by therapeutic hypothermia. We speculate that CSD underlies delayed deterioration in GWOT casualties who have characteristics of both civilian TBI and SAH. Based on civilian incidence, it is estimated that at least 2,716 U.S. service members in Operation Iraqi Freedom (OIF) have experienced CSD. We consider it a vital obligation to discover the pathophysiologic and therapeutic implications of CSD in order to improve survivability and recovery from military neurotrauma.

DTIC

Brain Damage; Cerebral Cortex; Cerebrum; Spreading

20080035404 Army Natick Soldier Center, Natick, MA USA

Determination of Percent Body Fat Using 3D Whole Body Laser Scanning: A Preliminary Investigation

Garlie, Todd N; Obusek, John P; Corner, Brian; Zambraski, Edward J; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481436; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to investigate the use of 3D whole body laser scanning technology to estimate body fat content. Percent body fat determined from current Army equations using manual and 3D laser scanning methods were compared to each other and to percent body fat obtained from Dual Energy X-ray Absorptiometry (DEXA), used here as a reference method. Manual measurements of body lengths and circumferences, 3D whole body laser scans and DEXA scans were performed on fifty-one men and women age 18-62. Mean percent body fat was not statistically different between the three

methods. Correlation coefficients (R) were moderately high with low standard errors (SEE) and Lin's (1989, 2000) concordance analyses revealed moderate to strong measurement agreement between the three methods. This preliminary study demonstrates that the novel application of 3D whole body laser scanning to determine percent body fat is in close agreement with percent body fat determined using both Army manual measurements and DEXA.

DTIC

Adipose Tissues; Lasers; Lipids; Measurement

20080035408 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Fluoride Ion Regeneration of Cyclosarin (Gf) from Minipig Tissue and Fluids Following Whole Body GF Vapor Exposure

Jakubowski, Edward N.; McGuire, Jeffery M; Evans, Ronald A; Hulet, Stanley W; Mioduszewski, Robert J; Thomson, Sandra A; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481446; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent developments to improve nerve agent biomarker techniques include methods for measuring fluoride regenerated Sarin (GB) in blood and tissue. Our efforts extend the fluoride ion regeneration method to be able to determine cyclosarin (GF) in red blood cells, plasma, and tissue of minipig blood samples after whole body exposure to GF at miosis levels. Blood samples were taken serially before, during, and after whole body GF exposure from the minipig via venous catheter allowing agent exposure profiles to be generated. After processing the samples with fluoride ion and extracting with C-18 solid phase extraction cartridges the ethyl acetate extract was analyzed by GC/MS. The GC/MS method utilized an autoinjector, a large volume injector port (LVI), positive ion ammonia chemical ionization detection in the SIM mode, and a 2H11- GF stable isotope internal standard. Results indicated that the method range was 10-1000 pg on column. The detection limit was 3 pg of GF on column despite the complexity of the red blood cell/tissue matrix. Conditions that needed to be optimized for the LVI included injection volume, initial temperature, pressure, and flow rate. The regenerated GF (R-GF) profiles differ greatly from the regenerated GB (R-GB) profiles in the minipig at similar exposure levels. The onset of the appearance of R-GF in the blood seems to be delayed and maximum levels are reached at much later times as compared to GB exposures. The rate of R-GB production was 5-10 times greater than that of R-GF at equimolar exposures.

DTIC

Exposure; Fluorides; Vapors

20080035412 Army Research Inst. of Environmental Medicine, Natick, MA USA

Rehydration with Fluid of Varying Tonicities: Effects on Fluid Regulatory Hormones and Exercise Performance in the Heat

Kenefick, R W; Maresh, C M; Armstrong, L E; Riebe, D; Echegaray, M E; Castellani, J W; Feb 22, 2007; 9 pp.; In English Report No.(s): AD-A481454; USARIEM-M-06-36; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rehydration with fluid of varying tonicities: effects on fluid regulatory hormones and exercise performance in the heat. *J Appl Physiol* 102: 1899-1905, 2007. First published February 22, 2007; doi:10.1152/jappphysiol.00920.2006. This study examined the effects of rehydration (Rehy) with fluids of varying tonicities and routes of administration after exercise-induced hypohydration on exercise performance, fluid regulatory hormone responses, and cardiovascular and thermoregulatory strain during subsequent exercise in the heat. On four occasions, eight men performed an exercise-dehydration protocol of ~ 185 min (33 C) to establish a 4% reduction in body weight. Following dehydration, 2% of the fluid lost was replaced during the first 45 min of a 100-min rest period by one of three random Rehy treatments (0.9% saline intravenous; 0.45% saline intravenous; 0.45% saline oral) or no Rehy (no fluid) treatment. Subjects then stood for 20 min at 36 C and then walked at 50% maximal oxygen consumption for 90 min. Subsequent to dehydration, plasma Na⁺, osmolality, aldosterone, and arginine vasopressin concentrations were elevated ($P < 0.05$) in each trial, accompanied by a -4% hemoconcentration. Following Rehy, there were no differences ($P > 0.05$) in fluid volume restored, post-rehydration (Post-Rehy) body weight, or urine volume. Percent change in plasma volume was 5% above pre-Rehy values, and plasma Na⁺, osmolality, and fluid regulatory hormones were lower compared with no fluid. During exercise, skin and core temperatures, heart rate, and exercise time were not different ($P > 0.05$) among the Rehy treatments.

DTIC

Body Fluids; Hormones; Physical Exercise

20080035415 Army Research Inst. of Environmental Medicine, Natick, MA USA

Thermoregulatory Function During the Marathon

Kenefick, Robert W; Cheuvront, Samuel N; Sawka, Michael N; Jan 2007; 5 pp.; In English

Report No.(s): AD-A481458; USARIEM-M-06-43; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Marathon races are performed over a broad range of environmental conditions. Hyperthermia is a primary challenge for runners in temperature and warm weather, but hypothermia can be a concern during cool-wet or cold conditions. Body temperature during the marathon is a balance between metabolic heat production and exchange with the environment described by the heat balance equation. During exercise, core temperature is proportional to the metabolic rate and largely independent of a wide range of environmental conditions.

DTIC

Temperature Control; Thermoregulation

20080035419 Air Force Research Lab., Tyndall AFB, FL USA

Silica-Immobilized Enzymes for Multi-Step Synthesis in Microfluidic Devices (Postprint)

Luckarift, Heather R; Ku, Bosung S; Dordick, Jonathan S; Spain, Jim C; Oct 2007; 7 pp.; In English

Contract(s)/Grant(s): F08637-03-C-6006; Proj-4915

Report No.(s): AD-A481472; AFRL-ML-TY-TP-2006-4580; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The microfluidic combinatorial synthesis of 2-aminophenoxazin-3-one (APO) is reported. Individual microfluidic chips containing metallic zinc, silica-immobilized hydroxylaminobenzene mutase and silica-immobilized soybean peroxidase are connected in series to create a chem-enzymatic system for synthesis. Zinc catalyzes the initial reduction of nitrobenzene to hydroxylaminobenzene which undergoes a biocatalytic conversion to 2-aminophenol, followed by enzymatic polymerization to 2-aminophenoxazin-3-one. Silica-immobilization of enzymes allows the rapid stabilization and integration of a biocatalyst within a microfluidic device with minimal preparation. The system proved suitable for synthesis of a complex natural product (APO) from a simple substrate (nitrobenzene) under continuous flow conditions.

DTIC

Biosynthesis; Catalysts; Enzymes; Fluidics; Microfluidic Devices; Silicon Dioxide

20080035499 Navy Environmental Health Center, Portsmouth, VA USA

Unplanned Pregnancy among Sailors: Background and Opportunities

Jan 5, 2005; 9 pp.; In English

Report No.(s): AD-A481175; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481175>

Unplanned pregnancies among active duty Sailors continue to be of concern. In 2001, 10% of young (E-2 through E-4) female Sailors became pregnant. Of all pregnancies among surveyed enlisted female Sailors during that year, only 1 of 3 (36%) was planned. In FY2002, this rate fell to 30%. The national 'Healthy People 2010' objective is to increase the proportion of pregnancies that are intended to 70%. Planned pregnancy rates among surveyed active duty Navy enlisted women in 1988, 1992, 1997, 1999, 2001 and 2003 are shown in Figure 1. Navy women who become pregnant often report the father to be another military member. For the most recent pregnancy experienced by those ever pregnant while in the Navy, 73% of enlisted members surveyed in 2001 said the father was a military man. About half of the enlisted female Sailors who experienced an unplanned pregnancy were unmarried (49%), and about half of the enlisted female Sailors that experienced an unplanned pregnancy were married during their most recent pregnancy (49 percent). The vast majority (81%) of men who fathered the children of unmarried Sailors in 1999 were military men. A significant proportion of these children are born to single parents. Among male enlisted Sailors, one of four single fathers with custody in 2001 was unmarried. Of female parents Navy-wide, 24% were single in 2001. Of male Navy parents in 2001, 6% were single. Fully 7% of all Navy women in 2001 were single parents, as were 3% of all Navy men. In 2003, there were over 5,000 single Navy mothers and over 10,000 single Navy fathers. The report also discusses the consequences of unplanned pregnancy, particularly single parenthood, and the costs of such pregnancies to the Navy in terms of dollars, reduced duty hours, absence from the workplace, reassignment, and staff shortages. Also discussed are sailors' attitudes toward birth control, knowledge of birth control, education about birth control, and access to birth control.

DTIC

Education; Military Personnel; Personnel; Pregnancy

20080035500 National Defense Univ., Washington, DC USA

The Role of Medical Diplomacy in Stabilizing Afghanistan (Defense Horizons, Number 63, May 2008)

Thompson, Donald F; May 2008; 9 pp.; In English

Report No.(s): AD-A480999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480999>

Comprehensive stabilization and reconstruction of Afghanistan are not possible given the current fragmentation of responsibilities, narrow lines of authorities, and archaic funding mechanisms. Afghans are supportive of U.S. and international efforts, and there are occasional signs of progress, but the insurgent threat grows as U.S. military and civilian agencies and the international community struggle to bring stability to this volatile region. Integrated security, stabilization, and reconstruction activities must be implemented quickly and efficiently if failure is to be averted. Much more than a course correction is needed to provide tangible benefits to the population, develop effective leadership capacity in the government, and invest wisely in reconstruction that leads to sustainable economic growth. A proactive, comprehensive reconstruction and stabilization plan for Afghanistan is crucial to counter the regional terrorist insurgency. This paper examines the health sector as a microcosm of the larger problems facing the USA and its allies in efforts to stabilize Afghanistan. A detailed RAND Corporation study cites the absence of an overarching, nationally driven plan, poor coordination, and the lack of a lead actor as major barriers to successful health sector reconstruction and stabilization. Three obstacles identified in the RAND study are at the root of failing U.S. efforts in Afghanistan: poor planning and coordination within and between U.S. Government military, and civilian agencies; lack of an overall health sector reconstruction game plan and the resources required for implementation; and misunderstanding of and failure to adjust for the complex counterinsurgency challenges of security, stabilization, and reconstruction. Focusing on health provides opportunities to overcome Taliban influence, strengthen the young Afghan government, and set the conditions for long-term economic growth.

DTIC

Afghanistan; Coordination; Horizon; Medical Services; Public Health; Public Relations; Stabilization

20080036052 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Boosting Immune Responses against Bacterial Pathogens: In Vivo Analysis of Immunomodulators

vanderKleij, D.; Kaman-van-Zanten, W. E.; April 2008; 25 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 014.17763

Report No.(s): TNO-DV 2008 A002; TD2008-0002; Copyright; Avail.: Other Sources

The threat of the use of biological weapons, including bacteria, has increased. Bacterial resistance to antibiotics increasingly becomes a problem. Vaccination of military personnel against biothreat agents may be an option, however there is a broad range of biothreat agents, which may become even broader as a result of genetic engineering. Moreover, vaccination against multiple agents may cause undesired effects. A more generic approach to prevent the effects of a broad spectrum of bacteria via immunomodulation seems more effective. To be able to evaluate the effectiveness of immunomodulators to limit bacterial infection, a bacterial infection model in the mouse was the set-up and validated. Furthermore, the potency of two immunomodulators to limit bacterial infection was tested using this model.

Author

Bacteria; Genetic Engineering; Immunity; In Vivo Methods and Tests; Pathogens

20080036211 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Fast Detection of Ciprofloxacin Resistance, Part 3

Wolterink, A. F. W. M.; vanDijk-Knijnenburg, W. C. M.; April 2008; 27 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 014.17762

Report No.(s): TNO-DV 2008 A001; TD2008-0001; Copyright; Avail.: Other Sources

The fast method for detection of ciprofloxacin resistance in bacteria, as described in previous reports, was extended to pathogens Like *Yersinia pestis*, *Vibrio cholerae*, *Francisella tularensis* and *E.coli*. For *Y. pestis* and *V. cholerae* the method was tested. For *F. tularensis* this could not be done because no resistant strains were available. *E. coli* strains were cultivated with different ciprofloxacin concentrations, however this did not result in detectable mutations. An additional method is necessary for confirmation, since the false-negatives observed cannot be excluded. An overview is given of bacterial species which can be tested for ciprofloxacin resistance using the QRDR mutation test.

Author

Antibiotics; Bacteria; Detection; Medical Science; Pharmacology

20080036220 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Identification of Brucella using Microarray Genotyping

Kieboom, J.; Voskamp, A. I.; vanBaar, B. L. M.; Broekhuijsen, M. P.; April 2008; 20 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 032.12821.01.03

Report No.(s): TNO-DV 2008 A010; TD2008-0006; Copyright; Avail.: Other Sources

Rapid biotyping and identification is of great importance for protection against biological weapons threat agents. For this reason a microarray for genotyping of Brucella is designed and constructed. The protocols for microarray spotting, labeling of genomic DNA, DNA hybridization, microarray washing, and microarray scanning were optimized. In initial experiments, Some unique oligo-DNA sequences were identified that could possibly be used for biotyping of Brucella suis. Further research will be focused on the validation of these markers in other Brucella suis strains and in Brucella family bacteria in general.

Author

Bacteria; Bioassay; Genome

20080036247 NASA Marshall Space Flight Center, Huntsville, AL, USA

NASA's Plans for Materials Science on ISS: Cooperative Utilization of the MSRR-MSL

Chiaromonte, Francis; Szofran, Frank; June 23, 2008; 16 pp.; In English; Original contains color illustrations; No Copyright;

Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036247>

The ISS Research Project draws Life (non-human) and Physical Sciences investigations on the ISS, free flyer and ground-based into one coordinated project. The project has two categories: I. Exploration Research Program: a) Utilizes the ISS as a low Technology Readiness Level (TRL) test bed for technology development, demonstration and problem resolution in the areas of life support, fire safety, power, propulsion, thermal management, materials technology, habitat design, etc.; b) Will include endorsement letters from other ETDP projects to show relevancy. II. Non-Exploration Research Program; a) Not directly related to supporting the human exploration program. Research conducted in the life (non-human) and physical sciences; b) The program will sustain, to the maximum extent practicable, the USA scientific expertise and research capability in fundamental microgravity research. Physical Sciences has about 44 grants, and Life Sciences has approximately 32 grants, mostly with universities, to conduct low TRL research; this includes grants to be awarded from the 2008 Fluid Physics and Life Science NRA's.

Derived from text

Physical Sciences; Life Sciences; Microgravity; Fluid Dynamics; Management Systems; Life Support Systems

20080036264 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Bioengineered Skin From Stem Cells for Treatment of Cutaneous Vesicant Injury

Nambiar, Madhusoodana P; Castagna, Michael P; Rogers, Kenneth C; Isidore, Myriane; Ratcliffe, Ruthie H; Doctor, Bhupendra P; Gordon, Richard K; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481517; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481517>

Severe exposure to HD induces blistering skin reactions and significant loss of stem cell keratinocytes that are required for a continuous renewal of the epidermal cell layer. Therefore, HD injuries require long healing periods leaving significant cosmetic and/or functional deficits. We are developing bioengineered skin from embryonic stem cells for improved therapy for HD-induced skin damage. Since stem cell keratinocytes lack major histocompatibility class II antigens, they exhibit little immunogenicity and are suitable for allograft use. The multipotential nature of stem cells may be particularly valuable for skin damage where several cell types and growth factors are necessary for proper repair and regeneration. We differentiated embryonic stem cells to skin keratinocytes in a cellular matrix cultured in an air/liquid system to form the bioengineered skin, mimicking normal skin. The efficacy of bioengineered skin for HD-induced skin lesions was evaluated using a C57BL/6 mouse model and 2-chloroethylethyl sulfide (half-mustard or CEES). Mice were exposed to 3 microliters neat CEES for 10 minutes, and at 48 h post exposure, the injured skin was excised and the site was cleaned with debridase. Next, the bioengineered skin was transferred directly to the wound and affixed with a non-adherent sterile gauze pad. The affixed with a non-adherent sterile gauze pad. The embryonic stem cell derived bioengineered skin exhibited growth and healing in 1 to 3 weeks. In contrast, the CEES exposed animals not treated with bioengineered skin had a) no skin growth and b) obvious contraction of the skin in the injured area. Our results demonstrate that for the first time, topically applied fresh or frozen

bioengineered skin or skin keratinocytes from embryonic stem cells produce improved healing when applied 48 h after HD exposure.

DTIC

Chemical Warfare; Injuries; Stem Cells; Transplantation

20080036267 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Investigation of Hair Follicle and Plasma Biomarkers for Low-Level VX Vapor Exposure

LaFiandra, E M; Chambers, A E; Horsmon, J; Valdes, J J; Sekowski, J W; Benton, B; Horsmon, M; Mioduszewski, R; Thomson, S; Evans, C; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481522; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481522>

Currently, there are no field-ready and expedient assays able to determine whether someone has been exposed to very low-level chemical warfare agent (CWA). Furthermore, if it were known that a person had been exposed, there is a paucity of information regarding the potential for transient or persistent neurological or other injuries. While our laboratory is working to address both of these problems, our recent work toward finding a more expedient method of detecting low-level agent exposure is addressed in this manuscript. Our laboratory has used two approaches on three different tissues in order to identify molecular indicators (biomarkers) of exposure to VX, an organophosphate (OP) nerve agent. The work described in this manuscript utilizes a whole mount immunohistochemistry (IHC) technique on whisker hair follicles and liquid chromatography coupled to mass spectrometry (LC/MS) on blood plasma to mine for metabolic biomarkers of VX exposure. To date, the work has identified several promising proteins in the follicle and a panel of interesting plasma metabolite markers in the plasma and liver that can discriminate VX exposure versus air as well as level of VX exposure.

DTIC

Biomarkers; Blood Plasma; Exposure; Hair; Histochemical Analysis; Metabolites; Plasmas (Physics); Proteins; Vapors

20080036279 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Development of a Vaccine for Neisseria Meningitidis Group B Based on Native Outer Membrane Vesicles

Zollinger, W D; Fisseha, M; Brandt, B L; Drabick, J; Nov 1, 2006; 8 pp.; In English

Report No.(s): AD-A481545; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481545>

A novel approach for development of a meningococcal group B vaccine has been developed. This approach, which uses vesicles or blebs of the meningococcal outer membrane prepared without exposure to detergent or denaturing solvents, allows the outer membrane antigens to be presented to the immune system in their natural conformation and membrane environment. Two strategies for using these native outer membrane vesicles (NOMV) as a vaccine have been investigated. The first is intranasal vaccination using NOMV prepared from a capsule negative mutant, and the second is intramuscular vaccination using NOMV prepared from a double mutant that is capsule negative and expresses a mutant lipopolysaccharide with low endotoxin activity. The intranasal vaccine has been evaluated in mice and rabbits and in two phase 1 clinical studies. The intramuscular vaccine has been evaluated in animals and is currently being evaluated in a clinical study. Results obtained to date with these vaccines are promising and show evidence of a high quality and quite cross reactive antibody response.

DTIC

Antibodies; Membranes; Vaccines

20080036281 Stanford Univ., Stanford, CA USA

Molecular Imaging of Ovarian Carcinoma Angiogenesis

Chen, Xiaoyuan; Mar 2007; 69 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0042

Report No.(s): AD-A481551; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481551>

This purpose of this proposal is to use high resolution microPET technology to image ovarian cancer integrin expression in vivo. Ovarian cancer is angiogenesis dependent. Integrin, a key player in tumor angiogenesis and metastasis, has been identified as a target for diagnostic and therapeutic interventions for several highly proliferative and metastatic tumor types. The interaction between vitronectin and integrin $\alpha v \beta 3$ is essential for ovarian cancer cell survival and invasion. The integrin expression has been identified as a marker of poor prognosis in advanced-stage ovarian cancer. Its role in ovarian cancer development and as treatment target is under-developed. Specific Aim 1: To develop and optimize 18F-labeled RGD

peptides for ovarian carcinoma targeting. Specific Aim 2: To test 18F-RGD peptide tracers in ovarian carcinoma models of different tumor integrin $\alpha v\beta 3$ expression levels in order to correlate the magnitude of tumor uptake with receptor density. Major Findings: In year 1, we have synthesized a series of multimeric RGD peptides with high integrin $\alpha v\beta 3$ affinity/specificity and labeled these peptides with F-18 for PET imaging of integrin expression in vivo (Aim 1). We have also established several ovarian cancer models with differentiated integrin levels (Aim 2). Further test of the optimal radiotracer in different ovarian cancer models to correlate the tracer uptake with tumor integrin expression is currently underway (Aim 2).

DTIC

Angiogenesis; Cancer; High Resolution; Imaging Techniques; Ovaries

20080036282 Baltimore Research and Education Foundation, Inc., Baltimore, MD USA

Efficient and Rapid Development of Transgenic Hamster Models of TSEs Using a Radical New Technology

Rohwer, Robert G; Alexeeva, Irena; Bulgin, Marie; Sep 2007; 96 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0746

Report No.(s): AD-A481552; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481552>

The development of blood-based or other diagnostic tests for the TSE diseases should be greatly facilitated by an integrated set of compatible resources: 1) a susceptible large animal (sheep) to provide blood or other substrates, 2) susceptible transgenic rodents that can be used as a sensitive bioassay, 3) standard reference samples of brain, blood, and plasma of sufficient volume to be used by the TSE community. We are breeding a flock of 50 genotyped sheep to select for the high scrapie susceptibility genotype VVRRQQ. All three lines of the mouse transgenics carrying sheep, human, and elk PrP have been now re-derived. We have observed the first transmission of the disease from our standard scrapie-infected sheep brain inoculum to the transgenic mice with sheep PrP and have completed an end-point dilution titration. We have pooled and aliquoted the infected sheep whole blood, and separately, plasma (100 liters total). The pooled whole blood and plasma have been inoculated into transgenic mice for limiting dilution titrations that will quantify their exact level of infectivity, thus increasing their value to researchers. A protocol for sharing or sale of these resources has been prepared and samples have already been distributed.

DTIC

Animals; Blood Plasma; Hamsters; Models; Radicals; Sheep

20080036285 Baylor Coll. of Medicine, Houston, TX USA

Preclinical Evaluation of Novel Dendritic Cell-Based Prostate Cancer Vaccines

Lapteva, Natalia; Jan 2008; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0105

Report No.(s): AD-A481556; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481556>

To enhance DC-based vaccines, we used the combination of a synthetic ligand-inducible CD40 receptor (iCD40) along with TLR-4 ligation in human monocyte-derived DCs. The iCD40 receptor permits targeted, reversible activation of CD40 in vivo, potentially bypassing the essential role of CD4+ T cells for activation of DCs. As a rigorous preclinical study of this approach, we evaluated key parameters of DC activation and function. While neither iCD40 nor TLR4 signaling alone led to high levels of IL-12p70 and IL-6, using iCD40 in combination with lipopolysaccharides (LPS) led to strongly synergistic production of both. Furthermore, this approach led to high expression of DC maturation markers, epitope-specific cytotoxic T cell and TH1 responses, as well as DC migration in vitro. Moreover, use of iCD40-modified and LPS-stimulated DCs led to targeted expansion of autologous T cells against the attractive tumor-associated antigen, prostate-specific membrane antigen (PSMA), supporting this technology as a potent strategy for DC-based prostate cancer immunotherapy.

DTIC

Cancer; Dendrimers; Prostate Gland; Vaccines

20080036286 Miami Univ., FL USA

Involvement of Novel Multifunctional Steroid Hormone Receptor Coactivator, E6-Associated Protein, in Prostate Gland Tumorigenesis

Srinivasan, Sathish; Jan 2008; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0103

Report No.(s): AD-A481557; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481557>

E3 ubiquitin-protein ligase enzyme, E6-associated protein (E6-AP), is a novel dual function steroid hormone receptor coactivator. E6-AP not only interacts with and enhances the hormonedependent transcriptional activities of various steroid hormone receptors, including androgen receptor (AR), but also is a member of the E3 class of functionally related ubiquitin-protein ligases. Previously, using E6-AP knockout animals we have shown that E6-AP is required for the proper development and growth of prostate gland. Furthermore, we also show that protein levels of the components of phosphatidylinositol 3-kinase/protein kinase B (PI3K-Akt) signaling pathway are decreased in E6-AP knockout animals. In this report we show that overexpression of E6-AP in the prostate gland leads to increased prostate gland size and also showed PIN like precancerous lesions. We also found that PI3K-Akt pathway is elevated in E6-AP transgenic prostate gland. In addition to that, stable LNCaP cells that stably overexpress exogenous E6-AP protein have elevated levels of PI3K, total Akt, phosphorylated Akt (active Akt) suggesting that E6-AP regulates the PI3K-Akt signaling pathway. This report also suggest that E6-AP may regulate PI3K-Akt signaling by regulating the protein levels of RhoA, a small GTPase, which is a negative regulator of the Akt signaling pathway via the ubiquitinproteasome pathway. In addition, we show that stable overexpression of E6-AP in prostate cancer cells results in decreased apoptosis. Overall our data suggests that E6-AP regulates the PI3K-Akt pathway in prostate cells which results in increased prostate gland growth, proliferation and decreased apoptosis.

DTIC

Cancer; Hormones; Males; Prostate Gland; Proteins; Steroids

20080036297 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Identification of Novel Inverted Terminal Repeat (ITR) Deletions of Human Adenovirus (AD) From Infected Host: Virulent Ads Containing Mixed Populations of Genomic Sequences

Houng, Huo-Shu H; Binn, Leonard; Kuschner, Robert; Russell, Kevin; Metzgar, David; Lynch, Julia; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481581; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481581>

There are a total six different species of human Adenoviruses, designated A through F. All Ads implicated in US military ARD infections are confined within two Ad species, B and E. It was demonstrated and confirmed that the clinical human Ad isolates from natural infections examined in this study carrying random terminal ITR deletions. Whereas, laboratory adapted human Ads including Ad human vaccine strains, such as Wyeth Ad4 and Ad7 strains contain mostly homogeneous and intact ITR sequences. The finding of novel ITR deletions in clinical Ads of natural infections could have significant impacts on the future Ad research and vaccine development.

DTIC

Adenoviruses; Genome; Populations; Sequencing

20080036298 Armed Forces Research Inst. of Medical Sciences, Bangkok, Thailand

Safety and Efficacy of a Hepatitis E Virus Vaccine Conducted in Nepal

Shrestha, M P; Scott, R M; Shrestha, S K; Myint, K S; Mammen, M P; Joshi, D M; Thapa, G B; Thapa, N; Fourneau, David M; Safary, A; Innis, B L; Kuschner, R A; Seriwatana, J; Endy, T P; Vaughn, D W; Nov 1, 2006; 6 pp.; In English

Report No.(s): AD-A481583; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481583>

Hepatitis E virus (HEV) causes hepatitis E, a public health problem in many developing countries. Several outbreaks of hepatitis E have been reported in military environments. We evaluated the safety and efficacy of a HEV recombinant protein (rHEV) vaccine in a randomized, double-blinded, placebo-controlled trial. In Nepal, we studied 2,000 healthy adults susceptible to HEV who were randomized to receive 3 doses of either the rHEV vaccine (1,000) or placebo (1,000) at months 0, 1 and 6. Active and hospital surveillance were used to identify acute hepatitis and adverse events. The primary endpoint was hepatitis E occurring after 3 vaccine doses.

DTIC

Hepatitis; Nepal; Safety; Vaccines; Viruses

20080036303 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Bacteria Classification via Surface Enhanced Raman Spectroscopy and Principal Component Analysis

Guicheteau, J; Christesen, S; Emge, D; Hyre, A; Argue, L; Nov 2006; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481588; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481588>

Surface-enhanced Raman scattering (SERS) provides rapid fingerprinting of biomaterial in a non-destructive manner. The adsorption of colloidal silver to biological material suppresses native biofluorescence while increasing the normal Raman signal via the surface-enhanced Raman effect. This work validates the applicability of qualitative SER spectroscopy, utilizing principal component analysis (PCA) to show discrimination of biological threat simulants, based upon multivariate statistical confidences limits bounding known data clusters. Several strains of Bacillus spores are investigated along with Pantoea agglomerans, and Brucella noetomae.

DTIC

Bacillus; Bacteria; Bioluminescence; Classifications; Principal Components Analysis; Raman Spectra; Raman Spectroscopy; Spores

20080036310 Maryland Univ., Baltimore, MD USA

Beta Human Chorionic Gonadotropin - Induction of Apoptosis in Breast Cancer

Cullen, Kevin J; Jan 2006; 59 pp.; In English

Contract(s)/Grant(s): DAMD17-00-1-0682

Report No.(s): AD-A481598; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481598>

Agents that induce apoptosis in breast cancer cells have great potential to facilitate chemotherapeutic intervention and improve patient outcomes. In this study the effects of injecting purified human chorionic gonadotropin (hCG) directly into human breast cancer xenografts grown in nude mice was examined. It was demonstrated that intra-tumoral injection of purified hCG increased the apoptotic index in breast cancer xenografts. These results were supported by the findings that exposure of breast cancer cells to purified hCG decreased cell viability in five different breast cancer cell lines. Further investigation revealed that the expression of Bcl-xL Bcl-2 and Bax was altered in concert with their role in apoptosis as demonstrated by Western blotting analysis and immunohistochemistry. Preoperative apoptotic induction by factors such as hCG may improve local control or work synergistically with neoadjuvant chemotherapy to improve complete pathologic response of locally advanced breast cancer.

DTIC

Apoptosis; Breast; Cancer; Mammary Glands; Membranes; Tissues (Biology)

20080036311 Army Construction Engineering Research Lab., Champaign, IL USA

Next Generation Sensors for Contaminants in Water: Catalytic DNA as a Molecular Beacon

Cropek, Donald M; Wang, Kris; Lu, Yi; Flachsart, Bruce; Shannon, Mark A; Sweedler, Jonathan V; Bohn, Paul W; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-ER-1459

Report No.(s): AD-A481599; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481599>

The mobile warfighter needs sensor technology that provides an immediate and unambiguous response to toxins in water. Heavy metals are a ubiquitous and troublesome class of pollutants, and lead (Pb) occupies a prominent position as a contaminant requiring constant attention. Especially due to its nature of its toxicity to humans and the environment, persistency, and bioaccumulation, anthropogenic sources of Pb from military operations require active monitoring and sensing to ensure soldier health protection and environmental compliance. We have created a selective and sensitive miniature sensor for Pb²⁺ by combining two significant advances: (a) catalytic DNA that is reactive only to Pb²⁺ and (b) nanoscale fluidic molecular gates that can manipulate fluid flows and perform molecular separations on tiny volumes of material.

DTIC

Beacons; Contaminants; Deoxyribonucleic Acid; Images; Molecules; Water Pollution

20080036316 National Defense Univ., Washington, DC USA

Terrorism and Domestic Response: Can DoD Help Get It Right?

Thompson, Donald F; Jan 2006; 8 pp.; In English

Report No.(s): AD-A481606; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481606>

The DoD Military Healthcare System has physicians, nurses, and other allied personnel to meet the day-to-day needs of the active-duty force, military family members, and retirees and their beneficiaries, but it depends in large part on the civilian network through the TRICARE Management Activity. Many military hospitals have been downsized or closed over the past 10 years, leading to an even greater dependence on civilian resources. The military has a robust occupational health and deployment health program to keep active-duty servicemembers fit to fight and to care for them while they are deployed, but the number of active-duty medics is largely limited to those needed to support this rapid deployment capability. While military residency training programs have hospitals and the associated support staff, more and more peacetime military care is provided by the civilian network. DoD accepts some risk by depending on the civilian network. This risk may be appropriate in providing peacetime healthcare services, but it has considerable implications for a timely response to a terrorist incident within the USA that affects a DOD installation or civilian infrastructure that DoD depends on for force projection. Should terrorists attack a military installation with conventional weapons, USNORTHCOM has the responsibility and plans to bring in combat forces to protect that installation. The response to such an attack, however, would likely require that casualties be transported to civilian hospitals that are largely unprepared. There are three broad areas in which DoD action might reduce this operational risk, but all involve more proactive command engagement with civilian agencies and organizations: requirements-based mass casualty planning, understanding the institutional cultures of civilian partners in a regional mass casualty response, and coordinated crisis management decision making.

DTIC

Casualties; Defense Program; Emergencies; Management Methods; Medical Services; Public Relations; Security; Terrorism

20080036335 Wake Forest Univ., Winston-Salem, NC USA

A Treatment Stage Specific Approach to Improving Quality of Life for Women with Ovarian Cancer

Avis, Nancy E; Miller, Brigitte; Oct 2007; 17 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0734

Report No.(s): AD-A481643; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481643>

Our primary objective was to identify the issues that are of greatest concern to women in each of three treatment stages: newly diagnosed with ovarian cancer, in-treatment, and post-treatment. The CARES-SF and FACT-O questionnaires were administered to participants following diagnosis and prior to chemotherapy (baseline), during chemotherapy, following chemotherapy, and after recurrence. Data for the study was collected through mailed questionnaires and telephone follow-up from women treated at the Wake Forest University Baptist Medical Center (WFUBMC) and Forsyth Medical Center (FMC). A total of 89 women participated in the study. Quality of life was worse at baseline and improved over time. Physical problems were the greatest problem area and were highest at baseline and improved during treatment. Data collection for the study will last 28 months (patient accrual will last 25 months and follow-up will continue an additional 3 months).

DTIC

Cancer; Chemotherapy; Females; Medical Services; Ovaries

20080036336 Minnesota Univ., Austin, MN USA

Methylselenium and Prostate Cancer Apoptosis

Lu, Junxuan; Feb 2008; 14 pp.; In English

Contract(s)/Grant(s): DAMD17-02-1-007

Report No.(s): AD-A481644; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481644>

The purpose of this research is to gain a better understanding of the biochemical pathways and molecular targets for the selective induction of apoptosis signaling and execution of prostate cancer (PCa) cells by methyl selenium. We hypothesized that methyl selenium inhibits PI3K-AKT survival pathway leading to the activation of caspase-dependent apoptosis execution in PCa cells. The specific aim for the no-cost extension period is to define early signaling mechanisms induced by methylselenium for apoptosis and how and through what targets AKT regulates death signaling. We have identified BCL-xL, FLIP and survivin as early targets affected by MSeA. This was designed to follow up on a novel lead for using selenium as a chemosensitizer for cancer therapeutic drug-induced apoptosis in androgen independent PCa cells. Work accomplished: We

have tested the functional significance of MSeA-induced down regulation of Bcl-xL and survivin through the ectopic expression of these two genes in DU145 cells and tested their impact on apoptosis induced by taxol. The results have been accepted for publication in *Clinical Cancer Res.* Re-print is appended for this addendum report.

DTIC

Apoptosis; Cancer; Prostate Gland; Selenium

20080036339 New York Hospital-Cornell Medical Center, New York, NY USA

Anti-Angiogenic Action of Neutral Endopeptidase

Nanus, David M; Nov 2007; 30 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0051

Report No.(s): AD-A481652; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481652>

Angiogenesis, or the formation of new blood vessels from existing vasculature is an important event in tumor progression. It results from a complex, multistep biochemical cascade that is initiated by the activation of endothelial cells in response to angiogenic factors. In prostate cancers, angiogenic factors are produced by epithelial and stromal cells, and are believed critical to prostate cancer growth and progression. One of the most important of these factors is basic fibroblast growth factor (bFGF), which plays an important role in angiogenesis through the stimulation of endothelial cell proliferation, migration, and protease production in vitro phenomenon. A number of studies both in vitro and in patient specimens suggest that enhanced expression of bFGF contributes to more aggressive prostate cancer. Clearly, a better understanding of the pathways regulating angiogenesis in the prostate and how these pathways change during malignant transformation and prostate cancer progression will assist in developing more effective therapies for patients with prostate cancer.

DTIC

Angiogenesis; Cancer; Prostate Gland

20080036344 Chicago Univ., Chicago, IL USA

Societal Interactions in Ovarian Cancer Metastases: Quorum-Sensing Hypothesis

Rinker-Schaeffer, Carrie; Nov 2006; 12 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0041

Report No.(s): AD-A481660; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481660>

It is unknown what specific biochemical and biological mechanisms control ovarian cancer metastasis. Uncovering the mechanism(s) responsible for regulating metastatic colonization in ovarian cancer requires a fresh look from a new perspective. The purpose of this work is to test a completely novel hypothesis: That a Quorum Sensing mechanism is involved in metastatic colonization. Quorum sensing is a process of cell-cell communication that bacteria use to control gene expression in response to fluctuations in cell population density.

DTIC

Cancer; Detection; Hypotheses; Ovaries

20080036345 University of Southern California, Los Angeles, CA USA

Prostate Cancer and Pesticide Exposure in Diverse Populations in California's Central Valley

Cockburn, Myles G; Dec 2007; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0081

Report No.(s): AD-A481661; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481661>

There is some evidence that pesticide exposure is a risk factor for prostate cancer. Some pesticides, classified as endocrine-disrupting chemicals (EDCs), can affect normal hormone function. Variations in hormone levels affect prostate cancer risk, since normal growth of the prostate gland is dependent on a critical balance of androgen levels. Pesticides may affect hormone function by mimicking hormones, affecting enzyme systems involved in hormone metabolism, or directly affecting the brain regions involved in hormone functioning. A possible involvement of pesticides in prostate carcinogenesis is suggested by findings among farmers in studies of occupation and prostate cancer. The overall association reported by recent meta-analyses of farming and prostate cancer report a summary relative risk of 1.1, but the majority of studies with relatively large numbers of subjects consistently showed excess relative risks of prostate cancer ranging from 1.06 to 5.0. This limited evidence may well be inconclusive because of the difficulty in measuring true pesticide exposure - all these studies relied on

self-reported occupational exposure, resulting in bias towards the null, and the omission of non-occupational environmental exposures (e.g. residences downwind of application sites).

DTIC

Cancer; Exposure; Pesticides; Populations; Prostate Gland; Valleys

20080036346 Texas Univ., Houston, TX USA

Role of Caveolin-1 in Prostate Cancer Angiogenesis

Thompson, Timothy C; Dec 2007; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0116

Report No.(s): AD-A481662; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481662>

My laboratory relocated to M. D. Anderson Cancer Center on October 1, 2008. The move and transition was handled in a very efficient manner and we did not compromise our progress toward the goals of this project in any way. With only slight modifications Tasks 1-3 are on schedule and we are progressing toward our stated goals. Notable achievements for the past year of funding include comprehensive documentation that prostate cancer cell derived, secreted caveolin-1 is taken up by cancer cells and tumor associated endothelial cells (Tahir et al., *Cancer Res* 68: 731-739, 2008). This autocrine/paracrine activity of secreted caveolin-1 promotes malignant progression and provides an accessible therapeutic target. In pursuit of a clinical therapy based on this mechanism we have also shown that systemic delivery of caveolin-1 antiserum suppresses primary tumor growth and increases survival in an immunocompetent mouse model of prostate cancer (see Fig 5-7). In our view these results represent a paradigm shift in prostate cancer translational research.

DTIC

Cancer; Prostate Gland

20080036347 Monash Univ., Victoria, Australia

Is Hormonal Induction of Prostate Carcinogenesis Due to Declining Androgens in Late Life and/or Increased Estrogen in Early Life

McPherson, Stephen; Jan 2008; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0018

Report No.(s): AD-A481663; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481663>

This study aims to identify if exposure to estrogen during the neonatal period increases the sensitivity of the prostate to hormonal induction of malignant and pre-malignant lesions in the adult. Significant progress had been made and it has been demonstrated that co-administration of high concentration of testosterone and estradiol can induce carcinogenesis in the prostate of mice including pathologies ranging from hyperplasia to dysplasia and carcinoma in situ. Comparison of the prostates of wild-type and estrogen deficient ArKO mice has shown that although both develop focal dysplastic pathologies in discrete sites the estrogen-deficient ArKO prostate shows a significantly reduced incidence of aberrant pathology compared to that of normal animals. This strongly suggests that exposure to increased estrogen increases the risk of developing prostate cancer.

DTIC

Cancer; Carcinogens; Estrogens; Hormones; Males; Prostate Gland

20080036348 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Injury Criteria for Dynamic Hyperextension of the Female Elbow Joint

Duma, Stefan M; Hansen, Gail A; Kennedy, Eric A; Stitzel, Joel D; Brozoski, Frederick T; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481665; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481665>

This paper describes an analysis to develop dynamic hyperextension injury criteria for the female elbow joint. Dynamic hyperextension tests were performed on 24 female cadaver elbow joints. The energy source was a drop tower utilizing a three-point bending configuration to apply elbow bending moments matching the previously conducted side airbag tests. Post-test necropsy showed that 16 of the 24 elbow joint tests resulted in injuries. Injury severity ranged from minor cartilage damage to more moderate joint dislocations and severe transverse fractures of the distal humerus. Peak elbow bending moments ranged from 42.4 Nm to 146.3 Nm. Peak bending moment proved to be a significant indicator of any elbow injury

($p = 0.02$) as well as elbow joint dislocation ($p = 0.01$). Logistic regression analyses were used to develop single and multiple variate injury risk functions. Using peak moment data for the entire test population, a 50% risk of obtaining any elbow injury was found at 56 Nm while a 50% risk of sustaining an elbow joint dislocation was found at 93 Nm for the female population. It is anticipated that this study will provide researchers with additional injury criteria for assessing upper extremity injury risk caused by both military and automotive side airbag deployments.

DTIC

Biodynamics; Females; Injuries; Regression Analysis

20080036349 Children's Hospital Medical Center, Cincinnati, OH USA

A Novel Strategy to Control and Prevent Norovirus Gastroenteritis

Jiang, Xi; Huang, Pengwei; Feng, Xizhi; Tan, Ming; Zhong, Weiming; Farkas, Tibor; Morrow, Ardythe L; Thornton, Scott; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0066

Report No.(s): AD-A481666; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481666>

Norovirus (NV) gastroenteritis is an important disease of all ages and populations, including the military. The disease is difficult to control due to its widespread nature and lack of a treatment. NVs recently have been found to recognize human histo-blood group antigens (HBGAs) as receptors. The human HBGA system is highly polymorphic; NVs also are genetically diverse. This presentation summarizes our studies on the unique interaction of NVs with human host and the discovery of diversified receptor binding patterns of NVs. We also developed a saliva-based enzyme immune assay (EIA) to screen for inhibitors against NVs binding to receptors using a compound library. We discovered over a dozen compounds that potentially could be developed into antivirals against NVs. Human NVs still cannot be cultivated and infect animals. Our studies have significantly advanced the field of NV research. Further characterization of the NV/host interaction and application of new knowledge gained from these studies would result in development of new strategy to control and prevent NV gastroenteritis.

DTIC

Diseases; Gastrointestinal System; Viruses

20080036355 Wroclaw Univ., Poland

Assessment of Cerebral Hemodynamics in Traumatic Brain Injury

Latka, M; Turalska, M; West, B J; Kolodziej, W; Latka, D; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-1-0349

Report No.(s): AD-A481674; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481674>

We employ complex continuous wavelet transforms to develop a consistent mathematical framework capable of quantifying both cerebrospinal compensatory reserve and cerebrovascular pressure reactivity. The wavelet gain, defined as the frequency dependent ratio of time averaged wavelet coefficients of intracranial pressure (ICP) and arterial blood pressure (ABP) fluctuations, characterizes the dampening of spontaneous ABP oscillations. This gain is introduced as a novel measure of cerebrospinal compensatory reserve. For a group of 12 patients who died as a result of cerebral lesions (Glasgow Outcome Scale GOS =1) the average gain = 0.45 calculated at $f=0.05$ Hz significantly exceeds that of 17 patients with GOS=2: wavelet gain = 0.24 with $p = 4 \cdot 10^{-5}$ (Kruskal-Wallis test). We also study the dynamics of instantaneous phase difference $\Delta\phi(f)$ between the fluctuations of ABP and ICP. The time-averaged synchronization index = $(\sin \Delta\lambda)^2 + (\cos \Delta\lambda)^2$, which depends upon frequency, yields information about the stability of the phase difference $\Delta\lambda$ and is used as a cerebrovascular pressure reactivity index. For both groups of patients the synchronization is strong. We hypothesize that in patients who died the impairment of cerebral autoregulation is followed by the breakdown of residual pressure reactivity. For example at $f=0.05$ Hz, synchronization index = 0.70 (GOS=1) and synchronization index = 0.58 (GOS=2). While these two synchronization levels are not statistically different ($p=0.15$) the corresponding average phase difference for GOS=1 is equal to 10 degrees in sharp contrast to the mean value of 44 degrees for patients with GOS=2 ($p = 1 \times 0.0001$).

DTIC

Arteries; Blood Pressure; Brain; Brain Circulation; Brain Damage; Cerebrum; Hemodynamics; Injuries; Intracranial Pressure; Wavelet Analysis

20080036356 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Optimization of a New Cell-Based Fluorescence Assay for U.S. Army Global Malaria Surveillance Efforts in Support of the Warfighter

Johnson, Jacob D; Dennull, Richard A; Gerena, Lucia; Lopez-Sanchez, Miriam; Roncal, Norma E; Waters, Norman C; Nov 1, 2006; 7 pp.; In English

Report No.(s): AD-A481676; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481676>

High-throughput in vitro anti-malarial drug screens have traditionally incorporated the use of radioactive substrates to measure the effect test compounds have on parasitic growth. Several alternative growth inhibition screening assays using fluorescent nucleic acid intercalating dyes have been recently published. In this study we evaluated the malaria SYBR Green I-based fluorescence (MSF) assay, described by Smilkstein et al., for its use in laboratory research and in support of the U.S. Army malaria drug resistance program and the Global Emerging Infection Surveillance and Response System (GEIS) objectives. We expanded upon Smilkstein's initial characterization and validation of the MSF assay to fit our program-specific drug screening needs by testing various culture conditions commonly used for resistance screening. Plasmodium falciparum strains D6 and W2 were treated with a panel of known anti-malarial drugs and their respective IC50s were determined using the MSF assay. The results were then compared to our IC50 data generated using our standard [3H]hypoxanthine incorporation assay. Assay conditions that could potentially affect MSF assay readout, including assay length, starting parasite density and hematocrit levels, microtiter plate selection, and different culture medium components, were also examined. The IC50 values from the MSF assay showed the expected pattern of drug resistance for both parasitic strains tested when compared to the values from the [3H]hypoxanthine incorporation assay. One possible limitation of the MSF assay for some drug resistance applications is due to a significant edge effect observed, which could influence IC50 calculation. The MSF assay was easily amended for use with our robotic plate and handling equipment. Compared to our gold standard radioactive assay, the MSF assay is more cost-effective, simple, and less hazardous, while still allowing for accurate high throughput, automated drug screening.

DTIC

Assaying; Fluorescence; Parasitic Diseases; Surveillance

20080036358 Duke Univ., Durham, NC USA

Physiological Signals and Their Fractal Response to Stress Conditions, Environmental Changes and Neurodegenerative Diseases

Scafetta, N; Moon, R E; West, B J; Nov 1, 2006; 6 pp.; In English

Report No.(s): AD-A481678; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481678>

During the last decades nonlinear system theory has been widely applied to the analysis of biomedical time series and given rise to what is known as nonlinear and fractal physiology. Some of these studies have been intended to develop more reliable methodologies for understanding how biological systems respond to peculiar altered conditions induced by internal stress, environment stress and/or disease. Herein, we show some of our results regarding the fractal dependency on different conditions of physiological signals such as inter-breath intervals, heart inter-beat intervals and human stride intervals.

DTIC

Central Nervous System; Diseases; Fractals; Physiology; Time Series Analysis

20080036369 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Histopathology of Lesions in Swine Exposed to a Hemostatic Bandage Composed of Salmon Thrombin and Fibrinogen

Szabo, Kathleen A; Flournoy, William S; Dorsey, Evelyn Sawyer; avid Simpson; ary Cadd; ennifer; Rothwell, Stephen W; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): MIPR-N0001406MP20010

Report No.(s): AD-A481703; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481703>

Hemostatic bandages composed of salmon thrombin and fibrinogen are very effective in stopping bleeding in a swine aortal injury model. However, because of concern that these foreign proteins may induce an immune response in the patients, we investigated the inflammatory response in pigs exposed to salmon thrombin/fibrinogen dressings. Two defined full-thickness skin lesions were surgically created on the backs of 25kg Yorkshire swine and one lesion was treated with a salmon protein-based dressing and the other with a control commercially-available pad. Animals were sacrificed at seven or twenty-one days and the lymphoid organs harvested for histopathological examination. The 21-day animals were given an

additional boost of salmon thrombin/fibrinogen to simulate a second bandage application. Examination of the histology showed a cellular inflammatory response in treated and untreated animals that resolved by the 21-day stage. Lymph node and spleen samples showed germinal center formation in follicles, but the activity levels were higher in organs on the untreated side. Blood samples taken to assay for antibodies showed antibodies formed at low titers that recognized salmon fibrinogen and, following the booster shot, salmon thrombin.

DTIC

Blood Coagulation; Fibrinogen; Histology; Immunity; Lesions; Pathology; Physiological Responses; Swine; Thrombin

20080036370 Phramongkutklo Hospital, Bangkok, Thailand

A Phase 1/2 Trial of a Tetravalent Live-Attenuated Dengue Vaccine in Flavivirus-Naive Thai Infants

Watanaveeradej, V; Kerdpanich, A; Samakoses, R; Tanakijaru, K; Aree, C; Simasathien, S; Mammen, M P; Nisalak, A; Hengprasert, S; Jarman, R J; Gibbons, R V; Innis, B L; Hutagalung, Y; Chunsuttiwat, S; Sun, W; Endy, T P; Thomas, S; Eckels, K H; Putnak, R; Vaughn, D W; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481707; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481707>

The Walter Reed Army Institute of Research (WRAIR) has produced a tetravalent live-attenuated dengue vaccine that has been well tolerated and immunogenic in U.S. adults and Thai children. As infants are considered by many as an important age group for vaccination in dengue-endemic countries, we evaluated the vaccine in Thai flavivirus-na ve infants who are at risk for dengue.

DTIC

Infectious Diseases; Vaccines

20080036371 Phramongkutklo Hospital, Bangkok, Thailand

A Phase 1/2 Trial of a Tetravalent Live-Attenuated Dengue Vaccine in Flavivirus-Native Thai Infants

Watanaveeradej, V; Kerdpanich, A; Samakoses, R; Tanakijaru, K; Aree, C; Simasathien, S; Mammen, M P; Nisalak, A; Hengprasert, S; Jarman, R J; Gibbons, R V; Innis, B L; Hutagalung, Y; Chunsuttiwat, S; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481708; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481708>

The Walter Reed Army Institute of Research (WRAIR) has produced a tetravalent live-attenuated dengue vaccine that has been well tolerated and immunogenic in U.S. adults and Thai children. As infants are considered by many as an important age group for vaccination in dengue-endemic countries, we evaluated the vaccine in Thai flavivirus-na ve infants who are at risk for dengue.

DTIC

Infectious Diseases; Vaccines

20080036372 Johns Hopkins Univ., Baltimore, MD USA

CDK5 as a Therapeutic Target in Prostate Cancer Metastasis

Nelkin, Barry D; Jan 2008; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0139

Report No.(s): AD-A481709; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481709>

We have recently found that CDK5 is active in prostate cancer cell lines and in almost all human metastatic prostate cancers, and inhibition of CDK5 activity resulted in reduction of spontaneous metastases by 79%. This suggests that CDK5 is a novel potential therapeutic target to limit prostate cancer metastasis. Based on our finding that CDK5 activity is present in prostate cancer and is important for metastasis, we intend to develop CDK5 as a novel therapeutic target. We hypothesized that 1) pharmacological inhibitors of CDK5 can limit or block metastasis, and 2) in established skeletal metastases, inhibition of CDK5 may inhibit tumor growth and sensitize tumor cells to other therapies. Therefore, we proposed to characterize a series of small molecule CDK5 inhibitors for specificity in cell culture, and for their effect on xenograft models of prostate cancer. We also proposed to examine the role of CDK5 activity in growth of prostate cancer metastatic to bone, using PC3 based bioluminescent cell clones, and to explore the potential for CDK5 inhibition to sensitize prostate cancer cells to chemotherapy.

DTIC

Cancer; Chemotherapy; Metastasis; Prostate Gland; Targets; Therapy

20080036373 Johns Hopkins Univ., Baltimore, MD USA

Neurofibromatosis and the Painful Neuroma

Belzberg, Allan J; Jan 2008; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0176

Report No.(s): AD-A481710; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481710>

Pain is a common and distressing symptom that impacts the quality of life of many patients with neurofibromatosis. The pain is often due to the formation of a neuroma. To understand better how neuromas cause pain and what treatments may be provided, we have developed an animal model of a painful neuroma. The tibial neuroma transposition (TNT) model has been confirmed as a model of neuropathic pain. The TNT model has been established as reliable and valid (Specific Aim 1). In the TNT model, the neuroma test-site mechanosensitivity is dependent on neural input from the tibial neuroma. In the TNT model, hindpaw mechanical hyperalgesia is independent of input from the tibial neuroma. We have altered the formation of a neuroma by applying a toxin that Pain is a common and distressing symptom that impacts the quality of life of many patients with neurofibromatosis. The pain is retrogradely transported (suicide transport) leading to neuronal death and axonal death (Specific Aim 2). This technique is now being refined using target-specific toxins and examining subsequent pain behaviour (Specific aim 3).

DTIC

Cells (Biology); Nervous System; Pain

20080036384 Cedars-Sinai Medical Center, Los Angeles, CA USA

Mouse Models of Hrs Nf2 Interaction

Pulst, Stefan M; Jan 2008; 15 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0188

Report No.(s): AD-A481732; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481732>

Neurofibromatosis 2 (NF2) is a tumor suppressor gene syndrome characterized by the development of tumors of Schwann cell, meningeal, and ependymal origin. NF2 is also the gene most commonly mutated in sporadic tumors of these cell types. With previous support from the NF2 program of the Army Medical Branch we have identified hepatocyte growth factor regulated kinase substrate(HRS) as a protein that interacts with schwannomin. Studies by us and others have indicated a role for HRS in growth factor receptor trafficking and downregulation of signaling, but also established a role for HRS in cytokine and IGF1-mediated signaling to the STAT pathway. In the first year of funding, we have continued our in vitro studies of Hrs partial proteins and have initiated mouse studies to test interactions. We have identified several different Hrs molecules that show dominant negative effects. Our initial intercrosses of Hrs+/- mice with Nf2+/- mice have been successful. However, we have noticed slightly reduced litter size and some evidence for segregation distortion. This may influence our overall timetable in that it may be more costly and lengthy to produce the number of animals necessary for analysis.

DTIC

Mice; Neoplasms; Signs and Symptoms

20080036415 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Sensitive and Rapid Blood and Tissue HPLC Oxime Assay and Pharmacokinetics of MMB-4 in Guinea Pigs and African Green Monkeys

Garcia, Gregory E; Singh, Harry; Moorad-Doctor, Deborah; Ratcliffe, Ruthie H; Wachtel, Katie; Castillo, Andres; Gordon, Richard K; Myers, Todd M; McDonough, John H; Nov 2006; 8 pp.; In English

Report No.(s): AD-A481798; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481798>

We developed a rapid and sensitive assay for pyridinium oximes in plasma and tissues. Samples are prepared by acidification and then deproteinized by ultrafiltration. The oximes are measured during sample HPLC fractionation over a cation-exchange column with UV detection. The assay is suitable for analysis of mono- and di-pyridinium oximes, but was originally developed for the measurement of the oxime MMB-4. For both plasma and tissue sources, the LLOD was 0.0005 microgram and the LOQ was 0.001 to 2.5 microgram. The assay requires as little as 50 microliters of whole blood or 30 microliters of tissue homogenate. The assay was used for plasma pharmacokinetic studies from a single intramuscular injection of MMB-4 (dichloride or dimethylsulfonate salt) in nonhuman primate African green monkeys (AGM), and the plasma and tissues of the rodent guinea pig (GP). For the two species, both MMB-4 salts were pharmacokinetically equivalent. In AGM plasma, the Cmax and the area under the curve (AUC) varied dose-dependently with a Tmax of approximately 20 min and

mean residence time (MRT) was approximately 92 minutes for all doses of both salts. In GP plasma and muscle tissues, the C_{max} and AUC also varied dose-dependently. The plasma T_{max} was about 34 to 42 min while the muscle tissue levels peaked at 5-20 min. The tissue concentrations were much lower than the plasma. The tissue levels peaked at 5-20 min depending on the tissue with a concentration ranking of diaphragm > heart > thigh muscle.

DTIC

Africa; Assaying; Blood; Blood Cells; Guinea Pigs; Liquid Chromatography; Monkeys; Organic Phosphorus Compounds; Pharmacology; Sensitivity

20080036416 Case Western Reserve Univ., Cleveland, OH USA

Role of Neuron-Specific Splicing Regulators as Modifiers of Neurofibromatosis Type 1

Lou, Hua; Mar 2008; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0249

Report No.(s): AD-A481799; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481799>

We hypothesized that the tightly regulated ratio of NF1 isoforms is critical in maintaining the homeostasis of cell growth and differentiation, thereby determining the functional output of NF1 gene. A corollary is that splicing regulators may modify the function of neurofibromin through altering alternative splicing of the NF1 pre-mRNA. We propose two specific aims to study the role of regulated alternative splicing in the function of neurofibromin. In Aim I, we will determine how changes in alternative splicing affects NF1 function. In Aim II, we will determine the biological consequence of altering the ratio of neurofibromin isoforms in cells with natural NF1 expression such as neuronal and glial cells. To this end, we have identified the cis-acting elements located to the vicinity of exon 23a that play key roles in regulating inclusion of this exon. To study the biological output of NF1 as a result of altered expression of splicing factors, we made lentiviruses that over-express Hu proteins. We also designed the gene-targeting strategy to engineer the NF1 locus in mouse ES cells and are in the process of carrying out the multiple steps of recombinant DNA cloning. Results of the proposed studies will not only provide important novel insights into the etiology of NF1 disease, but also shed light on how genetic variations in splicing regulators affect the progression of other diseases.

DTIC

Cells (Biology); Deoxyribonucleic Acid; Nervous System; Neurons; Regulators; Splicing

20080036417 Walter Reed Army Inst. of Research, Silver Spring, MD USA

A Case-Control Study of Antibodies to *Toxoplasma gondii* and Risk of Schizophrenia among U.S. Military Personnel

Niebuhr, David W; Millikan, Amy M; Cowan, David N; Yolken, Robert; Li, Yuanzhang; Brundage, Mary; Nov 1, 2006; 9 pp.; In English

Report No.(s): AD-A481804; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481804>

A number of studies have reported associations between *T. gondii* infection and risk of schizophrenia. Most existing studies used small populations and single post-diagnosis specimens. As part of a larger research program we conducted a hypothesis-generating, pilot case-control study of *T. gondii* antibodies among individuals discharged from the US military with a diagnosis of schizophrenia and multiple pre- and post- diagnosis serum specimens available.

DTIC

Antibodies; Disorders; Mental Health; Military Personnel; Risk; Schizophrenia

20080036418 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Damage Control Resuscitation: A New Paradigm for Fluid Resuscitation of Severely Injured Soldiers

Dubick, Michael A; Sondeen, Jill L; Kheirabadi, Bijan S; Delgado, Angel V; Holcomb, John B; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481805; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481805>

Recent studies have demonstrated that bleeding disorders are common in the most severely injured trauma patients on admission to the hospital, highlighting the importance of treating this coagulopathy at the earliest stage possible. The concept of damage control resuscitation, which includes hypotensive and hemostatic resuscitation components, was introduced as a new approach to treat these patients at the highest risk of dying. Research studies are being conducted in both experimental animals and with human blood to evaluate different aspects of damage control resuscitation (DCR). Swine models of severe

hemorrhage that mimics an uncontrolled hemorrhage have been performed in both anesthetized and sedated pigs (n=8-10/gp) to evaluate short term (3 hr) and long term (72 hr) responses to hypotensive fluid resuscitation with lactated Ringer's, Hextend or fresh whole blood to a systolic blood pressure of 80 mmHg. Human blood was evaluated in vitro to determine the activity of recombinant activated factor VII (rFVIIa), a major adjunct in the DCR guidelines under conditions of hemodilution and hypothermia. The results of the swine studies indicated that whole blood may be best, but where its use is limited by logistic constraints, Hextend should be useful for maintaining a casualty up to a few hours. In addition, in vitro data with rFVIIa suggest that it may be a beneficial adjunct promoting hemostasis in cold, coagulopathic trauma patients, such as those seen at the combat support hospital (CSH), without the need to correct the patient's body temperature prior to the treatment. In addition rFVIIa should also be effective at levels of hemodilution expected in surviving casualties.

DTIC

Blood; Blood Coagulation; Damage; Hemorrhages; Injuries; Resuscitation

20080036419 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Inspiratory Resistance Maintains Arterial Pressure During Central Hypovolemia: Implications For Treatment Of Combat Casualties With Severe Hemorrhage

Convertino, Victor A; Ryan, Kathy L; Richards, Caroline A; Holcomb, John B; Cooke, William H; Idris, Ahamed H; Metzger, Anja; Lurie, Keith G; Adams, Bruce D; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481806; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481806>

Loss of consciousness due to central hypovolemia can occur due to sudden cardiovascular decompensation in normal individuals or hypovolemic shock in wounded patients. A variety of devices have been developed to sustain perfusion to the brain including anti-G suits worn by pilots and returning astronauts and applied to patients as shock trousers. However, all countermeasures developed to date suffer from problems that limit their utility in the field. An impedance threshold device (ITD) has recently been developed that acutely increases central blood volume by forcing the thoracic muscles to develop increased negative pressure, thus drawing venous blood from extrathoracic cavities into the heart and lungs. We review here a series of experiments that demonstrate the application of the ITD to a variety of experimental conditions, including its use to: (a) increase heart rate, stroke volume, and arterial blood pressure in normovolemia and hypovolemia; (b) increase cerebral blood flow velocity; (c) reset cardiac baroreflex function to a higher operating range for blood pressure; (d) lower intracranial pressure; and (e) reduce orthostatic symptoms. In this brief review, we present evidence that supports further consideration of using inspiratory resistance as a countermeasure against circulatory collapse associated with orthostatic instability and hemorrhagic shock.

DTIC

Arteries; Blood Pressure; Cardiovascular System; Casualties; Combat; Heart Rate; Hemorrhages; Hypovolemia; Injuries; Shock (Physiology)

20080036420 Walter Reed Army Inst. of Research, Silver Spring, MD USA

Leukodepletion Filters for Prevention of Transfusion Transmission Of Leishmania

Cardo, Lisa J; Salata, Jeanne; Harman, Ronald; Mendez, Juan; Weina, Peter J; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481808; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481808>

BACKGROUND: Leishmania is an intracellular parasite of monocytes transmissible by transfusion. The feasibility of reducing Leishmania with leukodepletion filters was studied. At collection, infected blood contains the amastigote form of Leishmania within monocytes. Amastigotes cause the rupture of monocytes releasing free amastigotes that convert to promastigotes which exist extracellularly at blood storage temperatures. Leukodepletion filters were tested at various time points in this process. **STUDY DESIGN and METHODS:** Blood products were infected with Leishmania organisms then filtered: 1. using whole blood filters at collection, 2. using bedside filters after storage, and 3. to determine whether free promastigotes could be eliminated. **RESULTS:** Filtration at collection reduced Leishmania by three to four logs or to the level of detection. Filtration of infected packed red cells after two weeks of storage showed a reduction of Leishmania by four logs. Filtration resulted in a six to eight log reduction in promastigotes in either the presence or in the absence of white cells within the filter. **CONCLUSION:** Filtration at the time of collection and after storage of Leishmania infected blood resulted in a substantial reduction of free and intracellular organisms. There is currently no donor screen for Leishmania. Until adequate

testing is developed, the use of leukodepletion filters could add to the safety of the blood supply.

DTIC

Blood; Leukocytes; Monocytes; Parasites; Prevention; Transfusion

20080036422 State Univ. of New York, Albany, NY USA

Glutamate Receptor Aptamers and ALS

Niu, Li; Jan 2008; 101 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0106

Report No.(s): AD-A481810; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481810>

Excitotoxicity is one of the leading causes for amyotrophic lateral sclerosis (ALS). Our goal was to develop a novel class of powerful aptamer-based anti-excitotoxic inhibitors against GluR2Qflip a key AMPA receptor subunit that controls the calcium permeability and mediates excitotoxicity. An aptamer is a single-stranded nucleic acid that directly inhibits a protein's function by folding into a specific tertiary structure that dictates high-affinity binding to the target protein. To date we have identified two classes of aptamers (i.e. competitive and noncompetitive aptamers) against GluR2Qflip by using a molecular biology approach called systematic evolution of ligands by exponential enrichment (SELEX). These aptamers are water soluble and have a nanomolar affinity against GluR2Qflip. Their inhibitory properties rival those of any existing small chemical inhibitors. We are continuing to work with these aptamers towards developing them into anti-excitotoxic drugs for treating patients with ALS including those Gulf War veterans suffering from ALS.

DTIC

Glutamates; Glutamic Acid

20080036423 Mount Sinai School of Medicine, New York, NY USA

Effect of COX-2 (PGE2) and IL-6 on Prostate Cancer Bone Metastases

Levine, Alice C; Feb 2, 2008; 35 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0166

Report No.(s): AD-A481811; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481811>

We hypothesized that (1) prostate cancer cells that express high levels of cyclooxygenase-2 (COX-2) and prostaglandin E2(PGE2) display enhanced bone targeting and (2) the level of expression of COX-2 and PGE2 in established bone metastases determines the overall bone response, with lower vs. higher levels inducing osteoblastic vs. osteolytic responses, respectively. We utilized two human prostate cancer cell lines (MDA-PCa-2B that expresses low levels of COX-2 and PGE2 and produces osteoblastic lesions vs. PC-3 that expresses high levels COX-2/PGE2 and induces osteolytic mets). We demonstrated that (1) low levels of PGE2 stimulate preosteoblast cell growth, differentiation and Wnt signaling (2) Forced overexpression of COX-2 in MDA-PCa-2b cells induces the Wnt antagonist DKK-1 (3) PGE2 addition to PC-3 cells stimulates Dkk-1 (4) Forced overexpression of COX-2 in MDA-PCa-2B cells inhibits preosteoblastic cell growth in co-culture and, finally, (5) Treatment with a COX-2 inhibitor reduced PC-3 metastatic lesions in vivo after intracardiac inoculation. Over the next several weeks we will analyze bone metastatic lesions to determine overall bone response in vivo from the PC-3 experiments and from tibia of mice inoculated with wild-type vs. COX-2 overexpressing MDA-PCa-2b cells. These studies confirmed our hypothesis that levels of COX-2/PGE2 expression in prostate cancer cells modulates both bone targeting and bone response.

DTIC

Bones; Cancer; Metastasis; Prostate Gland

20080036425 Texas Univ., Houston, TX USA

TSC2 Haploinsufficiency Leads to a Mutator Phenotype

Walker, Cheryl; Nov 1, 2007; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0049

Report No.(s): AD-A481813; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481813>

Tuberous Sclerosis Complex (TSC) patients develop tumors of the brain, kidney, skin and heart upon loss of either the TSC1 or TSC2 gene, and we are interested in elucidating early molecular events that contribute to loss of TSC2 and in understanding how TSC2 heterozygosity might contribute to this process. Our lab uses the Eker rat, which possesses an inactivating retroviral insertion in one Tsc2 allele (Tsc2Ek/+), as a model to better understand how Tsc2 heterozygosity

contributes to cancer susceptibility. The goal of this award was to determine whether Tsc2 haploinsufficiency generated a mutator phenotype in target tissues in vivo that possibly contributed to early events in tumorigenesis within TSC2+/- individuals and establish an in vitro model of Tsc2 haploinsufficiency. We were able to successfully establish an in vitro method of depleting Tsc2 expression, and we are performing experiments to analyze mutation frequency and spectra in vitro in the presence or absence of Tsc2 expression. In addition, our preliminary results indicate that rats heterozygous for Tsc2 have a higher mutation frequency in vivo as they age compared to wild-type rats.

DTIC

Mutations; Phenotype

20080036427 Brigham and Women's Hospital, Boston, MA USA

Application of Nanotechnology in the Targeted Release of Anticancer Drugs in Ovarian Cancer Treatment

Feltmate, Colleen; Dec 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0177

Report No.(s): AD-A481815; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481815>

As a pilot study to localize the MagNaGel nanoparticles in an orthotopic ovarian cancer mouse model by MRI, mice were injected intraperitoneally with ovarian cancer cells. Tumor growth was monitored by a 4.7T small animal MRI. Once tumor and ascites developed in the mice, cisplatin-loaded MagNagel particles with 10.0 nm IO core (no targeting ligand) were injected into the tail-vein of the cancer bearing mice. After set time periods, MRI was performed on the mice. Organs were harvested and drug levels determined. Relative nanoparticle distribution by MRI images were correlated with drug levels.

DTIC

Cancer; Chemotherapy; Drugs; Nanotechnology; Ovaries

20080036429 Vanderbilt Univ., Nashville, TN USA

Biodegradable Poly (Ester Urethane) Urea Biomaterials For Applications in Combat Casualty Care

Guelcher, S A; Srinivasan, A; Hollinger, J O; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481817; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481817>

A family of biocompatible, biodegradable poly(ester urethane)urea (PEUUR) biomaterials has been developed that degrade to non-toxic by-products and support the attachment and proliferation of cells. These two component materials are synthesized by reactive liquid molding, thus rendering them suitable for injection or casting into molds to form a desired shape. The clinical goal is to develop biologically active cast and injectable PEUUR biomaterials that promote bone wound healing and decrease the incidence of nonunions and infection.

DTIC

Biodegradability; Biodegradation; Casualties; Combat; Esters; Infectious Diseases; Medical Services; Military Operations; Ureas; Urethanes

20080036430 Army Medical Center, Fort Gordon, GA USA

Effectiveness of Halogen-Based Disinfectants Against Acinetobacter Baumannii: Wound Care and Environmental Decontamination

McPherson, III, James C; Yacoub, Ator; Runner, Royce R; Buxton, Thomas B; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481818; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481818>

Historically, Acinetobacter baumannii has not been considered an important human pathogen. However, a surprisingly high number of multidrug-resistant A. baumannii war wound, bloodstream and osteomyelitis infections are occurring in American soldiers injured in Iraq/Kuwait (Operation Iraqi Freedom) and in Afghanistan (Operation Enduring Freedom). Thermal projectiles, (e.g., shrapnel, projectile injuries, or traumatic blast) carry the bacterium directly into combat wounds. Because of its resistance to multiple antibiotics, A. baumannii is emerging as an important pathogen among combat casualty victims and has become a significant clinical disease. With the number of A. baumannii infections rapidly rising, added to A. baumannii's well-established resistance to multiple antibiotics, underscores the relevance for identifying the most excellent disinfectants for reducing A. baumannii populations in combat wounds and combat health care settings. We compared the bacteriostatic and bactericidal activities of five commercially available U.S. halogenbased disinfectants against A. baumannii,

along with a standard E. coli comparator, in a novel bacterial culture system that incorporated a three log range of organic growth media concentrations. We report the highest dilutions of stock disinfectant able to inhibit replication or kill the bacteria, denoted as the maximum inhibitory dilution (MID) and maximum bactericidal dilution (MBD), respectively.

DTIC

Antiseptics; Decontamination; Diseases; Halogens; Infectious Diseases; Musculoskeletal System; Pathogenesis

20080036441 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Design and Engineering of a Multi-Target (Multiplex) DNA Simulant to Evaluate Nucleic Acid Based Assays for Detection of Biological Threat Agents

Carrera, Monica; Sagripanti, Jose-Luis; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481840; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481840>

We designed and engineered a non-infectious Bio-threat simulant that included the nucleic acid signature of Bacillus anthracis, Yersinia pestis, Coxiella Burneti, Brucella sp., Francisella tularensis, Enterohemorrhagic E. coli, O157:H7, Burkholderia mallei, Burkholderia pseudomallei and Variola virus (smallpox virus). A chimera of 2040 bp was engineered to produce PCR amplicons of different sizes in a single Multiplex reaction designed for the rapid identification of the threat agents selected above.

DTIC

Assaying; Bacteria; Biological Weapons; Deoxyribonucleic Acid; Multiplexing; Simulation; Targets

20080036446 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Fluoride Ion Regeneration of Cyclosarin (GF) From Minipig Tissue and Fluids Following Whole Body GF Vapor Exposure

Jakubowski, Edward M; McGuire, Jeffery M; Evans, Ronald A; Hulet, Stanley W; Mioduszewski, Robert J; Thomson, Sandra A; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481857; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481857>

Recent developments to improve nerve agent biomarker techniques include methods for measuring fluoride regenerated Sarin (GB) in blood and tissue. Our efforts extend the fluoride ion regeneration method to be able to determine cyclosarin (GF) in red blood cells, plasma, and tissue of minipig blood samples after whole body exposure to GF at miosis levels. Blood samples were taken serially before, during, and after whole body GF exposure from the minipig via venous catheter allowing agent exposure profiles to be generated. After processing the samples with fluoride ion and extracting with C-18 solid phase extraction cartridges the ethyl acetate extract was analyzed by GC/MS. The GC/MS method utilized an autoinjector, a large volume injector port (LVI), positive ion ammonia chemical ionization detection in the SIM mode, and a 2H11-GF stable isotope internal standard. Results indicated that the method range was 10-1000 pg on column. The detection limit was 3 pg of GF on column despite the complexity of the red blood cell/tissue matrix. Conditions that needed to be optimized for the LVI included injection volume, initial temperature, pressure, and flow rate. The regenerated GF (R-GF) profiles differ greatly from the regenerated GB (R-GB) profiles in the minipig at similar exposure levels. The onset of the appearance of R-GF in the blood seems to be delayed and maximum levels are reached at much later times as compared to GB exposures. The rate of R-GB production was 5- 10 times greater than that of R-GF at equimolar exposures.

DTIC

Exposure; Fluorides; Vapors

20080036449 Minnesota Univ., Austin, MN USA

Role of Obesity in Prostate Cancer Development

Cleary, Margot P; Mar 2008; 20 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0292

Report No.(s): AD-A481862; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481862>

Prospective epidemiological studies indicate that obesity increases the risk for prostate cancer. Also, mortality from prostate cancer is increased with elevated body weights and obesity recently was reported to be associated with higher prostate cancer grade at diagnosis and with higher recurrence rates. However, it is difficult in human studies to adequately assess effects of body weight or the effect of body weight change at specific ages on prostate cancer. Here we used the TRAMP mouse model

of prostate cancer and induced obesity by injections of gold-thioglucose (GTG) at either 6, 16 or 26 weeks of age. Mice were followed until 46 weeks of age. Overall GTG led to a high death rate and obesity did not appear to negatively impact prostate cancer development or metastases. Tissue and serum analyses are now underway to evaluate adiponectin and leptin pathways. Additionally, we have initiated a study using mice with diet-induced obesity to assess the effect of body weight on tumor progression from TRAMP-C2 cells which were derived from a TRAMP prostate tumor. Presently tumor growth is being monitored.

DTIC

Cancer; Obesity; Prostate Gland

20080036453 Oregon State Univ., Corvallis, OR USA

Prostate Cancer Prevention by Sulforaphane, a Novel Dietary Histone Deacetylase Inhibitor

Zhen, Yu; Jan 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0056

Report No.(s): AD-A481867; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481867>

Prostate cancer is the second leading cause of cancer related death in men. To test Sulforaphane (SFN) as a novel histone deacetylases (HDAC) inhibitor and explore the mechanism of SFN protection against prostate cancer, different stage of prostate cancerous cells were treated with 15µM or 30 µM SFN and harvest 48hr later for MTT assay, HDAC activity and western blot assay. MTT cell proliferation showed that SFN and its metabolites inhibited PC3 prostate cancerous cell growth. SFN also inhibited HDAC activity in prostate cancerous cell alone but not normal cells. SFN selectively induced cell cycle arrest in prostate cancer cells, but not normal prostate cells. SFN treatment reduced the HDAC1 and HDAC3 protein level in PC3 cells and increased the acetylated histone H4. All the study showed that SFN is a HDAC inhibitor and protected against cancer development through epigenetic alteration in prostate cancer cells.

DTIC

Cancer; Diets; Inhibitors; Prevention; Prostate Gland

20080036459 Saint Jude Children's Research Hospital, Memphis, TN USA

Novel Small Molecule Antagonists of the Interaction of the Androgen Receptor and Transcriptional Co-regulators

Feau, Clementine; Jan 31, 2008; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0073

Report No.(s): AD-A481881; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481881>

Androgens, mediated by the Androgen Receptor (AR), play a crucial role in prostate cancer. Current treatments include antiandrogens competing with natural androgens and antagonize AR transcriptional activity. Although widely used, antiandrogens have shown significant side effects. Regulation of gene expression by AR requires the binding to its natural ligand, dihydrotestosterone (DHT), and assembly of coregulatory proteins (CoR). The blockage of the interaction between DHT-liganded AR and CoR by small molecules has been shown to inhibit gene transcription. Targeting this interaction might be a relevant way to regulate prostate cancer proliferation. Preliminary data revealed that flufenamic acid (FLF) binds to AR and inhibit the recruitment of CoR. We have synthesized a series of FLF analogs, evaluated their solubility, cell permeability and cytotoxicity profiles. We report the biochemical activity of these compounds towards their ability to block CoR binding. In cell based assays, we show the bioactivity of these inhibitors at a gene transcription level. Thus, we provide the first class of small molecules able to inhibit AR transcription activity. Additionally, we optimized an AR scintillation proximity (SPA) competition ligand binding assay. We showed that this assay can be used to measure ligand affinities for a range of nuclear receptors.

DTIC

Cancer; Hormones; Males; Prostate Gland; Regulators

20080036462 Massachusetts Univ. Medical Center, Worcester, MA USA

Prostate Cancer Cell Growth: Stimulatory Role of Neurotensin And Mechanism of Inhibition by Flavonoids as Related to Protein Kinase C

Carraway, Robert E; Jan 31, 2008; 88 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0242

Report No.(s): AD-A481884; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481884>

The purpose is to define the relationship between neurotensin (NT) and protein kinase C (PKC) isoforms and to investigate

the mechanism by which flavonoids (FLAV) inhibit NT growth signaling in PC3 cells. The long-range scope is to determine the significance of NT in the negative effects of high fat intake on PC incidence and the positive effects of diets containing FLAV. Our results show that NT-induced growth signaling involves and requires activation of several PKC isotypes (most notably PKC epsilon and delta) that arachidonic acid metabolism and EGF receptor activation participate in the NT signaling process that cell metabolism and ATP levels can influence NT receptor function and that activated PKC (most notably PKC alpha and beta) can feed back to regulate the ability of NT receptor to bind NT and to initiate signaling. FLAV was found to exert differential effects on PKC isotype activation and downregulation. Thus FLAV could alter the balance between conventional and novel PKC activity which could influence growth responses to NT. These findings have implications regarding mechanisms that regulate NT receptor function and the design of agents to block NT-induced growth signaling in PC.

DTIC

Antioxidants; Cancer; Intestines; Metabolism; Neurotransmitters; Prostate Gland; Proteins

20080036464 Texas Univ., Houston, TX USA

Cell Cycle Dependence of TRAIL Sensitivity in Prostate Cancer Cells

McConkey, David J; Nov 2007; 50 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0059

Report No.(s): AD-A481900; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481900>

The proteasome inhibitor bortezomib (PS-341, Velcade) synergizes with tumor necrosis factor-related apoptosis-inducing ligand (TRAIL) acts via a p21- dependent mechanism to induce high levels of apoptosis in prostate cancer cells. Our further investigation into the molecular mechanisms underlying the effects of bortezomib implicated endoplasmic reticular (ER) stress in its anti-tumoral effects. These effects also provide us with a molecular mechanism to explain the observed anti-angiogenic effects of bortezomib in prostate cancer cells. We have generated luciferase-transduced variants of our human prostate cancer cell lines in order to use them to generate orthotopic tumors in nude mice that can be imaged non-invasively. We plan to use these models in the coming 6-12 months to test the toxicity and anti-tumoral efficacy of combination therapy with bortezomib plus anti-DR5 antibodies in vivo. Preliminary toxicity studies confirmed that mice tolerate daily therapy with recombinant TRAIL plus biweekly therapy with bortezomib (at its MTD) very well.

DTIC

Cancer; Prostate Gland; Sensitivity

20080036466 Mount Sinai Hospital, Toronto, Ontario Canada

Genetic and Molecular Analysis of the Mechanisms by which TSC regulates Neuronal Differentiation

McNeill, Helen; Feb 2008; 61 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0154

Report No.(s): AD-A481905; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481905>

We have shown that TSC plays a key role in controlling the timing of neuronal differentiation in *Drosophila* through the conserved insulin receptor (InR)/Tor kinase signaling pathway (Bateman & McNeill, 2004). The goal of our current research is to determine the mechanism by which TSC regulates the timing of neuronal differentiation. To uncover the pathway(s) downstream of TSC in the temporal control of neuronal differentiation we are taking complementary approaches. 1) Analysis of minimal regions of neuronal promoters responsive to TSC. 2) Identification and analysis of genes regulated by TSC to control neural differentiation. We find that InR/TSC signaling regulates the transcription and phosphorylation state of the ETS transcription factor, Pointed P2. We define a 2.5kb region of the ELAV neuronal enhancer region that responds to TSC. We have further used transgenic RNAi analysis in vivo to test if candidate genes that are regulated by TSC in a screen of S2 cells have a role in the regulation of neuronal differentiation in vivo, and have identified candidate genes that regulate neuronal differentiation timing in vivo.

DTIC

Genetics; Nervous System; Neurophysiology

20080036468 Massachusetts Inst. of Tech., Cambridge, MA USA

Development of Novel Bifunctional Compounds that Induce Apoptosis in Prostate Cancer Cells

Essigmann, John M; Croy, Robert G; Mar 1, 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0183

Report No.(s): AD-A481907; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481907>

We have designed and synthesized a novel compound (11 beta) that efficiently triggers apoptosis in prostate cancer cells such as LNCaP. This bifunctional compound was designed to form DNA adducts that are camouflaged by the androgen receptor making them less readily repaired in AR+ prostate cancer cells. The aims of our studies are to investigate the mechanisms by which 11 beta is able to trigger apoptosis in target cells. Methods have been developed that permit us to determine the fates of 11 beta-DNA adducts in treated cells in culture as well as in tumors growing in animal models. Another objective is to identify the signaling events that lead from DNA adducts to activation of the apoptotic program. Finally we have obtained encouraging results from animal experiments that indicate that molecules such as 11 beta may have clinical potential for the treatment of human tumors.

DTIC

Apoptosis; Cancer; Prostate Gland

20080036473 California Univ., Los Angeles, CA USA

Combining Radiotherapy and Immunotherapy to Target Surviving in Prostate Cancer

Schaue, Dorthe; Jan 2008; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0114

Report No.(s): AD-A481920; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481920>

Here, we propose to harness the immune system by immunotherapy (IT) alongside conventional radiotherapy (RT) to improve the treatment of men with advanced or recurrent prostate cancer. The overall aim is to determine whether local irradiation of prostate tumors in a preclinical and clinical setting leads to measurable tumor-specific immune responses and whether tumor vaccination can boost these immune responses possibly leading to better tumor control. Survivin is our tumor antigen of choice because it seems superior to other prostate tumor antigens. We generated stable mouse prostate cancer cell lines (TRAMP C1 and TRAMP C2) that express human HLA-A2.1 and we were able to confirm that these cells express survivin. These are two important steps as this will allow us to examine the responses to human surviving epitopes that are clinically relevant within a transgenic humanized mouse model. Enumeration of circulating survivin-specific CD8+ T lymphocytes in prostate cancer patients using tetramers indicated that many patients have higher than normal numbers of these T cells and that they are increased further upon completion of radiation treatment. Whether or not this is due to increase in antigenic peptide liberation and whether this will translate to tumor regression we don't know. What is clear is that RT does not induce immune tolerance to surviving making IT approaches feasible in combination with RT.

DTIC

Antigens; Cancer; Prostate Gland; Radiation Therapy; Targets

20080036476 Beth Israel Deaconess Medical Center, Boston, MA USA

Structural Basis for TSC-1 TSC-2 Complex Formation

Ladias, John A; Mar 1, 2008; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0178

Report No.(s): AD-A481926; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481926>

Tuberous sclerosis complex (TSC) is a neurological disorder characterized by the formation of hamartomas in brain skin kidney and other organs. The tumor suppressor genes TSC1 and TSC2 encode the proteins hamartin and tuberin respectively. The tuberin(1-418) region interacts with hamartin(302-430) forming the TSC1-TSC2 complex that functions in cell growth regulation. Certain mutations in TSC patients disrupt the hamartin-tuberin interaction indicating that association of these proteins is required for their growth suppressing function. However the mechanisms underlying their interaction are poorly understood because their three-dimensional structures are not known. To obtain structural insights into the hamartin-tuberin interaction the hamartin(302-430) and tuberin(11-418) domains were expressed in Escherichia coli cells and purified to homogeneity. Attempts to crystallize the isolated hamartin(302-430) and tuberin(11-418) domains yielded small crystals

whereas the hamartin-tuberin heterodimer did not produce crystals. Experiments are in progress to produce diffraction quality crystals of these proteins and determine their structures.

DTIC

Genes; Mutations; Neoplasms; Neurology; Proteins

20080036486 California Univ., Santa Barbara, CA USA

Stochastic Modeling Of Biochemical Reactions

Singh, Abhyudai; Hespanha, Joao P; Nov 2006; 8 pp.; In English

Contract(s)/Grant(s): DAAD19-03-D-0004

Report No.(s): AD-A481948; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481948>

The most common theoretical approach to model the interactions in a biochemical process is through chemical reactions. Often for these reactions, the dynamics of the first M-order statistical moments of the species populations do not form a closed system of differential equations, in the sense that the time-derivatives of first M-order moments generally depend on moments of order higher than M. However, for analysis purposes, these dynamics are often made to be closed by approximating the needed derivatives of the first M-order moments by nonlinear functions of the same moments. These functions are called the moment closure functions. This paper presents a systematic procedure to construct these moment closure functions. This is done by first assuming that they exhibit a certain separable form, and then matching time derivatives of the exact (not closed) moment equations with that of the approximate (closed) equations for some initial time and set of initial conditions. Using these results a stochastic model for gene expression is investigated. We show that in gene expression mechanisms, in which a protein inhibits its own transcription, the resulting negative feedback reduces stochastic variations in the protein populations.

DTIC

Biochemistry; Chemical Reactions; Mathematical Models; Stochastic Processes

20080036488 Special Operations Command (Army), Fort Bragg, NC USA

Global Scouts

Wagner, Robert W; Hall, Michael T; Nov 2006; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481955; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481955>

One result of the Battle of Mogadishu, 3-4 October 1993, in which 18 American soldiers died and 73 were wounded, was the development and implementation of Tactical Combat Casualty Care (TCCC) Guidelines. The TCCC has 3 phases of care _ under fire, tactical field care after cessation of hostile fire, and evacuation. The briefing provides an overview of the TCCC and its future development.

DTIC

Emergencies; Medical Services; Military Operations; Military Personnel

20080036569 Brandeis Univ., Waltham, MA USA

Networks in Neuroscience: The Problem of Stability in the Face of Constant Change

Marder, Eve; Nov 2006; 15 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481978; No Copyright; Avail.: Defense Technical Information Center (DTIC)

NETWORKS IN NEUROSCIENCE: (1) Every individual neuron contains complex networks of interacting biochemical and molecular processes. (2) The nervous system consists of networks of networks. NEUROSCIENTISTS ATTEMPT TO: (1) Determine how functions are localized in neuronal circuits; (2) Determine the properties of the synaptic wiring and excitability of individual neurons that constitute a network; (3) Explain how network performance arises from the interactions of the components.

DTIC

Molecular Biology; Networks; Neurology; Stability

20080036580 Maryland Univ., Baltimore, MD USA

Molecular Targets for Organophosphates in the Central Nervous System

Albuquerque, Edson X; Apr 2006; 102 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-95-C-5063

Report No.(s): AD-A482005; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project was a major effort to determine the effects of low-level exposure to the nerve agents sarin, soman, and VX

in the mammalian CNS. Actions on synaptic transmission and neuronal cell death were assessed. Studies gave us clues to the mechanism of action of the agents, particularly in regard to cognitive function in humans that could be exposed to nerve agents in a chemical warfare attack. Reversible cholinesterase (ChE) inhibitors were tested for their ability to counteract nerve agent effects. Galantamine, a reversible ChE inhibitor with nicotinic allosteric potentiating actions currently used to treat mild to moderate Alzheimer's disease, was found to be effective in counteracting nerve agent toxicity. In vitro studies were therefore employed to determine the mechanism of action of galantamine. In vivo studies in guinea pigs were ultimately begun to assess the effectiveness of a pre- and/or post-treatment regimen of galantamine in protecting against multiple LD50 challenges with nerve agents. We compared the effectiveness of pre- and post-treatment with galantamine with other reversible ChE inhibitors in preventing lethality of the nerve agents and examined potential mechanisms underlying the effectiveness of the best treatment.

DTIC

Central Nervous System; Nerves; Organic Phosphorus Compounds; Targets

20080036592 Catholic Healthcare West, Phoenix, AZ USA

Studies of Kinesins and Axonal Transport in a Mouse Model of NF1

Narayanan, Vinodh; Mar 2008; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0239

Report No.(s): AD-A482036; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this research project, we investigated the hypothesis that mutation of the NF1 gene might alter axonal and dendritic transport in neurons. This might provide new insights into the development of cognitive defects in patients with neurofibromatosis 1. The significant results of this pilot research project are all derived from functional studies done by sciatic nerve ligation in wild-type and Nf1-/+ mice. After nerve ligation, proximal and distal segments of the sciatic nerve were homogenized, and analyzed for content of tubulin and synaptic proteins by Western blot and immunohistochemistry. Our results support the idea that there is a quantitative decrease in the accumulation of synaptic proteins immediately proximal to the site of nerve ligation in the Nf-/+ nerve, as compared to wild-type nerves. This supports the idea that Nf1 gene mutation does indeed result in a quantitative defect in axonal transport in the peripheral nervous system. We are preparing to see if there is a similar deficiency in the rate of axonal transport in the central nervous system (CNS) as well. Once we can confirm these findings in the CNS, then we shall embark on a series of experiments that address the molecular mechanisms by which axonal transport is affected in the Nf1-/+ mice.

DTIC

Axons; Cells (Biology); Central Nervous System; Genes; Mice; Nerves; Nervous System; Peripheral Nervous System

20080036602 General Accounting Office, Washington, DC USA

DOD Health Care: Mental Health and Traumatic Brain Injury Screening Efforts Implemented, but Consistent Pre-Deployment Medical Record Review Policies Needed

Bascetta, Cynthia A; Mann, Marcia; Anderson, Eric; Friday, Krister; Fritz, Lori; Griffin, Adrienne; Pusey, Amanda; Smith, Jessica C; May 2008; 49 pp.; In English

Report No.(s): AD-A482072; GAO-08-615; No Copyright; Avail.: Defense Technical Information Center (DTIC)

DOD has taken steps to implement mental health standards for deployment and screen service members for mental health conditions prior to deployment, but policies for providers to review medical records are inconsistent. To meet the requirements related to deployment mental health standards and screening, DOD issued a November 2006 policy to establish and implement minimum mental health standards for deployment. The policy identified the pre-deployment health assessment as a mechanism for screening service members for mental health conditions and for ensuring that the standards are utilized in making deployment determinations. The policy also required a review of service member medical records as part of this assessment. Such a review serves to validate information service members disclose about their mental health. However, DOD's August 2006 Instruction on Deployment Health (DoDI 6490.03), which implements policy and prescribes procedures for deployment health activities, is silent on whether a review of medical records is required as part of the pre-deployment health assessment. During our site visits to three installations, we found that health care providers were unaware that a medical record review was required, and medical records were not always reviewed by providers conducting the pre-deployment health assessment. Because of DODs inconsistent policies, providers determining if OEF and OIF service members meet DODs minimum mental health standards for deployment may not have complete medical information.

DTIC

Brain; Brain Damage; Deployment; Health; Injuries; Medical Services; Mental Health; Policies

20080036607 Pennsylvania Univ., Philadelphia, PA USA

Revealing the Functions of Tenascin-C in 3-D Breast Cancer Models Using Cell Biological and in Silico Approaches

Taraseviciute, Agne; Mar 2008; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0315

Report No.(s): AD-A482088; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The extracellular matrix (ECM) glycoprotein tenascin-C (TN-C) is induced in the breast stroma, where it is associated with both breast cancer development and progression, yet its role in this disease remains obscure. To investigate the effects of stromal TN-C on normal human mammary epithelium, we cultured MCF-10A cells in a three-dimensional (3-D) reconstituted basement membrane (Matrigel), either with or without exogenous TN-C. Whereas control cells formed polarized acinar structures, complete with a continuous basement membrane and a central lumen (resulting from site-specific apoptosis), exposure to TN-C provoked selective loss of basement membrane and increased epithelial cell proliferation, without affecting apoptosis. To determine how these changes alter mammary epithelial tissue structure and function, an image analysis algorithm was developed to generate 3-D renditions of mammary acini, which were then used to assess and quantify acinar topography and volume. Although TN-C increased acinar surface roughness, it had no effect on volume. Based on these results, we hypothesized that TN-C promotes epithelial cell proliferation within the lumens of the acini, and that this process might involve c-met, a receptor tyrosine kinase which is over-expressed in breast tumors, where it is believed to affect both lumen formation and cell proliferation. Indeed, TN-C-treated acini contained filled lumens and expressed higher levels of c-met than controls. Furthermore, blockade of c-met resulted in reversion of the TN-C acinar phenotype, complete with restoration of acinar architecture, lumen formation and a decrease in proliferation that approached levels similar to those observed in controls. Importantly, human breast cancers enveloped by a TN-C-rich stroma expressed high levels of epithelial c-met when compared to normal tissue.

DTIC

Breast; Cancer; Mammary Glands; Silicon; Three Dimensional Models

20080036608 Pennsylvania Univ., Philadelphia, PA USA

Notch Signaling and Schwann Cell Transformation: Development of a Model System and Application to Human MPNSTs

Kadesch, Tom; Mar 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0209

Report No.(s): AD-A482091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This is an annual report that presents data obtained during the grant's third year of funding. The grant addresses the potential role of Notch signaling in the malignant transformation of neurofibromas to MPNSTs in patients with NF1. Our previous work has shown that constitutive expression of Notch can transform rat Schwann cells and that at least on MPNST-derived human Schwann cell line (of three examined) signals via Notch. This report includes novel results pertaining to two Tasks of the Statement of Work, including our observations 1) that the Notch targets Hes5 and c-Myc alone are unable to mimic the constitutive form of Notch, NICD, to effect transformation and 2) that NICD is NOT sufficient to transform primary Schwann cells. This latter observation is in stark disagreement with our earlier results. Accordingly, we have added a new Task that will address this discrepancy and elucidate cells.

DTIC

Cancer; Lymphocytes; Models; Notches

20080036615 Wake Forest Univ., Winston-Salem, NC USA

Tissue Engineering and Regenerative Medicine

Atala, Anthony; Nov 2006; 84 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482108; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During combat, blunt penetrating and blast injuries may lead to soft and solid tissue and organ damage. In turn, trauma and its subsequent infection and inflammation all lead to tissue loss. The challenge is to replace those tissues and organs. To this end, regenerative medicine brings together the areas of biosurgery, cell therapies, tissue engineering and artificial and biohybrid organs. Wake Forest Institute for Regenerative Medicine conducts research in the areas of growth factor biology, cell differentiation, molecular mechanisms, and cell-matrix interactions.

DTIC

Bioengineering; Tissue Engineering

20080036619 Silent Spring Inst., Inc., Newton , MA USA

Development of a Biosensor for Identifying Novel Endocrine-Disrupting Chemicals

Standley, Laurel J; Feb 2008; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0621

Report No.(s): AD-A482119; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Substantial evidence indicates that endocrine disrupting chemicals (EDCs) particularly those that interact with the estrogen receptor may play a role in reproduction and hormonal cancers in humans and animals. EDCs can mimic or alter the action of the endogenous hormones, which have been shown to affect the reproductive and endocrine systems of mammals and reptiles. EDCs are found in food, water, air, and consumer products and originate from pharmaceutical, industrial, agricultural, and natural sources. Most chemicals in commerce, and their environmental degradation products, have not been screened to identify EDCs. We have investigated a novel technology an estrogen-receptor quartz crystal microbalance (ER-QCM) biosensor to break through this barrier in identifying EDCs. The ER-QCM detects estrogenic substances using a genetically engineered construct of the hormone-binding domain of the estrogen receptor immobilized to a piezoelectric quartz crystal. The ER-QCM detects the presence of ligands that are known to bind the ER and shows no response for non-binding substances such as testosterone and progesterone. Our ultimate goal is to develop the ER-QCM biosensor as a robust tool for identifying estrogenic activity in complex environmental mixtures and to combine the biosensor with other biophysical methods in order to identify novel estrogenic chemicals in a number of environmental matrices. Experiments were done to determine the viability of ER-QCM for this novel purpose.

DTIC

Bioinstrumentation; Disrupting; Endocrine Glands; Endocrinology; Estrogens; Hormones; Identifying

20080036620 Alabama Univ., Birmingham, AL USA

A Targeted Multifunctional Platform for Imaging and Treatment of Breast Cancer and Its Metastases Based on Adenoviral Vectors and Magnetic Nanoparticles

Everts, Maaik; Feb 2008; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0630

Report No.(s): AD-A482120; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nanotechnology holds many promises for the imaging and treatment of breast cancer. In particular, magnetic nanoparticles can be utilized for tumor imaging via magnetic resonance imaging (MRI) techniques and tumor treatment by heating after exposure to an alternating magnetic field. However, selective targeting of the nanoparticles to the tumor cells needs to be accomplished before the imaging or therapy can be successful. In this respect, adenoviral (Ad) vectors for gene therapy have made great progress in achieving successful tumor targeting after their intravenous administration. We therefore hypothesized that coupling magnetic nanoparticles to targeted Ad vectors would allow the selective localization of these particles to the tumor, thereby making imaging and therapy possible. We herein identified that coupling gold nanoparticles to the Ad capsid protein hexon does not perturb vector infectivity or retargeting efficiency in vitro. Furthermore, we identified that available magnetic nanoparticles did not provide enough contrast to be suitable for Ad-mediated delivery and subsequent MRI. We therefore pursued the coupling of quantum dots (QDs) as an alternative imaging-method, and demonstrated that Ad vectors can deliver these intracellularly in breast cancer cells. However, QDs abrogated transgene expression of the Ad vectors by reasons not related to size or coupling chemistry. Future research will aim at identifying the reasons for transgene abrogation.

DTIC

Adenoviruses; Breast; Cancer; Diseases; Imaging Techniques; Magnetic Resonance; Mammary Glands; Medical Services; Metastasis; Nanoparticles

20080036621 Virginia Univ., Charlottesville, VA USA

S-Nitrosylation and the Development of Pulmonary Hypertension

Palmer, Lisa A; Feb 2008; 26 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0134

Report No.(s): AD-A482123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Nitric oxide (NO) transfer reactions between protein and peptide cystines are thought to represent a regulated signaling process. In the current studies, N-acetyl cysteine (NAC) was used as a bait reactant to measure NO transfer reactions in the blood and the vascular effects of these reactions in the pulmonary vasculature. In blood, NAC was converted to S-nitroso-N acetyl cysteine (SNOAC) both in vivo and ex vivo. Ex vivo, SNOAC formation was found to be dependent on oxyhemoglobin desaturation. The formation of SNOAC was found to be a relatively slow ($K \sim 5.3 \times 10^{-10}$ M/s) pseudo-first order reaction.

Physiologically, chronic administration of NAC resulted in the development of pulmonary hypertension that was indistinguishable from that caused by chronic hypoxia. Male endothelial nitric oxide synthase (eNOS) mice were protected from the effects of NAC but not SNOAC, demonstrating the importance of eNOS in this process. NAC was also found to increase the DNA binding activity of the transcription factor hypoxia inducible factor-1 (HIF-1). This appears to be due, in part, by altering the interaction between HIF-1 and protein von Hippel Lindau via S-nitrosylation of cysteine 162. Together the data suggest that erythrocytic oxygen desaturation signals hypoxia through NO transfer reactions in vivo.

DTIC

Blood Vessels; Cardiovascular System; Hypertension; In Vivo Methods and Tests; Nitric Oxide

20080036623 Arizona Univ., Tucson, AZ USA

A Chemoprevention Trial to Study the Effects of High Tea Consumption on Smoking-Related Oxidative Stress

Hakim, Iman A; Feb 2008; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0053

Report No.(s): AD-A482127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our overall goal is to develop a safe and feasible model for the chemoprevention of a wide range of tobacco-related diseases. Our immediate goal that is addressed over a 5-year study period is to determine the effects of high tea consumption on biological markers of oxidative stress that mediate lung cancer risk. We are conducting a 6-month randomized controlled double-blinded chemopreventive trial in a group of COPD subjects who are being randomized to green or black tea preparations or a control intervention (matching placebo). Levels of 8-hydroxydeoxyguanosine and 8-F2-isoprostanes are used to measure DNA and lipid damage respectively. Changes in biomarkers of oxidative damage are being measured in urine blood and exhaled breath condensate. The study protocol was approved by all parties in September 2003. Recruitment and screening of participants for eligibility criteria started in October 2003. Total recruitment was completed in December 2007. A total of 154 participants completed the study. Laboratory analyses (urine blood and sputum) for the last cohort of participants is ongoing along with data entry. We expect to complete all the laboratory analyses by June 2008 and the data analyses and final report and manuscript preparation will be completed by December 2008.

DTIC

Sicknesses; Smoke; Tea Lasers; Tobacco

20080036629 State Univ. of New York, Buffalo, NY USA

Postdoctoral Fellowship for Dr. Lindholm, Underwater Physiology and Medicine

Lundgren, Claes E; Pendergast, David R; May 2008; 26 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0076

Report No.(s): AD-A482138; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this Postdoctoral fellowship was to provide education to extend their training to embarking on an independent research. Two Postdoctoral Fellows were trained. Important safety issues of breath-holding and limitations to diver performance were studied. Two studies showed the potential for increased risk of loss of consciousness (LOC) during breath-holding when carbohydrate stores were reduced by either dietary restriction or exercise without proper replenishment of glucose and glycogen. In addition, it was shown that the risk of LOS is greater in experienced breath-hold divers due to increased CO₂ tolerance. The increased risk of LOC could be prevented by a high carbohydrate drink prior to diving. In another series of studies it was shown that there are respiratory limitations to sustained exercise performance in divers in air and during surface and at depth (120 fsw) swimming, and that these limitations could be eliminated by specific training of the respiratory muscles (RMT). RMT minimized respiratory muscle fatigue and normalized the ventilatory response to increasing CO₂ (CO₂ sensitivity) and blood CO₂ in CO₂.

DTIC

Diving (Underwater); Respiratory System; Swimming; Underwater Physiology

20080036667 Wayne State Univ., Detroit, MI USA

Eicosanoid Regulation of Prostate Cancer Progression: Disruption of Hemidesmosomes and Collaboration in Tumor Invasive Growth

Honn, Kenneth V; Mar 2006; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAMD17-03-1-0102

Report No.(s): AD-A482204; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A significant achievement in the current reporting period is our ability to immunostain both the 12-LOX protein and Beta4

integrin in paraffin- embedded prostate tumor tissues circumventing the problems described in the previous report. With the new protocol we have stained about 20 cases so far and the remaining cases are in progress. We have generated several stable transfectants of PC-3 cells expressing mutant forms of the Beta4 integrin and studied their interaction with 12-LOX. During this study we have identified that the peptide spanning between amino acids 1126 and 1315 of the cytoplasmic tail of the Beta4 integrin shows strong interaction with 12-LOX. An important observation is that the full-length cytoplasmic tail of Beta4 integrin when expressed ectopically disrupts the interaction with 12-LOX with Beta4 integrin in a dominant negative manner. This interaction also resulted in a decrease in the biosynthesis of the enzymatic product 12-HETE as well as reduction in the tumor growth rate from subcutaneously injected PC-3 cells in athymic nu/nu mice.

DTIC

Cancer; Prostate Gland; Proteins; Tumors

20080036675 Pennsylvania State Univ., Hershey, PA USA

Lipid Peroxidation, Chronic Oxidative Stress and Breast Cancer Incidence: Implications for Breast Cancer Prevention

Weisz, Judith; Jul 2007; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0449

Report No.(s): AD-A482231; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The experiments were based on the following interrelated hypotheses: a) Exposure of the mammary epithelium (ME) to chronic oxidative stress (OxS) underlies the high breast cancer (BC) incidence associated with Western industrialized environment/lifestyle and b) that there is a positive correlation between BC incidence within a population and the prevalence within that population of protein adducts of the well-documented marker of chronic OxS 4-hydroxy-2-nonenal (4HNE) that is a major breakdown product of lipid peroxidation caused by OxS. The PI had available for this research; a) archived forensic breast tissue from women without BC from two populations in SW USA with an over three-fold difference in BC incidence and; b) reduction mammoplasty specimens from women representative of the high BC incidence population served by her institution. A qualitative survey of tissue sections from 247 women from the three populations confirmed the pilot observation of a higher prevalence of 4HNE immunostaining of mammary epithelial (ME) in high BC risk populations and that 4HNE adducts are present in the ME already in many teenagers in that populations. However the marked heterogeneity in extent localization and intensity of the 4HNE immunostaining proved an obstacle to achieving the research goals by the proposed conventional semiquantitative scoring method for assessing immunostaining. Hence in order to obtain a more objective and quantitative measure of immunostaining effort was directed towards adapting to the task recently developed cytometric methods specifically; a) the application of densitometric image analysis to mammary ductal units extracted from digitized images of immunostained tissue sections and; b) multiplex immunoblotting of proteins transferred from tissue sections a method that allows for assessing levels of multiple epitopes normalized to total protein.

DTIC

Breast; Cancer; Lipids; Mammary Glands; Prevention

20080036676 Creighton Univ., Omaha, NE USA

Efficacy of Calcium and Vitamin D Supplementation for the Prevention of Stress Fractures in Female Naval Recruits

Lappe, Joan M; Sep 2007; 17 pp.; In English

Contract(s)/Grant(s): DAMD17-01-1-0807

Report No.(s): AD-A482235; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal was to determine if calcium and vitamin D supplementation can reduce the incidence of stress fracture in female Naval recruits during basic training. The secondary goal was to examine the potential mechanisms for increasing bone adaptation to intense mechanical loading. We recruited 5201 females who were randomly assigned to calcium 2000 mg and vitamin D 800 I.U. per day or a control placebo group. The intervention and stress fracture monitoring continued through 8 weeks of basic training. We were not able to recruit the targeted number of subjects for the sub-study designed to determine changes in moment of inertia using peripheral quantitative computed tomography (pQCT) because the Great Lakes Command directed us to stop the study once we reached our target sample size (5201) for the primary study. For the substudy, we enrolled 148 (out of a target 560). SFx were ascertained when recruits reported to the Great Lakes clinic with symptoms. All SFx were confirmed with radiography or technetium scan according to the usual Navy protocol. A total of 309 subjects were diagnosed with a SFx resulting in an incidence of 5.9% per eight weeks. Using intention-to-treat analysis by including all enrolled subjects, we found that the calcium and vitamin D group had a 20% lower incidence of SFx than the control group (5.3% vs. 6.6%, respectively, $P=0.0026$ for Fisher's Exact test). The per protocol analysis, including only the 3700 recruits who completed the study, found a 21% lower incidence of fractures in the supplemented vs. the control group (6.8% vs. 8.6%,

respectively, $P=0.02$ for Fisher's Exact test). Generalizing the findings to the population of 14,416 females who entered basic training at the Great Lakes during the 24 months of recruitment, calcium and vitamin D supplementation for the entire cohort would have prevented about 187 persons from fracturing. Such a decrease in SFx would be associated with a significant decrease in morbidity and financial costs.

DTIC

Calciferol; Calcium; Females; Fractures (Materials); Military Personnel; Prevention

20080036677 Vanderbilt Univ., Nashville, TN USA

The Role of Membrane-Derived Second Messengers and Bmx/Etk in Response to Radiation Treatment of Prostate Cancer

Willey, Christopher; Jan 2008; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0128

Report No.(s): AD-A482236; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Radiation-induced activation of the PI3K/Akt signal transduction pathway requires Akt binding to phosphatidylinositol phosphates (PIPs) on the cell membrane. The tyrosine kinase, bone marrow X-kinase (Bmx), binds to PIPs in a manner similar to Akt. Since Bmx is known to be involved in cell growth and survival pathways, Bmx could contribute to the radiation response within the vascular endothelium and prostate cancer, which highly express this protein. We therefore are studying Bmx signaling within the vascular endothelium and prostate cancer. Our initial studies have focused on the vascular endothelium. Bmx was activated rapidly in response to clinically relevant doses of ionizing radiation. Bmx inhibition enhanced the efficacy of radiotherapy in endothelial cells within *in vitro* systems. Retroviral shRNA knockdown of Bmx protein enhanced HUVEC radiosensitization. Furthermore, pretreatment of HUVEC with a pharmacological inhibitor of Bmx, LFM-A13, produced significant radiosensitization of endothelial cells as measured by clonogenic survival analysis and apoptosis as well as functional assays including cell migration and tubule formation. *In vivo*, LFM-A13, when combined with radiation resulted in significant inhibition of blood flow within prostate tumors as measured by pixel weighted power doppler. Bmx, therefore, represents a molecular target for the development of novel radiosensitizing agents.

DTIC

Cancer; Membranes; Prostate Gland

20080036678 University Hospital, Hamburg, Germany

Receptor Tyrosine Kinases as Targets for Treatment of Peripheral Nerve Sheath Tumors in NF 1 Patients

Mautner, Victor-Felix; Mar 2008; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0280

Report No.(s): AD-A482237; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study is the preclinical testing of multiple available tyrosine kinase inhibitors for NF1-associated benign and malignant tumors *in vitro* and *in vivo*. We found frequent copy number changes for EGFR and ERBB2, and also for the tumor suppressor genes PTEN, CDKN2A and TP53 in MPNST. CDKN2A loss was associated with metastasis. EGFR and ERBB2 were frequently expressed in MPNST on the protein level. MPNST and neurofibroma xenograft mouse models have been established. Erlotinib, and combined AMN107/Gefinitib inhibited cell proliferation *in vitro*. In the xenograft model, Gefinitib and Glivec suppressed growth of the xenograft tumors. Glivec treatment led also to shrinkage of plexiform neurofibromas xenograft in mice.

DTIC

Enzymes; Nerves; Patients; Peripheral Nervous System; Phosphorus; Sheaths; Targets; Tumors; Tyrosine

20080036679 Johns Hopkins Univ., Baltimore, MD USA

Evaluation of Fibroblast Activation Protein-Alpha (FAP) as a Diagnostic Marker and Therapeutic Target in Prostate Cancer

Brennen, Nathaniel; Dec 2007; 21 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0059

Report No.(s): AD-A482238; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our goal is to evaluate FAP expression patterns and enzymatic activity in both normal prostate tissue and at various stages of oncogenic transformation (i.e. PIA, PIN, Localized and Advanced Cancer) to determine tumor stage in which FAP expression may play a role. A second objective is to exploit this expression in the treatment of prostate cancer by developing therapies targeted for activation by FAP. This will be accomplished by identifying selective peptide substrates for the

proteolytic activity of FAP and coupling these peptides to a highly cytotoxic agent, thapsigargin, to generate prodrugs that are only activated in prostate tumors where FAP is expressed.

DTIC

Cancer; Fibroblasts; Markers; Prostate Gland; Proteins; Targets; Therapy

20080036680 Wisconsin Univ., Madison, WI USA

Sanguinarine: A Novel Agent Against Prostate Cancer

Ahmad, Nihal; Jan 2008; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0220

Report No.(s): AD-A482239; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The traditional therapeutic and surgical approaches have not been successful in the management of prostate cancer (CaP). Natural plant-based products have shown promise as anticancer agents. Sanguinarine, a benzophenanthridine alkaloid derived from the root of *Sanguinaria Canadensis*, has been shown to possess anti-microbial, antioxidant and anti-inflammatory properties. Our earlier studies suggested that sanguinarine may be developed as an agent for the management of prostate cancer. Based on this rationale, funded by the DOD (Award - W81XWH-04-1-0220), we initiated a study to investigate the hypothesis that sanguinarine will impart antiproliferative effects against prostate cancer via a modulation in NF- κ B-pathway-mediated apoptosis. During the funding period, we have made reasonable progress towards our goals. However, the progress during this reporting period was hampered due to several unforeseen circumstances. Because of this reason, a one-year extension of the grant was also obtained in January 2007. So far, the key accomplishments of our project are as follows. We have demonstrated that sanguinarine possesses anti-proliferative effects against CaP in an athymic nude mice xenograft model. Further, our data suggested that sanguinarine-caused effects may be mediated via modulations in NF-B pathway and cyclin kinase inhibitor-cyclin-cyclin dependent kinase machinery. Our study with transgenic TRAMP model has suggested that sanguinarine may be developed as an agent for the management of CaP.

DTIC

Cancer; Prostate Gland

20080036682 Oregon Health Sciences Univ., Portland, OR USA

A Novel Mechanism of Androgen Receptor Action

Roberts, Jr, Charles T; Jan 2008; 7 pp.; In English

Contract(s)/Grant(s): W81XWH-05-1-0152

Report No.(s): AD-A482241; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This revised project has as its goal the characterization of a novel alternative product of the Her-2/neu/erbB2 protooncogene derived from intron retention. The product of this splicing mechanism termed herstatin is a secreted protein comprised of the N terminus of the Her-2 receptor tyrosine kinase and a unique intron-encoded C terminus that allows binding to the other members of the EGFR/erbB family. This binding down-regulates erbB expression and inhibits EGF family signaling and cell proliferation. We have found that herstatin also binds to and down-regulates the IGF-I receptor (IGF-IR) and modulates IGF signal transduction. Herstatin is therefore a novel bifunctional inhibitor of erbB and IGF-IR signaling. Herstatin is expressed in prostate tissue and may represent a promising therapeutic target and biomarker in CaP. The work proposed in this project will assess the effect of herstatin on CaP cell phenotype the expression of herstatin in CaP samples and potential mechanisms of regulation of herstatin expression.

DTIC

Cancer; Hormones; Males; Prostate Gland

20080036683 Sloan-Kettering Inst. for Cancer Research, New York, NY USA

Non-Invasive Markers of Tumor Growth, Metastases, and Sensitivity to Anti- Neoplastic Therapy

Koutcher, Jason A; Jan 2008; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0108

Report No.(s): AD-A482242; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goals of this application are to develop methods to non-invasively differentiate fast and slow growing prostate tumors and also develop methods to evaluate response to anti-angiogenic agents. Validation of the results will be based on tumor growth metastases and microvessel density measurement (antiangiogenic studies). To date we have succeeded in demonstrating that the R3327AT rat prostate tumor which is relatively radiation resistant has detectable lactate which is heterogeneously distributed once the tumor exceeds 600mm³. In contrast the radiation sensitive slow growing Dunning H

does not have lactate that is detectable by NMR. DCE-MRI studies do not suggest differences between slow and fast growing rat prostate tumors.

DTIC

Markers; Metastasis; Prostate Gland; Sensitivity; Therapy; Tumors

20080036684 Cornell Univ., Ithaca, NY USA

Use of Vegetable Oil in Reductive Dechlorination of Tetrachloroethene

To, Sin C; Aug 2001; 190 pp.; In English

Contract(s)/Grant(s): DACA72-99-P-0219

Report No.(s): AD-A482244; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Reductive dechlorination is an effective bioremediation method for treating tetrachloroethene and its daughter compounds. Common techniques of stimulating reductive dechlorination involve the injection of costly, soluble electron donors into the contaminated plume. Vegetable oil is a cheaper alternative to such donors on a cost-per-mass basis, and may even be more economically implemented. This study applied microcosm studies to investigate the effectiveness of vegetable oil as an electron donor. Cultures fed with vegetable oil were observed to completely dechlorinate tetrachloroethene to ethene. Dechlorination by vegoil was also sustainable over a period of 140 days without the addition of nutrient amendments. Nevertheless, vegetable oil was found to ferment relatively quickly, leading to low donor efficiency. Biomass and acetate were the most significant products of vegoil-fed microcosms. Volatile fatty acids longer than 2 carbons rarely persisted. Since these acids can act as good secondary donors in the aqueous phase, their absence implies that the dechlorination zone does not extend very far from the vegoil phase. Inference from biomass measurements and dechlorination behavior hints that endogenous decay of large quantities of biomass could provide a stable source of electron donor. Perhaps a similar method of growing up a large pool of biomass for electron-donating purposes could be investigated in the future. Since acetate rarely ferments further to produce more hydrogen, and methanogenic biomass is fairly immobile, one good area of application for vegoil would be in bio-barriers. Interception of a contaminated plume by constructing biobarriers downstream reduces the need to maintain a large zone of treatment, although treatment times could be longer. For example, vegetable-oil-coated sand particles could be used to back-fill a trench to intercept and treat a plume consisting of dissolved chlorinated ethenes.

DTIC

Biodegradation; Contamination; Oils; Vegetables

20080036685 Rochester Univ., NY USA

Function of PTP1B in Neuroendocrine Differentiation of Prostate Cancer

Huang, Jiaoti; Jan 2008; 33 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0061

Report No.(s): AD-A482246; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of the project is to identify the molecular mechanisms responsible for therapeutic failure in prostate cancer patients receiving hormonal therapy. Scope: The scope of the project is to use prostate cancer cell lines in in-vitro cell culture systems to study the complex signal transduction pathways that may be responsible for the neuroendocrine differentiation of prostate cancer cells, particularly the relationship of PTP1B to IL-8 signaling through its receptors CXCR1 and CXCR2, to IGF-1 receptor signaling through PI3 kinase/AKT/mTOR pathway and to androgen receptor signaling. Major findings: We have established LNCaP cell lines stably expressing CXCR1 and CXCR2. In such cell lines, PTP1B is overexpressed when compared with parental cells. There is also significant increase in the expression of NSE, a marker of neuroendocrine differentiation, in such stable cell lines. We studied the expression of IL-8 in LNCaP cells stably overexpressing PTP1B and a mutant PTP1B and found increased levels of IL-8 in such cell lines in comparison to parental LNCaP cells. Expression of IL-8 receptors CXCR1 and CXCR2 are also increased in these stable cell lines. A related but unexpected significant finding is that the neuroendocrine cells may be the stem cells of prostate cancer.

DTIC

Cancer; Endocrine Systems; Hormones; Neurology; Neurophysiology; Prostate Gland; Stem Cells

20080036686 Georgetown Univ., Washington, DC USA

Internet-Based Education for Prostate Cancer Screening

Taylor, Kathryn L; Dec 2007; 48 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0182

Report No.(s): AD-A482247; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer (PCa) is the leading cancer diagnosis among men and the second leading cause of male cancer death.

However, screening asymptomatic men remains controversial, as early diagnosis and treatment of PCa has not yet demonstrated reduced disease-related mortality in a randomized trial. The goal of the current study is to develop and assess widely accessible, easily disseminable methods to assist men in making informed decisions about PCa screening. We will compare the efficacy of a new web-based, interactive decision support approach to our existing print-based PCa screening decision tool, among a diverse sample of male primary care patients. Abundant evidence documents the expanding role of the Internet in increasing access to and understanding of health information and the need for systematic evaluations of Internet-based interventions. The print- and web-based interventions have been

DTIC

Cancer; Education; Internets; Prostate Gland

20080036687 Massachusetts Inst. of Tech., Cambridge, MA USA

Advanced Technologies for Ultrahigh Resolution and Functional Optical Coherence Tomography

Fujimoto, James G; Apr 15, 2008; 64 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0046

Report No.(s): AD-A482249; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This program, entitled Advanced Technologies for Structural and Functional Optical Coherence Tomography, is a collaborative effort between investigators at the Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science and Research Laboratory of Electronics; Dr. David Boas, Associate Professor in Radiology, Harvard Medical School at the Massachusetts General Hospital, Martinos Center for Biomedical Imaging; and Dr. Jay Duker, Director, New England Eye Center, Professor and Chair of Ophthalmology, Tufts University School of Medicine. The objective of this program is to develop and apply advanced optical coherence tomography (OCT) technologies for ultrahigh resolution and functional imaging in biomedical applications.

DTIC

Biomedical Data; Medical Science; Tomography

20080036697 Mayo Clinic, Rochester, MN USA

Role of Dopamine as Antiangiogenic Agent in the Treatment of Prostate Cancer

Basu, Sujit; Feb 2008; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0051

Report No.(s): AD-A482288; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer is a major cause of cancer-related mortality for men in the USA. The established treatment protocol for the advanced stage of the disease is by surgical castration and/or chemotherapy. Although androgen ablation therapy is initially effective in inhibiting tumor growth in most patients, however with time, the tumors recur with a more aggressive and metastatic phenotype, ultimately causing death. Thus limitation of treatment underscores the need of development of an alternative treatment approach. Several reports suggest that vascular permeability factor/vascular endothelial growth factor (VPF/VEGF) induced angiogenesis is essential for the growth and metastasis of prostate cancer. As our recent reports indicate that the neurotransmitter dopamine (DA) can specifically and significantly inhibit VPF/VEGF induced angiogenesis, therefore, we investigated whether DA can inhibit angiogenesis, and thereby growth of prostate cancer. We here in this report demonstrate that DA can significantly inhibit PC3 human prostate cancer growth by inhibiting VPF/VEGF mediated angiogenesis by suppressing VEGFR-2 phosphorylation in tumor endothelial cells. Thus our results are significant because DA is already in clinical use with an established safety record; therefore our study may be rapidly translated to the clinics as a new and more effective therapy for prostate cancer.

DTIC

Angiogenesis; Cancer; Dopamine; Prostate Gland

20080036698 Albany Medical Coll., NY USA

The Role of ATF3, a New p53 Regulator, in Prostate Carcinogenesis

Yan, Chunhong; Feb 2008; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0095

Report No.(s): AD-A482293; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ATF3 is a newly-identified p53 regulator, whose expression is frequently down-regulated in prostate cancers. The overall goal of this project is to elucidate the role of ATF3 in prostate carcinogenesis. Towards this aim, we are in a process of determining whether ATF3-deficient mice are prone to prostate carcinogenesis (Specific Aim #1) as well as whether ATF3

deficiency promotes survival of prostate epithelia cells (Specific Aim #2). Our major task in this report period (~6 months) is to establish a colony of ATF3 knockout (KO) mice in our animal facility and allow it to expand for subsequent studies. We have successfully completed this task, and obtained ~30 KO mice - 10 of them will be housed until moribund to determine whether aged mice grow prostate lesions (Task #1) while others will be bred with WT mice and ARR2Pbi-Cre/Pten(-/-) mice for carcinogenesis studies. In addition, we have developed several ATF3-knockdown LNCaP cell lines using a retroviral-based shRNA technology. These cells will be used to determine the effects of ATF3 on the survival of prostate cancer cells (Task #4).

DTIC

Cancer; Carcinogens; Prostate Gland; Regulators

52

AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments, see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

20080035254 Cincinnati Univ., OH USA

Diagnostic Methods for Predicting Performance Impairment Associated with Combat Stress

Matthews, Gerald; Warm, Joel S; Washburn, David; Aug 2007; 76 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-C-0002

Report No.(s): AD-A481166; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481166>

This report reviews the third year of research on the diagnostic utility of psychophysiological indices that may predict the current and future functional efficiency of the soldier. The research focuses especially on the measurement of cerebral bloodflow velocity (CBFV) using transcranial Doppler sonography (TCD) together with additional indices including salivary cortisol and subjective state. Two studies at the University of Cincinnati demonstrated that CBFV declines during cognitive vigilance and during simulated driving extending prior results from sensory vigilance tasks. In addition, phasBloodflow responses to a short task battery predicted cognitive vigilance. Predictive validity was increased by including subjective state measures in a multivariate model. Research at Georgia State University employing simulated military tasks representing sentry duty peacekeeping operations and tactical decision making. These studies confirmed that CBFV correlates with various performance indices indicating that the technique may have diagnostic utility not just for vigilance but also military decision-making. Attentional skills and eye movement indices were also found to have diagnostic utility. The report concludes with a summary of the main findings from the three years of research and recommendations for future studies to translate the research into applied techniques for diagnostic monitoring and prediction in military environments.

DTIC

Cognition; Combat; Performance Prediction

20080035387 Army Research Inst. of Environmental Medicine, Natick, MA USA

Decrements in Human Performance During 72-84 Hours of Sustained Operations

Castellani, John W; Nindl, Bradley C; Lieberman, Harris R; Montain, Scott J; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481403; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Purpose: This study examined the effects of 3.5 days of sustained military operations (SUSOPS) on physical and cognitive performance and thermoregulatory responses to cold stress. Methods: Thirteen male soldiers participated in this study. The experiment consisted of 84-h (from 0600-h on Day 1 to 1800-h, Day 4) of physical activity with limited time allotted for sleep. Sleep was restricted by scheduling only limited blocks (1-h for each sleep period - total of 6- h). On the previous week, subjects were not sleep deprived or in a negative energy balance (CONTROL week). Subjects completed a battery of physical and cognitive performance tests and a cold-air test on each week at various time points. Conclusion: This study demonstrated that while decrements in a Soldier's physical performance can be expected during short term operational stress, these decrements are primarily restricted to tasks that recruit muscle groups that are over-utilized without given adequate recovery or during tasks that require high levels of persistence. The decrements in cognitive performance are similar to those observed

in highly stressful field studies. These results also indicate that 84-h of SUSOPS leads to greater declines in core temperature, increasing susceptibility to hypothermia.

DTIC

Body Temperature; Cold Weather Tests; Human Performance; Mental Performance; Performance Tests

20080035394 Army Research Inst. of Environmental Medicine, Natick, MA USA

Heat Exhaustion and Dehydration as Causes of Marathon Collapse

Kenefick, R W; Sawka, M N; Jan 2007; 5 pp.; In English

Report No.(s): AD-A481412; USARIEM/TMMD-M06-44; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This article reviews causes of marathon collapse related to physical exhaustion, heat exhaustion and dehydration. During severe exercise-heat stress (high skin and core temperatures), cardiac output can decrease below levels observed during exercise in temperate conditions. This reduced cardiac output and vasodilated skin and muscle can make it difficult to sustain blood pressure and perhaps cerebral blood flow. Dehydration can accentuate this cardiovascular strain. In contrast, excessive heat loss to the environment during cold weather may result in hypothermic collapse. Other factors contributing to post-race collapse might include reduced skeletal muscle pump activity and dehydration and prior heat stress mediated changes in cerebrovascular responses to orthostatic challenges.

DTIC

Collapse; Dehydration; Exhaustion; Hyperthermia; Hypothermia; Syncope

20080035504 Yuma Test Station, Yuma, AZ USA

Thermal Comfort Testing for Vehicle Operator/Passenger Workspaces (Truck Cabs)

Oct 9, 2007; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481104; TOP 1-2-807; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481104>

This TOP describes the procedure to quantify the thermal comfort of a truck cab in temperatures as hot and humid as possible. Facilities, instrumentation, health and safety, test conditions, test procedures, data required, and presentation of data will be discussed in this TOP. This TOP will supplement the following TOPs: TOP 1-1-006, TOP 2-2-508, TOP 2-4-001, and TOP 10-1-003.

DTIC

Passengers; Thermal Comfort; Trucks; Ventilation

20080036049 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

TNO Contribution to the Quest 303 Trial - Human Performance Assessed by a Vigilance and Tracking Test, a Multi-Attribute Task, and by Dynamic Visual Acuity

Bos, J.; Valk, P. L.; Hogervorst, M. A.; Munnoch, K.; Perrault, D.; Colwell, J. L.; July 2008; 29 pp.; In English

Contract(s)/Grant(s): TNO Proj. 032.131112

Report No.(s): TD2008-0107; TNO-DV-2008-A267; Copyright; Avail.: Other Sources

A multi-national sea trial on the effects of ship motions on human performance was performed off the coast of Canada, in early 2007. Primary goal: To obtain subjective and objective measures for human task performance, possibly affected by real ship motion. TNO participated with a Vigilance and Tracking Test, a Multi-Attribute Task, and a Dynamic Visual Acuity test. The experiment was conducted in three phases: a pre-exposure phase in harbour, an exposure phase at sea, (sea conditions varying from calm to low sea state six) and a post-exposure phase in sheltered waters to re-examine baseline performance. Experiment schedule and protocol are described, motions and wave conditions encountered during the trial, and the results of the Dutch tests are presented. Results: Cognitive performance and visual acuity are impaired by ship motion. This seems to be caused by sea sickness in particular, possibly even more so than by ship motion per se. Tracking was affected only by sickness, and not by motion itself. Apart from showing that DVA is of value to further quantify human performance, these data also support the development of an on site fit-to-perform screening tool based on DVA.

Author

Human Performance; Mental Performance; Motion Sickness; Visual Acuity

20080036224 Army Research Lab., Aberdeen Proving Ground, MD USA

The Effect of Stress on Crossmodal Interference During Visual Search

Burton, P A; Morelli, F; Nov 1, 2006; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481091; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481091>

A key factor in determining the efficiency of target detection is the influence of distracting information during the search process. Using a response competition paradigm, the present study examined how induced stress influences crossmodal links with respect to perceptual load in a visual search task under conditions of no stress versus induced stress. Individuals were tasked to perform both an easy and a hard visual search task while ignoring either auditory or visual distractors. Under conditions of no stress, previous research findings were replicated in that visual distractors produced greater costs in easy searches whereas compatible auditory distractors produced benefits while incompatible auditory distractors produced costs. However, under conditions of stress, auditory distractors caused greater costs, especially under hard search conditions, while benefits were only seen during easy searches. Visual distractors caused little interference under conditions of stress in either easy or hard searches. Levels of physiological and perceived stress were substantiated by measures of salivary alpha-amylase and scores on the Multiple Affect Adjective Checklist-Revised.

DTIC

Stress (Physiology); Visual Tasks; Visual Perception; Target Acquisition

20080036382 Army Aeromedical Research Lab., Fort Rucker, AL USA

Situational Awareness, Crew Resource Management and Operational Performance in Fatigued Two-Man Crews Using Three Stimulant Countermeasures

Darlington, K; Palacio, L V; Dowler, T; LeDuc, P; Nov 1, 2006; 6 pp.; In English

Report No.(s): AD-A481729; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481729>

The Warfighter lives a life of critical judgments, decisions, and risk taking. There is barely enough time to perform mission-essential tasks, let alone time to rest and rejuvenate body and mind. Army researchers have done a thorough job in the pursuit of countermeasures to Soldier fatigue that do not interfere with soldier performance, when that issue is couched in terms of individual soldiers performing fairly simple, repetitive tasks. Acceptable sedatives and stimulant preparations have been identified and their operational parameters described. However, it is not known how these agents perform when the dynamics of group/team interaction are injected into the research program. The DUO-WOMBAT-CS is the primary measure examined herein, and was chosen due to its focus on crew resource management and situational awareness in a complex task environment. Army aviators were subjected to over 64 hours of sleep deprivation, and were randomly assigned to one of four stimulant conditions (dextroamphetamine, modafinil, caffeine or placebo). The participants were repeatedly tested in pairs throughout the deprivation period. Testing included the WOMBAT, flights in the USAARL UH-60 research simulator, and various other tasks. Scores were compared over time and between drug groups, for the WOMBAT and the simulator performance. The analysis suggests that performance on the crew management and situational awareness sensitive tasks done by crew-pairs is well attenuated over periods of fatigue by these stimulants. Simulator performance did not prove as sensitive to fatigue or drug condition as expected. Future work will attempt to redress this information shortfall, and to further explore the effects of these preparations on higher-order, crew based soldier activities.

DTIC

Countermeasures; Crews; Human Performance; Resources Management; Situational Awareness; Stimulants

20080036582 University of Central Florida, Orlando, FL USA

A Meta-Analysis of Aperiodic Noise Stress on Human Performance

Saxton, B M; Ross, J M; Braczyk, A; Conway, G E; Szalma, J L; Hancock, P A; Nov 2006; 5 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482011; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Aperiodic noise, also known as intermittent noise, is a pervasive and influential source of stress across military environments, and can be defined by the changes in its intensity over a given period of time (therefore containing 'gaps' between louder phases of the noise). With examples ranging from the discharge of weapons to vehicle and machinery movements, then it is intuitive to recognize that this common form of noise may constitute a risk to Soldier performance across a range of tasks (i.e., as measured by speed and accuracy metrics). In order to quantify these effects, a meta-analytic evaluation of aperiodic noise effects on performance was undertaken. The results indicate that a general effect of aperiodic noise is to exert a negative influence on performance; however this effect is contingent upon the type of tasks and performance measures

used. These results can be used to inform decisions concerning when noise should be mitigated or even alternatively exploited in military settings.

DTIC

Degradation; Human Performance; Stress Analysis

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20080035110 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

MATE (Mental Aspects of Team Effectiveness)

vanMeer, J. p.; 'tHart, M. H. E.; vanderBeijl, I.; May 2008; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 015.34095

Report No.(s): TNO-DV 2008 A144; TD2008-0058; Copyright; Avail.: Other Sources

MATE is a model that gives insight in the stages of team development by integrating the views on team effectiveness from both the military organisation and organisational psychology. Based on this theoretical framework, a practical handout was developed that supports commanders in recognizing and identifying the stages of the development of their own team.

Author

Teams; Effectiveness; Mental Performance; Group Dynamics; Military Psychology

20080036219 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Adaptive Teams: An Integral Support Concept for the Operational Planning and Employment of Navy Crews

vandenBroek, J.; Arciszewski, H. F. R.; Post, W. M.; April 2008; 49 pp.; In Dutch; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 032.13078

Report No.(s): TNO-DV 2007 A445; TD2007-0192; Copyright; Avail.: Other Sources

The Royal Netherlands Navy (RNLN) is preparing for a future in which a large variety of missions must be carried out, with smaller crews, in new and demanding environments. In order to keep up to these expectations, the RNLN has a need for flexible teams and crews which can adapt to highly dynamic situations. The aim of this research is to develop an adaptive framework that allows the RNLN flexible and efficient crew planning. Current navy crew planning has already a certain amount of flexibility. By taking more variables, planning windows and mission profiles into account, crew adaptability is brought to another level. The adaptability framework combines knowledge and support tools that facilitates the various planning cycles and reduces planning uncertainty. The adaptability framework is used for the design of the operational rooms of the new patrol vessel. Besides the determination of the crew configuration for specific mission profiles, the aim was to organize the operational rooms in such a way that efficient cooperation remains possible with various team sizes. The lessons learned from using the adaptive framework, is that we need computer support in order to structure the process. That is why we focused in this study on integrated support for all planning levels.

Author

Military Operations; Mission Planning; Adaptation; Flexibility

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering, bionics, man-machine systems, life support, space suits and protective clothing. For related information see also *16 Space Transportation and Safety* and *52 Aerospace Medicine*.

20080034710 National Security Technologies, LLC, Las Vegas, NV, USA; Department of Energy, Las Vegas, NV, USA
Emergency Response Equipment and Related Training. Airborne Radiological Computer System (Model-II) User's Manual. Revision 3.0

January 2007; 97 pp.; In English

Report No.(s): DE2007-915350; DOE/NV/25946-122; No Copyright; Avail.: National Technical Information Service (NTIS)

The materials included in the Airborne Radiological Computer System, Model-II (ARCS-II) were assembled with several considerations in mind. First, the system was designed to measure and record the airborne gamma radiation levels and the

corresponding latitude and longitude coordinates, and to provide a first overview look of the extent and severity of an accidents impact. Second, the portable system had to be light enough and durable enough that it could be mounted in an aircraft, ground vehicle, or watercraft. Third, the system must control the collection and storage of the data, as well as provide a real-time display of the data collection results to the operator. The notebook computer and color graphics printer components of the system would only be used for analyzing and plotting the data. In essence, the provided equipment is composed of an acquisition system and an analysis system. The data can be transferred from the acquisition system to the analysis system at the end of the data collection or at some other agreeable time.

NTIS

Education; Effluents; Emergencies; Radioactivity; Radiology; User Manuals (Computer Programs)

20080034759 Texas A&M Univ., College Station, TX USA

Rail Crew Resource Management (CRM): The Business Case for CRM Training in the Railroad Industry

Roop, S. S.; Morgan, C. A.; Kyte, T. B.; Arthur, W.; Villado, A. J.; Sep. 2007; 124 pp.; In English

Report No.(s): PB2008-101509; No Copyright; Avail.: CASI: [A06](#), Hardcopy

Crew Resource Management (CRM) is a human factors training process that has been employed in the commercial aviation industry for over 25 years. During that time period, CRM has been credited with contributing to a marked decrease in human factors-caused accidents. Military teams, commercial shipping crews, surgical teams, nuclear power operators, and offshore drilling crews have all since employed forms of CRM training to address relative increases in human factors accidents compared to mechanical- or equipment-based accident causes. This study uses utility analysis to quantify the anticipated benefits to the railroad industry if CRM training were to be more broadly adopted. The research team tested the utility analysis model using collected airline industry data and then applied it to actual and estimated data from the railroad industry. The study found that CRM training can be expected to have net positive benefits at both the industry and individual railroad level by reducing the overall costs associated with human factors accidents. This result was derived by taking into account mean values for the number of human factors accidents, number trained, reported costs of accidents, and costs of training. Additional benefits from improved crew coordination and cost savings from reduced litigation, while not quantified in this study, would add to the overall benefits of sustained railroad CRM training programs.

NTIS

Commerce; Education; Industries; Rail Transportation; Rails; Resources Management

20080034790 McDermott Will and Emery, LLC, Los Angeles, CA, USA; University of Southern California, Los Angeles, CA USA

Haptic Apparatus (PAT-APPL-11-143 696)

Khoshnevis, B., Inventor; 2 Jun 05; 14 pp.; In English

Contract(s)/Grant(s): ERC-EEC-9529152

Patent Info.: Filed Filed 2 Jun 05; US-Patent-Appl-SN-11-143 696

Report No.(s): PB2008-101121; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A haptic apparatus may include a plate element positionable to extend over an anatomical segment of a user, and an elongate member coupled to the plate element and configured to be movably mounted onto the anatomical segment so as to remain substantially vertical and substantially perpendicular to the anatomical segment while the anatomical segment undergoes a motion. The haptic apparatus may further include a motion restrictor responsive to a control signal to impede the motion of the anatomical segment by generating an opposing force along the elongate member in a direction normal to the anatomical segment, thereby providing tactile feedback to the user.

NTIS

Feedback; Patent Applications; Touch

20080034938 Idaho National Engineering Lab., Idaho Falls, ID, USA

Effects of Transient Emotional State and Workload on Size Scaling in Perspective Displays

Tran, T. Q.; Raddatz, K. R.; Oct. 2006; 6 pp.; In English

Report No.(s): DE2007-911711; INL/CON-06-11522; No Copyright; Avail.: Department of Energy Information Bridge

Previous research has been devoted to the study of perceptual (e.g., number of depth cues) and cognitive (e.g., instructional set) factors that influence veridical size perception in perspective displays. However, considering that perspective displays have utility in high workload environments that often induce high arousal (e.g., aircraft cockpits), the present study sought to examine the effect of observers emotional state on the ability to perceive and judge veridical size. Within a dual-task

paradigm, observers ability to make accurate size judgments was examined under conditions of induced emotional state (positive, negative, neutral) and high and low workload. Results showed that participants in both positive and negative induced emotional states were slower to make accurate size judgments than those not under induced emotional arousal. Results suggest that emotional state is an important factor that influences visual performance on perspective displays and is worthy of further study.

NTIS

Display Devices; Emotional Factors; Emotions; Human Factors Engineering; Workloads (Psychophysiology)

20080035102 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Optimization of the Load Carriage System

Koerhuis, C. L.; Rensink, P.; vanSchijndel, J.; June 2008; 27 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 032.13231

Report No.(s): TNO-DV 2008 A230; TD2008-0093; Copyright; Avail.: Other Sources

Besides positive effects of an earlier developed load carriage system in which the load was carried predominantly on the hips, mobility was increased and protection and load carriage was integrated into one system (ILCS), tilting of the hip belt caused an unacceptable amount of discomfort. After optimization of the construction of the ILCS (ILCS-II), the performance while wearing the ILCS-II was compared with the performance while wearing the current load carriage system. Wearing the ILCS-II, with all the load carried on the hips, resulted in an unacceptable amount of discomfort. Wearing the ILCS-II, with the load partly carried on the hips and shoulders, resulted in less discomfort and a lower RPE score compared to wearing the current load carriage system. The increase in HR during walking was higher wearing the ILCS-II compared to the current load carriage system. Wearing the ILCS-II (with the load distributed on the hips and shoulders) has both advantages (less discomfort, lower RPE) and disadvantages (small increase in HR) compared to wearing the current load carriage system. Besides these results, in an earlier study an improved mobility was found wearing the ILCS(-II) compared to the current load carriage system. Based on these results, the ILCS-II seems to be an improvement for the operational performance compared to the current load carriage system.

Author

Loads (Forces); Load Carrying Capacity; Human Performance; Biodynamics; Human Factors Engineering

20080035105 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Performance of Protection of M2000 and OOA Materials after Contact with Decontaminants

vanWuijckhuijse-Rosbergen, C.; June 2008; 36 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): TNO Proj. 014.17234

Report No.(s): TNO-DV 2008 A180; TD2008-0070; Copyright; Avail.: Other Sources

The protection against mustard agent offered by the Dutch M2000 and OOA NBC suit was investigated to obtain information about the protection after contact with five different decontaminants. Vapour- and liquid tests with mustard agent were performed in triplicate on the material. Tests were carried out close to the NATO-NBC clothing Triptych.

Author

Chemical Warfare; Protective Clothing; Permeability; Decontamination

20080035120 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Rijswijk, Netherlands

Alternative Adsorbents - A Literature Study

Goedhart-Kamphuis, M. B.; Linders, M. J. G.; June 2007; 44 pp.; In English

Contract(s)/Grant(s): TNO Proj. 014.17681

Report No.(s): TD2008-0085; TNO-DV-2008-A214; Copyright; Avail.: Other Sources

Active carbon has been known for many years to be one of the most suitable materials to remove harmful gases and vapors from the air. This report presents an overview obtained through literature study on new adsorbent materials studied by the scientific world, mainly during the past five years. The search focused on materials with improved properties compared to active carbon. One can think of materials with an even further increased adsorption capacity, causing less pressure difference, being less sensitive to water vapor, of which adsorb both the classical warfare agents and toxic industrials. The main conclusion of this report is that the major progression within air purification is to be expected from new combination materials, existing both out of organic and inorganic materials. The most widely described variant hereof are the metal-organic frameworks (MOF's). Other promising developments in this category are the carbon-silica composites and zeolites/metal

oxides. Also several interesting developments not directly related to Chemical, Biological, Radiological, and Nuclear (CBRN) are described, these present a more general trend which might lead to alternative adsorbents in the CBRN world after all. The developments described are still in a relatively embryonic phase. It is to be expected that true implementation of these materials in respiratory protection equipment will not occur within 5 years.

Author

Adsorbents; Adsorption; Desorption; Organic Materials; Protection; Toxicity; Poisons; Air Purification; Decontamination

20080035156 Tiffany and Bosco, Phoenix, AZ, USA; Griswold (Bernard L.), Evergreen, CO, USA

3D Face Authentication and Recognition Based on Bilateral Symmetry Analysis

Zhang, L., Inventor; Razdan, A., Inventor; Farin, G., Inventor; 3 Jun 05; 24 pp.; In English

Contract(s)/Grant(s): 0312849

Patent Info.: Filed Filed 3 Jun 05; US-Patent-Appl-SN-11-145 033

Report No.(s): PB2008-102138; No Copyright; Avail.: CASI: [A03](#), Hardcopy

There is provided a novel approach for automatic human face authentication. Taking a 3D triangular facial mesh as input, the approach first automatically extracts the bilateral symmetry plane of the face surface. The intersection between the symmetry plane and the facial surface, namely the Symmetry Profile, is then computed. By using both the mean curvature plot of the facial surface and the curvature plot of the symmetry profile curve, three essential points of the nose on the symmetry profile are automatically extracted. The three essential points uniquely determine a Face Intrinsic Coordinate System (FICS). Different faces are aligned based on the FICS. The Symmetry Profile, together with two transversal profiles, namely the Forehead Profile and the Cheek Profile compose a compact representation, called the SFC representation, of a 3D face surface. The face authentication and recognition steps are finally performed by comparing the SFC representation of the faces.

NTIS

Computer Information Security; Patent Applications; Symmetry

20080035225 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA

Human Systems Integration. Test Operations Procedure

Oct 15, 2007; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481080; TOP-1-1-015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481080>

This TOP will provide a capstone overview of HSI testing. It will provide the background for other HSI related TOPs.

DTIC

Human Factors Engineering; Systems Integration

20080035230 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase III Part C2: Development of a Dynamic Biomechanical Model Version 1 of Human Load Carriage

Reid, S A; Bryant, J T; Stevenson, J M; Aug 2005; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481096; DRDC-T-CR-2005-122; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481096>

The overall purpose of this is to improve the understanding of human load carriage capabilities. Earlier phases of the dynamic biomechanical model have lead to a new modeling approach that treats the pack person interface as a dynamic suspension system. In the current study, both 2D and 3D dynamic modeling software packages were selected to permit multiple models of the pack person suspension characteristics. The selected software both permit full user control of model geometry, inertial properties, have extensive libraries of existing dynamic elements for modeling constraints, allow the user to construct complex constraint equations and allow the user to input complex forcing functions. For both the 2D and 3D models, two types of dynamic tests were conducted to determine the impulse response and the natural frequencies. For the 2D model, the impulse response test showed typical results for a mildly under damped system with the amplitude ratio plot showing a modest peak at approximately 8 Hz, higher than the estimated natural frequency of 4.8 Hz. On the other hand, the impulse response test for the 3D model gave a vertical displacement typical of an over damped system and an amplitude ratio plot with several resonant frequencies at approximately 2.5 Hz and again at 5 Hz. With the damping reduced by a factor of 100, there were some initial oscillations of the system followed by a slow decay in the vertical position and as expected, the minimally damped 3D model displayed a dominant natural frequency at approximately 5 Hz. Overall, the 2D model required much higher damping coefficients to bring about a pack displacement pattern similar to that of the 3D model. In addition, the

3D model behaviour was more consistent with the physical system. The next stage in model development is to integrate a waist belt model (Hadcock, 2002) being developed separately into the 3D model.

DTIC

Anatomy; Biodynamics; Carriages; Dynamic Models; Loads (Forces); Pressure Distribution

20080035243 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase 4, Parts A and B: Development of a Dynamic Biomechanical Model Version 2 of Human Load Carriage

Reid, S A; Bryant, J T; Stevenson, J M; Abdoli, M; Aug 2005; 52 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481125>

The purpose of this DRDC dynamic biomechanical model research program is to improve the understanding of human load carriage capabilities and to understand the effects of load carriage design features on human health and mobility. This research is directed at creating a method of determining several of the biomechanical factors to be used as inputs to the Load Conditions Limit model as described in DRDC report# W7711-0-7632-01 entitled 'Proposed Long Range Plan for a Research and Development Program of Dynamic Load Carriage Modeling.' In the current study, a 3D solid model was split into an upper and lower torso coupled with a rigid joint located at the location of the spine at the L3/L2 height. Acceleration histories of subjects wearing packs were previously recorded during human trials. Acceleration of a person was numerically integrated and used to drive the motion of the Dynamic Biomechanical Model (DBM) torso. Torso accelerations for a wide range of activities were recorded and can be used to drive these models, creating an excellent data base for many human and pack motions for current and future modeling of human motions. This technique of capturing and generating motions is applicable to many situations where an envelope of human motion and body accelerations needs to be tested to ensure equipment does not cause excessive dynamic loading on the soldier. Piecewise linear dynamic, static and creep material response models were developed for typical backpack materials. In addition, a piecewise linear model of the dynamic stress strain response for the Cloth the Soldier shoulder strap assembly was developed. The model estimates reaction forces and moments on the lumbar spine and the total shoulder reaction force. The model also calculates the distribution of force to the upper and lower torso and the total contact force.

DTIC

Biodynamics; Carriages; Dynamic Loads; Dynamic Models; Human Factors Engineering; Loads (Forces); Models

20080035244 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase 4, Part C4: User's Manual for the Standardized Protocol of Mapping Skin Contact Pressure Using the Standardized Load Distribution Mannequin

Hadcock, L J; Aug 2005; 42 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481126; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481126>

The Dynamic Biomechanical Model (DBM) requires input about pack geometry and the material property response of the load carriage suspension interface to resolve the forces acting on the body. Since there is extensive redundancy in applied forces (i.e., shoulder straps, load lifter straps, hip stabilizer straps and waist belt and skin contact pressure), it is not possible to describe the mechanical characteristics of pack components as combinations of linear and/or non linear springs and linear and/or non linear dampers unless a standardized protocol is used to determine the limit values that should be placed on specific straps in the model. The purpose of this report is to describe the common pack protocol on the Load Distribution Mannequin that will be followed when establishing these limit values for the DBM. The rationale for using the static Load Distribution Mannequin is that forces can be partitioned into upper and lower body forces, it is easier to control strap force inputs than with the Load Carriage Simulator and dynamic forces follow a similar profile to static measures expect that amplitudes and phase shifts are likely. (DBM model is calibrated for these conditions using the LC Simulator). This report describes the protocol for the baseline testing of backpacks on the Standardized Load Distribution Mannequin (SLDM). The protocol describes three different configurations: isolated shoulder, isolated waist belt and combined shoulder and waist belt.

DTIC

Biodynamics; Carriages; Dynamic Loads; Dynamic Models; Human Factors Engineering; Loads (Forces); Manuals; Protocol (Computers); Simulators; Standardization; User Manuals (Computer Programs)

20080035245 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase 4, Part C3: Dynamic Assessment of Pressure Measurement Systems for Use in Human Load Carriage

Fergenbaum, M A; Hadcock, L; Stevenson, J M; Bryant, J T; Morin, E; Reid, S A; Aug 2005; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481127; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481127>

Soldiers, who transport equipment by foot, experience dynamic pressures as a result of personal load carriage equipment. To understand how these dynamic pressures affect soldier tolerance and performance, pressure measurement equipment must be able to accurately and repeatably measure changing applied pressures to the skin. Two modern pressure measurement systems with potential for application on human subjects were examined in this study: a piezoresistive technology by Vista Medical, Ltd., and a capacitance system by XSENSOR Technology Corporation. Each system was tested to determine the accuracy and repeatability to highly controlled, standardized dynamic loading. To examine pressure sensor performance, each pressure sensor was cyclically loaded by an Instron 5500 R using a standardized protocol in each sensor's calibration range. Results showed the XSENSOR had showed better accuracy compared to the FSA, since the XSENSOR measured a force that was 64% of the peak force applied to the sensor; whereas the FSA measured a force that was 49% of the actual applied force. Further, the XSENSOR showed better repeatability for peak forces (1.3% coefficient of variation) compared to the FSA (20.8% coefficient of variation). Results suggest that both systems have poor accuracy in comparison to the Instron; however, the low coefficient of variation for the XSENSOR means that an algorithm could be built to correct for the slow response time of the system. Further research is required to improve the accuracy and repeatability of the XSENSOR for dynamic research applications.

DTIC

Biodynamics; Carriages; Dynamic Loads; Dynamic Models; Dynamic Pressure; Human Factors Engineering; Loads (Forces); Pressure Measurement

20080035246 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase 4, Part C2: Assessment of Pressure Measurement Systems on Curved Surfaces for the Dynamic Biomechanical Model of Human Load Carriage

Fergenbaum, M A; Hadcock, L; Stevenson, J M; Bryant, J T; Morin, E; Reid, S A; Aug 2005; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481128; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481128>

Soldiers experience pressure as a result of their personal load carriage system acting on the shoulder and back. As such, an experimental measurement tools must be able to accurately and repeatably measure pressures on these curved surfaces. The purpose of this study was to examine pressure measurement systems on curved surfaces resembling the shoulders and the hips. To accomplish this, a method developed by Hadcock (2002) that resolves normal force vectors into vertical and horizontal components was used to test the validity using two different pressure measurement technologies: the XSENSOR X36 model by XSENSOR Technology Corporation and the F Scan (F socket series) model by Tekscan Incorporated. The testing jigs used in this study were a cylindrical shape for the shoulder and an elliptical shape for the hips. Under ideal test conditions, results showed that the XSENSOR had a 2% accuracy error on the shoulder and 4% accuracy on the hip, which is notably better than the 72% accuracy error on the shoulder model and 53% accuracy error for the hip model found for the F Scan. The F Scan errors were due primarily to working at the low end of the sensor's range and bending the mylar around a 114 mm diameter cylinder that induces a preload on the sensels.

DTIC

Biodynamics; Carriages; Dynamic Loads; Dynamic Models; Human Factors Engineering; Loads (Forces); Pressure Measurement; Surfaces

20080035275 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Bewegingshinder van Impactbeschermingsmiddelen voor de ME van de KMar (Restriction of Movement of Impact Protective Clothing for the Anti-Riot Squad of the Dutch Military Police)

Tan, T K; Kistemaker, J A; Dec 2007; 25 pp.; In Dutch; In Dutch; Original contains color illustrations

Report No.(s): AD-A481208; TNO-DV-2007-A559; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481208>

Impact protective clothing was ergonomically tested by experts from the Dutch Military Police and the Police and by

naive subjects. Movements above the head and across the chest and bending give restriction. The new impact protective clothing gives more restriction than the present used impact protective clothing.

DTIC

International Relations; Police; Protective Clothing

20080035425 Army Research Lab., Aberdeen Proving Ground, MD USA

Concept Map Value Propagation for Tactical Intelligence

Kaste, Richard; Heilman, Eric; Hoffman, Robert; Jun 2007; 20 pp.; In English

Report No.(s): AD-A481481; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Command and control analysts increasingly apply traditionally unassociated concepts to situation understanding. Techniques are needed to tailor knowledge acquisition resource allocation according to probable value of information, both inferring an answer to a question using knowledge at hand and quickening intelligence efforts to fill in gaps. Concept Maps (Cmaps) are a form of meaningful diagram that represents concepts as nodes, linked by specified relationships. This paper discusses research into methods for negotiating and updating Cmaps by accounting for both nodal data and links. Cmaps provide the flexibility to represent at a meaningful level contemporary tactical knowledge not lending itself to conventional data structures. In some senses Cmapping generalizes the notion of an inference network, a set of propositions organized with rules directing information propagation and combining antecedents to update consequents. We are attempting to develop a mathematical system for organized navigation of a Cmap, driven by expected variability in the value of a datum and cost to get a new value. We use the CmapTools software developed with DoD support at the Institute of Human and Machine Cognition as a structural basis for creating and assessing tactical Cmaps. The paper sets forth Cmap construction, analytical philosophy, and methodology development.

DTIC

Intelligence; Man Machine Systems

20080035430 Army Research Lab., Aberdeen Proving Ground, MD USA

Assessing Constraints on Soldier Cognitive and Perceptual Motor Performance During Vehicle Motion

Metcalfe, Jason S; Davis, Jr., James A; Tauson, Richard A; McDowell, Kaleb; May 2008; 43 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481487; ARL-TR-4461; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Among the most significant challenges to implementing U.S. Army future force concepts are persistent human factors issues associated with staffing ground vehicles that are equipped with advanced capabilities including intelligent automation. This review is particularly concerned with understanding the influence of vehicle motion on the ability of Soldiers to perform goal-directed behaviors in future military vehicles. Because vehicle motion is a primary influence on the Soldier's performance, understanding the relationship between vehicle motion and performance is considered essential to solving the human factors problems brought about by implementation of advanced technologies in modern tactical vehicles. The review is organized in three main sections. First, a conceptual framework, alternately known as a 'systems perspective', is introduced as a way to analyze the problem of Soldier-vehicle performance in terms of delineating the constraints that influence goal-directed behavior within the military context. Second, this framework is then used to structure an overview of research on whole-body motion and human performance, with a particular emphasis on relationships that have most frequently been identified in empirical studies. In the third and final section, the available information is applied to the military context in specific reference to lessons learned from the formal studies, field tests, and demonstrations that have been conducted with experimental platforms such as the Bradley infantry fighting vehicle and the crew integration and automation test bed (CAT). Overall, the extant literature taken in the context of direct observations in military platforms leaves little doubt that occupation of moving vehicles will result in detriments to performance of essential tasks for vehicle control as well as other essential command and control functions such as target acquisition, route planning, and teleoperation of remote assets.

DTIC

Combat; Mental Performance; Military Personnel; Motion

20080035470 Texas A&M Univ., College Station, TX USA

Development of a Personal Computer-Based Secondary Task Procedure as a Surrogate for a Driving Simulator

Schrock, S. D.; Aug. 2007; 188 pp.; In English

Report No.(s): PB2008-101553; No Copyright; Avail.: CASI: [A09](#), Hardcopy

This research was conducted to develop and test a personal computer-based study procedure (PCSP) with secondary task

loading for use in human factors laboratory experiments in lieu of a driving simulator to test reading time and understanding of traffic control devices such as changeable message sign (CMS) messages. The importance of this research effort was to show that a PCSP approach could be used to achieve comparable results as a driving simulator approach. Therefore, a larger sample of subjects can be tested with the PCSP at a much lower cost. A secondary loading task was developed for the PCSP where subjects were shown CMS messages while simultaneously deactivating randomly displayed buttons in an on-screen control panel. The secondary task workload could be varied by increasing or decreasing the rate the buttons appeared in the control panel. One-hundred-twenty-six subjects were tested within the PCSP and in a fixed-base driving simulator. The subjects were subdivided into three subgroups to compare performance between the driving simulator and the PCSP for alternative CMS messages. Analysis revealed that essentially the same conclusions were reached with respect to differences in average reading times for each of the three PCSP button display rates in comparison to those reached using the TTI driver simulator.

NTIS

Computer Techniques; Messages; Simulators

20080035479 National Inst. of Standards and Technology, Gaithersburg, MD USA

Computational Model of Dissipation of Oxygen from an Outward Leak of a Closed-Circuit Breathing Device

Butler, K. M.; Jun. 2007; 49 pp.; In English

Report No.(s): PB2008-101881; NIST/TN-1484; No Copyright; Avail.: National Technical Information Service (NTIS)

Closed-circuit breathing devices recycle exhaled air after scrubbing carbon dioxide and adding make-up oxygen from a tank of pure oxygen. Use of this equipment allows first responders to work for up to four hours without swapping out cylinders and scrubbing canisters. Firefighting situations in which these devices would be useful include tunnels, mines, ships, high-rise buildings, and environments contaminated with biological or chemical toxins. A risk perceived by firefighters entering environments containing open flame and high radiant heat is the possibility of fire ignition in the vicinity of the respirator caused by the outward leakage of oxygen around the facepiece. This paper presents the results of a computational fluid dynamics (CFD) study of oxygen dissipation into the environment surrounding a respirator facepiece. Actual heads and masks are scanned into a 3D data set for entry into the CFD software, providing a physical boundary for the problem to be solved. Leak geometries representing an imperfect seal are defined. Oxygen concentration fields and flow streamlines are presented for multiple combinations of fuel and air in the surrounding environment, for pure oxygen and air expelled from the leak, and for both normal and high stress breathing patterns. The flammability diagram for propane is used to estimate the flammable regions as a function of time during two breathing cycles for each case.

NTIS

Breathing Apparatus; Leakage; Oxygen

20080035509 National Inst. for Occupational Safety and Health, Washington, DC, USA

Simple Solutions: Ergonomics for Construction Workers, 2007

January 2007; 92 pp.; In English

Report No.(s): PB2008-101584; DHHS/PUB/NIOSH-2007-122; No Copyright; Avail.: CASI: [A05](#), Hardcopy

This booklet is intended for construction workers, unions, supervisors, contractors, safety specialists, human resources managers - anyone with an interest in safe construction sites. Some of the most common injuries in construction are the result of job demands that push the human body beyond its natural limits. Workers who must often lift, stoop, kneel, twist, grip, stretch, reach overhead, or work in other awkward positions to do a job are at risk of developing a work-related musculoskeletal disorder (WMSD). These can include back problems, carpal tunnel syndrome, tendinitis, rotator cuff tears, sprains, and strains. To aid in the prevention of these injuries, this booklet suggests many simple and inexpensive ways to make construction tasks easier, more comfortable, and better suited to the needs of the human body. Did You Know: (1) Construction is one of the most hazardous industries in the USA. (2) The number of back injuries in U.S. construction was 50% higher than the average for all other U.S. industries in 1999 (CPWR, 2002). (3) Backaches and pain in the shoulders, neck, arms, and hands were the most common symptoms reported by construction workers in one study (Cook et al, 1996). (4) Material handling incidents account for 32% of workers' compensation claims in construction, and 25% of the cost of all claims. The average cost per claim is \$9,240 (CNA, 2000). (5) Musculoskeletal injuries can cause temporary or even permanent disability, which can affect the worker's earnings and the contractor's profits. The 'Tip Sheets' in this booklet show how using different tools or equipment may reduce the risk of injury. All of the items described in this booklet have been used on working construction sites. Given the nature of construction, some solutions here may not be appropriate for all worksites. Sometimes solutions discovered for one trade can be modified for other trades. This booklet provides general information regarding the methods some construction contractors have used to reduce workers' exposures to risk factors for work-related

musculoskeletal disorders. The examples described in this booklet may not be appropriate for all types of construction work. The use of the tools and equipment described in the booklet does not ensure that a musculoskeletal disorder will not occur. The information contained in this booklet does not produce new obligations or establish any specific standards or guidelines. Our goal has been to describe solutions that are also cost-effective. Although the cost of some of the solutions here exceeds \$1,000, which may be too high for some contractors, we believe successful implementation will lead to a quick recovery of the investment in many cases.

NTIS

Construction; Handbooks; Human Factors Engineering; Personnel; Musculoskeletal System

20080036012 Calfee Halter and Griswold, LLP, Cleveland, OH, USA

Hand-Held Paint Container

Byrne, J. M., Inventor; 4 Oct 04; 18 pp.; In English

Patent Info.: Filed 4 Oct 04; US-Patent-Appl-SN-10-957 825

Report No.(s): PB2008-102001; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A hand-held container for paint and painting implements. The body of the paint container includes an internal reservoir for holding paint and a magnet housed within the body for securing a paint brush or the like within the reservoir. An automatically adjusting, flexible handle that includes a living hinges provides a means for holding a person's hand against the exterior of the body. The paint container also includes a body that is dividable into multiple compartments. A textured surface covers a portion of exterior of the handle and the body and creates a non-slip surface useful for gripping the container. A portion of the container is shaped in a manner that allows the container to function as a pitcher for dispensing fluids such as paint. Stabilizing legs formed on or attached to the front portion of the container allow the container to be also be used as a paint tray.

NTIS

Paints; Patent Applications; Containers

20080036243 NASA Marshall Space Flight Center, Huntsville, AL, USA

International Space Station USA Orbital Segment Oxygen Generation System On-Orbit Operational Experience

Erickson, Robert J.; Howe, John, Jr.; Kulp, Galen W.; VanKeuren, Steven P.; June 30, 2008; 9 pp.; In English; International Conference on Environmental Systems (ICES), 30 Jun. - 3 Jul. 2008, San Francisco, CA, USA; Original contains black and white illustrations

Report No.(s): 08ICES-0035; Copyright; Avail.: CASI: [A02](#), Hardcopy

The International Space Station (ISS) USA Orbital Segment (USOS) Oxygen Generation System (OGS) was originally intended to be installed in ISS Node 3. The OGS rack delivery was accelerated, and it was launched to ISS in July of 2006 and installed in the US Laboratory Module. Various modification kits were installed to provide its interfaces, and the OGS was first activated in July of 2007 for 15 hours, In October of 2007 it was again activated for 76 hours with varied production rates and day/night cycling. Operational time in each instance was limited by the quantity of feedwater in a Payload Water Reservoir (PWR) bag. Feedwater will be provided by PWR bag until the USOS Water Recovery System (WRS) is delivered to SS in fall of 2008. This paper will discuss operating experience and characteristics of the OGS, as well as operational issues and their resolution.

Author

International Space Station; Oxygen Production; Oxygen Supply Equipment; Orbital Servicing; Payloads

20080036269 Army Aeromedical Research Lab., Fort Rucker, AL USA

Evaluation of a Portable Helicopter Oxygen Delivery System

Roller, Richard A; Curry, Ian P; Mando, Victoria J; Nov 1, 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481527; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481527>

Rotary-wing aircrew can be repeatedly exposed to moderately high altitude (up to 18,000 feet pressure altitude), making hypoxia and its performance effects a real hazard. Accordingly, USAARL was tasked to evaluate a portable oxygen system for potential use by U.S. Army helicopter aircrew. The system described below provided capability for oxygen production, charging of the portable system, as well as final use by aircrew. The objectives of the investigation were to determine if the system can adequately protect aircrew from hypoxia at altitude, to assess the integration of the device into existing Aviation Life Support Equipment (ALSE), and to verify ease of use. Eighteen subjects were exposed to altitudes of 10, 15, and 18

thousand feet with and without exercise. Throughout the study, the subjects' SpO₂ (peripheral hemoglobin oxygen saturation) was continuously monitored. Two criterion values were selected: 91 %, above which no cognitive deficit is expected, and 80%, below which significant cognitive deficits are more frequent. Mean SpO₂ declined significantly with increasing altitude whether the subjects were on or off oxygen. With the oxygen system in use (nasal cannula), mean SpO₂ levels were above 91%, significantly better than without supplemental oxygen. Post exercise SpO₂ was significantly lower ($p < 0.001$, paired t-test) than pre-exercise for both mask and cannula conditions. The system provided adequate oxygenation (defined as SpO₂ >91%) at low levels of exertion up to 18,000 feet, but oxygenation dropped with exercise at the higher altitudes. These findings supported recommendations to the customer for operational use and further research.

DTIC

Helicopters; Oxygen; Oxygen Supply Equipment; Portable Equipment

20080036289 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Tweede Serie Ergonomietests Lichtgewicht Bombenpakken (Second Series of Ergonomic Tests on Lightweight Bomb Disposal Suits)

Kistemaker, J A; Dec 2007; 29 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481562; TNO-DV-2007-A521; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481562>

A second series of tests were performed with light weight bomb disposal suits to get a number of tests that will give information about ergonomics and heat load. At the end of this second series of tests the final tests were determined. In the third series reference data of the light weight bomb disposal suits will be assessed.

DTIC

Heat; Human Factors Engineering; Loads (Forces); Ordnance; Protective Clothing

20080036306 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Design of an Advanced Headform for the Prediction of Eye and Facial Injuries

Kennedy, Eric; Duma, Stefan; Depinet, Paul; Morgan, Craig; Beebe, Mike; Roller, Richard; Crowley, John; Brozoski, Fred; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481591; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481591>

The Virginia Tech - Wake Forest, Center for Injury Biomechanics is in the second year of a multi-year research effort focused on predicting face and eye injury resulting from blunt impacts. The primary thrust of this effort is the development of physical headform capable of measuring face and eye impact loads. In order to assess the capability of protective equipment in reducing eye and facial injuries, the FOCUS headform is being developed with the capability of predicting fracture of facial bones, as well as eye injuries from impact loading. The headform will be used by the USA Army to test and evaluate various protective devices and other equipment to assess the likelihood of these devices to prevent, or possibly cause, an eye or facial injury. It is expected that this headform will be used by researchers and engineers in other disciplines as well; for instance, this headform can be used to evaluate the injury potential of sports equipment or the effectiveness of automotive safety systems.

DTIC

Eye (Anatomy); Injuries; Protectors

20080036308 Army Research Lab., Aberdeen Proving Ground, MD USA

The Human Factors of Sensor Fusion

Hunn, Bruce P; May 2008; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481596; ARL-TR-4458; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481596>

This report discusses select, cognitively based principles associated with the sensor fusion process. A review is made of the standard definitions and descriptions of sensor fusion from an information processing perspective, and that review is tied to basic principles of human cognitive processes which are involved with processing information. Each step of the definition of sensor fusion provided by the Joint Directors of Laboratories is used as a basis of comparison in this report, and elements of human cognition associated with those steps are described in theory and practice. Comparisons of machine cognition are contrasted and compared with human cognition, and recommendations are made about allocation of functions to human and

machine in sensor-fused information systems. Implications of sensor fusion as applied to military operations are also discussed.

DTIC

Human Factors Engineering; Multisensor Fusion

20080036375 Army Aeromedical Research Lab., Fort Rucker, AL USA

Enhancing Injury Protection Capabilities of Army Combat Helmets

Brozoski, F T; McEntire, B J; Crowley, J S; Padgett, K L; Nov 2006; 8 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481713; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481713>

Traditionally, combat helmet design has focused on improving ballistic protection, but there has been recent interest in providing better protection from blunt impacts as well. In the military environment, many factors can produce blunt force head injury, including ground vehicle or aircraft mishaps, falls, etc. This paper outlines recent accomplishments of the combat helmet program at the U.S. Army Aeromedical Research Laboratory (USAARL) that have contributed measurably to enhanced Soldier survival in current combat operations.

DTIC

Armed Forces (United States); Combat; Helmets; Injuries; Military Personnel; Protection; Protectors

20080036376 Physical Acoustics Corp., Princeton, NJ USA

Automated Damage Assessment System for Ballistic Protective Inserts Using Low Frequency Ultrasonics

Godinez-Azcuaga, Valery F; Ozevin, Didem; Finlayson, Richard D; Colanto, David; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481718; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481718>

Ballistic Protective Inserts (BPI) provide personal ballistic protection through several layers of materials such as ceramic plates and composite fibers. The complex BPI structure makes inspection with conventional nondestructive testing methods difficult. Radiography and low frequency ultrasonics are two methods that can provide information about the condition of a BPI, with respect to cracking and porosity in the ceramic plate and debonding between layers. Although both ultrasonics and radiography are sensitive to the presence of cracking and porosity, ultrasonics may be more sensitive to the presence of debonds, which makes it a powerful tool for BPI evaluation. In this paper, we discuss the development and application of an automated inspection system, which uses low frequency ultrasonics and a newly developed mathematical algorithm to assess the condition of BPI.

DTIC

Damage Assessment; Inserts; Low Frequencies; Protectors; Ultrasonics

20080036412 Army Natick Soldier Center, Natick, MA USA

The Effects of a Lower Body Exoskeleton Load Carriage Assistive Device on Limits of Stability and Postural Sway

Schiffman, Jeffrey M; Gregorczyk, Karen N; Bense, Carolyn K; Hasselquist, Leif; Obusek, John P; Piscitelle, Louis; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481786; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481786>

The purpose of the study was to investigate the effects of using a lower body prototype exoskeleton (EXO) on Soldiers static limits of stability and postural sway. Ten Army enlisted men participated in the study. Limits of stability and postural sway were measured while participants stood on a force platform. Soldiers were tested with and without the EXO (15 kg) while carrying three load configurations: fighting load (20 kg), approach march load (40 kg), and emergency approach march load (55 kg). Body lean to the left and right was significantly less and postural sway excursions and maximal range of movement were significantly reduced when the EXO was used. Hurst values indicated that body sway was less random over short-term time intervals and more random over long-term time intervals with the EXO than without it. The use of an EXO prototype changes both the individual s limits of stability and postural sway.

DTIC

Carriages; Exoskeletons; Loads (Forces); Posture; Prototypes; Stability

20080036445 Pittsburgh Univ., Pittsburgh, PA USA

Platform Technologies for Minimally Invasive Physiological Monitoring

Sun, Mingui; Hackworth, Steven A; Tang, Zhide; Zhao, Jun; Li, Daliang L; Enos, Sharon E; Errigo, Brian; Gilbert, Gary; Marchessault, Ronald; Cardin, Sylvain; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-C-0047

Report No.(s): AD-A481856; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481856>

Two critical problems exist in the engineering design of minimally invasive implantable devices: power supply and communication. Without solving these two problems, implantable devices will not be able to exchange information with the outside world and operate for extended periods of time. Currently, there exist only limited approaches to these problems. Inspired by the power delivery mechanisms of electric fish, we have developed a bio-mimetic approach using the volume conduction property of biological tissue as a natural cable to pass both information and power. A miniature device, called an energy pad, is designed. This device can be easily attached to the exterior of the skin for the purposes of communication and recharging of an implanted battery within the human body. The volume conduction system is analyzed by a linear network model and experimentally evaluated using samples of pig skin.

DTIC

Biotelemetry; Electric Current; Implantation; Medical Equipment; Physiology; Supplying

20080036450 Rutgers - The State Univ., Piscataway, NJ USA

A Bioengineered Human Skin Equivalent (HSE) for the Evaluation of Protectants

Batheja, Priya; Song, Yifan; Michniak, Bozena; Kohn, Joachim; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481863; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481863>

Estimation of permeation of compounds such as chemical warfare agents (CWAs) alone or through barrier creams such as SERPACWA (Skin Exposure Reduction Paste Against Chemical Warfare Agents) requires animal experiments or in vitro testing using animal or human skin. While animal skin does not reflect the same barrier properties as human skin, human skin poses problems of procurement, cost and large variations from donor to donor. Skin equivalents, such as the Human Skin Equivalent (HSE) developed in our laboratory, are in vitro cultured skin models that can be used for permeation/toxicity testing of compounds. The HSE is a full thickness skin equivalent that has been optimized by addition of various growth factors, such as ascorbic acid, lipids and a PPAR-alpha agonist. It has been characterized for morphology, lipid composition and barrier properties and compared to the commercially available skin equivalents. Compared to these, the HSE possesses closer lipid composition and barrier properties to human skin. The morphology shows a highly differentiated epidermis that provides a good barrier to the permeation of tested model agents such as caffeine. The HSE also provides lower variation in permeability data as compared to human cadaver skin and can be a consistent and reproducible model for permeability testing of agents.

DTIC

Bioengineering; Chemical Warfare; Skin (Anatomy)

20080036477 Mississippi State Univ., Mississippi State, MS USA

Symbolic Model of Perception in Dynamic 3D Environments

Carruth, D W; Robbins, B; Thomas, M D; Morais, A; Letherwood, M; Nebel, K; Nov 2006; 9 pp.; In English

Report No.(s): AD-A481929; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481929>

Computational models of human cognition have been applied to many complex real-world tasks including air traffic control, human-computer interaction, learning arithmetic, traversing the World Wide Web, intelligent tutors, instrument-based flight, and vehicle driving. There are numerous additional applications for these computational models including integration with models of human motion, military simulation of enemy agents in virtual environment training, testing of new vehicle designs or machine interfaces, and analysis of cognitive components of tasks. However, most of these models exist in limited two-dimensional (2D) environments. In order to apply computational models to tasks in a dynamic three-dimensional world, extensions to current cognitive architectures must provide the capability for models to perceive, process, and act in the threedimensional environments. The current research will seek to extend the vision components of a cognitive architecture to

support computational models capable of simulating human vision in a dynamic three-dimensional (3D) environment.
DTIC

Cognition; Models; Visual Perception

20080036600 Florida Univ., Gainesville, FL USA

Separation Control Using ZNMF Devices: Flow Physics and Scaling Laws

Tian, Ye; Cattafesta, III, Louis N; Dec 31, 2007; 105 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0093

Report No.(s): AD-A482062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary goal of this research is to implement a closed-loop control system to control separated flow and to evaluate the performance of the controller. A control system that includes an array of actuators, sensors (pressure sensors or lift/drag balance) and a digital controller is proposed to control flow separation in a closed-loop fashion. The first chapter introduces the flow physics and active control approaches of flow separation. It is organized as follows. First, a brief overview of separation control is provided to orient the reader, followed by the motivation. Then a technical background section is presented to review previous work reported in the literature. Finally, the objectives and technical approaches of this research are presented.

DTIC

Boundary Layer Separation; Control; Feedback Control; Fluid Dynamics; Scaling Laws; Separated Flow

20080036639 State Univ. of New York, Buffalo, NY USA

Design and Testing of a Diver Thermal Protection Garment

Pendergast, David R; Mollendorf, Joseph M; May 2008; 15 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0278

Report No.(s): AD-A482163; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Missions in cold and hot water have to be planned to insure thermal protection to prevent loss of diver capability. The objective of this project was to design, develop and test a diver thermal protection system (DTPS) that would eliminate the thermal constraint, and protect free swimming divers in waters from 5C to 40C at rest and during exercise at depths to 350 fsw. The DTPS developed met the objectives, protecting divers in waters from 5C to 40C at rest and during free swimming. The DTPS is self contained, has few moving parts, does not use consumables, and can run 200 hrs without maintenance. The DTPS can be powered from batteries and other power sources, including surface supply. The battery modules developed under this grant can provide protection for 8-12 hrs in cold and 2-4 hrs in warm. The DTPS also acts as a total body and regional calorimeter. importantly the DTPS automatically protects the diver via a controller in cold and hot water. The DTPS is protected and currently available for commercialization and can be adapted to many diving environments.

DTIC

Diving (Underwater); Garments; Swimming; Thermal Protection; Thermodynamic Properties; Underwater Breathing Apparatus

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MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

20080034754 Rutgers - The State Univ., Piscataway, NJ, USA

Investigating the Feasibility of Establishing a Virtual Container Yard to Optimize Empty Container Movement in the NY-NJ Region

Theofanis, S.; Boile, M.; Sep. 2007; 136 pp.; In English

Report No.(s): PB2008-101762; No Copyright; Avail.: National Technical Information Service (NTIS)

A Virtual Container Yard (VCY) is a mean of developing a shared resource information system to match empty equipment needs through the adoption of next generation internet and new technology information platforms. The project examines the feasibility of developing and operating a Virtual Container Yard to serve the freight and maritime community in the NY-NJ region. Definition of user requirements and potential business and institutional impediments in successfully establishing the system are identified. To support user requirements production and solutions, and to address potential impediments, literature dealing with local, US and International experience in applying web-based shared information systems is critically reviewed.

Subsequently, the conceptual architecture, specifications and functionalities of the system are developed based on latest e-business collaborative solutions, systems and protocols. Special attention is given to systems security architecture to make the application robust and attractive to potential partners. Proprietary products either dealing directly with street-turn matching or with wide range matching applications are critically evaluated in view of the developed user requirements. An analytical formulation and simulation model developed to evaluate the potential benefits of a VCY under different market conditions is presented. Financial and economic evaluation, potential funding alternatives and investment recovery strategies to ensure successful development and long term viability of systems operation, are presented. Systems governance structure and potential partnership is proposed to serve the purpose of long-term sustainability of the system. Finally, a staged application timeline and implementation plan is produced, to cater for an intermediate pilot demonstration phase, necessary to draw experiences leading to proper full-scale application. The project provides for an integrated support product to enhance setting up a Virtual Container Yard system application in the NY-NJ region.

NTIS

Information Systems; New York; New Jersey

20080034756 Government Accountability Office, Washington, DC, USA

Information Technology: Improvements for Acquisition of Customs Trade Processing System Continue, But Further Efforts Needed to Avoid More Cost and Schedule Shortfalls

Oct. 2007; 123 pp.; In English

Report No.(s): PB2008-101511; GAO-08-46; No Copyright; Avail.: CASI: [A06](#), Hardcopy

The Department of Homeland Security (DHS) established the Automated Commercial Environment (ACE) program to replace and supplement existing cargo processing technology. According to the fiscal year 2007 DHS appropriations act, DHS is to develop and submit an expenditure plan for ACE that satisfies certain conditions, including being reviewed by GAO. GAO reviewed the plan to (1) determine whether the expenditure plan satisfies the legislative conditions, (2) determine the status of 15 open GAO recommendations, and (3) provide observations about the expenditure plan and DHS's management of the program. To address the mandate, GAO assessed plans and related documentation against federal guidelines and industry standards and interviewed the appropriate DHS officials.

NTIS

Cargo; Costs; Schedules; Security

20080034765 Sonnenschein Nath and Rosenthal. LLP, Chicago, IL, USA; Boston Univ., Boston, MA, USA

Apparatus for Three-Dimensional Optical Data Storage and Retrieval

Fourkas, J. T., Inventor; Olson, C. E., Inventor; Previte, M. J. R., Inventor; 8 Nov 05; 19 pp.; In English

Contract(s)/Grant(s): AFOSR-F49620-01-1-0455

Patent Info.: Filed 8 Nov 05; US-Patent-Appl-SN-11-269 016

Report No.(s): PB2008-101192; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A three dimensional optical data storage and retrieval system that includes a three dimensional optical data storage medium and an apparatus for providing access to data stored on the medium. The data storage medium includes an optical data storage material which either a low molecular weight or polymeric glassy solid that are capable of undergoing multi-photon excitation that are energetically different in the write and read cycles. The optical data storage materials provide substantially higher storage capacities relative to conventional materials, and show high robustness in that written and stored data can undergo multiple read cycles without erasure or overwriting. An apparatus for data recording and accessing stored data on the medium includes a controllable variable energy photo-emitting excitation source and an emission photo-detector.

NTIS

Computer Storage Devices; Optical Memory (Data Storage)

20080034775 National Science Foundation, Washington, DC USA

National Science Foundation Directorate for Mathematical and Physical Sciences

January 2007; 29 pp.; In English

Report No.(s): PB2008-101373; No Copyright; Avail.: National Technical Information Service (NTIS)

This brochure has been created with the intent of informing you about the Mathematical and Physical Sciences Directorate of the National Science Foundation (NSF). MPS research spans the full range of spatial and time scales accessible to human investigation distance scales ranging from the size of atoms to the structure of galaxies and of the universe itself, and timescales ranging from reactions lasting millionths of a billionth of a second to the evolution and age of the universe. We

develop new mathematical structures and investigate the fundamental particles and processes of matter. We bring what we've learned in physical sciences to exploring complex biological systems, human and social dynamics, sustainable energy, and the environment. Past research in MPS has led to the Magnetic Resonance Imaging (MRI) machines you find in hospitals, the biological and chemical detectors you see in airports, and the development of alternate fuel technologies.

NTIS

Physical Sciences; Mathematics; Evolution (Development); Complex Systems; Galactic Structure

20080034793 Baker and Daniels, LLP, Indianapolis, IN, USA

Object Oriented Mixed Reality and Video Game Authoring Tool System and Method

Kirkley, E. H., Inventor; Borland, S. C., Inventor; Tomblin, S. J., Inventor; Nelson, A. J., Inventor; Pendleton, W. R., Inventor; 31 Aug 05; 36 pp.; In English

Contract(s)/Grant(s): W74V8H-04-C-001

Patent Info.: Filed Filed 31 Aug 05; US-Patent-Appl-SN-11-216 377

Report No.(s): PB2008-101124; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The present invention involves a mixed reality or video game authoring tool system and method which integrates design information in the mixed reality or video game interfaces and allows the authoring of both mixed reality and video game environment and facilitates the iterative development of mixed reality and video game environments.

NTIS

Display Devices; Games; Patent Applications

20080034849 Hanor (Charles W.), San Antonio, TX, USA

Data-Fusion Receiver

Gabelmann, J. M., Inventor; Kattner, J. S., Inventor; Houston, R. A., Inventor; 20 Aug 04; 29 pp.; In English

Contract(s)/Grant(s): DE-FC26-02NT41656

Patent Info.: Filed Filed 20 Aug 04; US-Patent-Appl-SN-10-922 630

Report No.(s): PB2008-101095; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This invention is an ultra-low frequency electromagnetic telemetry receiver which fuses multiple input receive sources to synthesize a decodable message packet from a noise corrupted telemetry message string. Each block of telemetry data to be sent to the surface receiver from a borehole tool is digitally encoded into a data packet prior to transmission. The data packet is modulated onto the ULF EM carrier wave and transmitted from the borehole to the surface and then are simultaneously detected by multiple receive sensors disbursed within the rig environment. The receive sensors include, but are not limited to, electric field and magnetic field sensors. The spacing of the surface receive elements is such that noise generators are unequally coupled to each receive element due to proximity and/or noise generator type (i.e. electric or magnetic field generators). The receiver utilizes a suite of decision metrics to reconstruct the original, non noise-corrupted data packet from the observation matrix via the estimation of individual data frames. The receiver will continue this estimation process until: (1) the message validates, or (2) a preset 'confidence threshold' is reached whereby frames within the observation matrix are no longer 'trusted'.

NTIS

Multisensor Fusion; Patent Applications; Receivers

20080034850 Jenkins, Wilson and Taylor, P.A., Durham, NC, USA; Duke Univ., Durham, NC, USA

Methods, Systems, and Computer Program Products for Neural Channel Selection in a Multi-Channel System

Wolf, P. D., Inventor; Won, D. S., Inventor; 20 Aug 04; 16 pp.; In English

Contract(s)/Grant(s): DARPA-BAA01-42

Patent Info.: Filed Filed 20 Aug 04; US-Patent-Appl-SN-10-922 752

Report No.(s): PB2008-101094; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods, systems, and computer program products for transmitting neural signal information. Methods, systems, and computer programs products are disclosed for neural channel selection in a multi-channel system. A method according to one embodiment can include a step for receiving a plurality of neural signals on a first plurality of channels. The method can also include a step for calculating criterion variable value for the neural signal on each of the channels. In addition, the method can include a step for ranking the channels by the criterion variable value. The method can also include a step for calculating mutual information between a measured output and a total population activity for the first plurality of channels. Further, the

method can include a step for determining a second plurality of channels that encodes a predetermined amount of the mutual information.

NTIS

Computer Programs; Multichannel Communication; Neural Nets; Patent Applications

20080034853 Brown, Raysman, Millstein, Felder and Steiner, LLP, New York, NY, USA

Central Credit Filtering in Computerized Trading

Hausman, A., Inventor; Tannenbaum, K. D., Inventor; Beatty, P. B., Inventor; Waldorf, L. C., Inventor; Dweck, A., Inventor; 31 Jan 05; 23 pp.; In English

Patent Info.: Filed Filed 31 Jan 05; US-Patent-Appl-SN-11-048 661

Report No.(s): PB2008-101089; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Systems, methods, and computer program products are disclosed for establishing and using credit limits between counterparties and for managing risk in the trading of financial interests. The invention provides credit filtered views of executable market information to trading parties. By setting credit limits used to provide credit-filtered views, the invention provides trading parties the ability to control the amount of future financial exposure that the trading party will incur with any counterparty in one or more present-and/or future time periods in trades by the trading party during a trading session. A trading party may establish and use credit limits with potential counterparties in the trading of financial interests having a current or future financial exposure such as foreign exchange ('FX') forwards contracts, forwards contracts in commodities, e.g., precious metals, energy, etc., stock options, futures contracts, bonds, loan contracts, money market certificates, other fixed income securities, etc. The credit information is used by a central computer to provide credit filtered market views to trading parties. During a trading session, the credit remaining of a set credit limit between the trading party and the respective counterparty is changed according to trades executed between the trading party and the counterparty.

NTIS

Financial Management; International Trade; Patent Applications

20080034855 Fish and Richardson, P.C., Minneapolis, MN, USA

Geometric Search Engine

Qamhiyah, A. Z., Inventor; Flugrad, D., Inventor; 30 Jun 04; 23 pp.; In English

Contract(s)/Grant(s): NSF-DMI-0329212

Patent Info.: Filed Filed 30 Jun 04; US-Patent-Appl-SN-10-883 001

Report No.(s): PB2008-101088; No Copyright; Avail.: CASI: [A03](#), Hardcopy

One implementation provides a method to provide information associated with a previously designed component having a geometry that is similar to a geometry of a source component. In this implementation, the method includes obtaining a first set of coefficients for a non-invertible representation of the geometry of the source component, and comparing the first set of coefficients to a second set of coefficients for a non-invertible representation of the geometry of the previously designed component. If the first set of coefficients matches the second set of coefficients according to a threshold of similarity, the method further includes providing a search result associated with the previously designed component.

NTIS

Information Retrieval; Patent Applications

20080034857 Bureau of Economic Analysis, Washington, DC, USA

Outsourcing and Imported Services in BEA's (Bureau of Economic Analysis') Industry Accounts

Yuskavage, R. E.; Strassner, E. H.; Medeiros, G. W.; January 2006; 36 pp.; In English

Report No.(s): PB2008-101790; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Outsourcing of professional and support services by U. S. firms, especially goodsproducing firms, is one of the factors that has contributed to the steady increase in the service sectors share of the U.S. economy. Outsourced services typically include software production, information and data processing services, computer systems design, professional, scientific, and technical services, and administrative and support services.

NTIS

Economic Analysis; Industries; Support Systems

20080034860 New Jersey Dept. of Transportation, Trenton, NJ, USA; Rutgers - The State Univ., Piscataway, NJ, USA; City Coll. of the City Univ. of New York, NY, USA

Cost of Transporting People in New Jersey

Ozbay, K.; Bartin, B.; Berechman, J.; Apr. 2001; 169 pp.; In English

Report No.(s): PB2008-101772; UTRC-2001-009; No Copyright; Avail.: National Technical Information Service (NTIS)

This project has developed a state-of-the-art GIS-based interactive tool for calculating network-wide full marginal costs (FMC) of highway transportation in New Jersey. The new tool is used to evaluate the short-term impacts of policy implications on the marginal costs of different trips. The illustration of the proposed FMC calculation methodology on a sample network shows that the traditional distance-based approach overestimates the marginal cost of the network, and more importantly it provides marginal cost on the basis of distance rather than trips, which is the most basic way of considering travel behavior of drivers. Results obtained from application of the new tool on the North Jersey network demonstrate that FMC between an O-D pair exhibit differences among various paths that connect any single O-D pair. These results also demonstrate the importance of analyzing trips based on a number of factors in addition to travel times such as volume, capacity, road type, and distance. The analysis conducted to observe the short-term impacts of capacity investments on several route sections (NJ Route 18, NJ Route 17, NJ Route 3, and the Garden State Parkway) demonstrate that even though capacity investments can reduce the marginal cost of users, the amount of savings mainly depends on the characteristics of that region, the excessive demand that needs to be satisfied, and the reduced congestion delays. This GIS-based tool will help transportation planners to estimate the changes in transportation costs due to a particular transportation demand management measure or supply change such as adding new lanes or improving existing lanes.

NTIS

Costs; Highways; Transportation; Cost Reduction

20080034863 University Transportation Research Center, Region 2, New York, NY, USA; Massachusetts Inst. of Tech., Cambridge, MA, USA

Collaborative Exploratory Research: The Anticipatory Route Guidance Problem

Kachani, S.; Perakis, G.; Jul. 2006; 105 pp.; In English

Report No.(s): PB2008-101769; UTRC-49777-1805; No Copyright; Avail.: National Technical Information Service (NTIS)

Finding solutions to fixed point problems can help government and industry leaders to plan for real world success. One concrete example of problem solving which may be amenable to fixed point solution is the anticipatory route guidance problem (ARG). An exercise in dynamic traffic user equilibrium, this problem envisions a communications system which transmits dynamic, shortest path traffic data to drivers. But anything that influences the path-choice decisions of drivers will, in itself, affect traffic conditions on the ground. The challenge is clear: develop a model in which shortest-path forecasting does not become a selfdefeating prophecy. This research develops and evaluates a software system which explores the ARG problem from a fixed point perspective. A significant part of our research consists in identifying the best algorithms for step size computation. Methods evaluated include: MSA (Method of successive averaging), Polyak iterate averaging method, and a variety of potential optimization line search methods.

NTIS

Problem Solving; Routes

20080034924 Transportation Research Board, Washington, DC USA

Community Visualization of a Light Rail Transit Oriented Development

Grossardt, T.; Bailey, K.; Apr. 2004; 26 pp.; In English

Report No.(s): PB2008-101504; TRB-IDEA-33; No Copyright; Avail.: CASI: [A03](#), Hardcopy

This project was aimed at enhancing community involvement in the design of proposed light rail transit-oriented development. A combination of an advanced decision technique and virtual reality computer visualization were tested. This process is designed to enhance public input and cooperation in the planning process, and to provide recommendations for transit agencies, planners, and architects. The process was tested in Louisville, Kentucky, in cooperation with the local transit agency, Transit Authority of River City (TARC).

NTIS

Rails; Rivers; Virtual Reality

20080034926 Government Accountability Office, Washington, DC, USA

Critical Infrastructure Protection: Multiple Efforts to Secure Control Systems Are Under Way, but Challenges Remain

Sep. 2007; 58 pp.; In English

Report No.(s): PB2008-100179; GAO-07-1036; No Copyright; Avail.: CASI: [A04](#), Hardcopy

Control systems--computer-based systems that monitor and control sensitive processes and physical functions--perform vital functions in many of our nation's critical infrastructures, including electric power, oil and gas, water treatment, and chemical production. The disruption of control systems could have a significant impact on public health and safety, which makes securing them a national priority. GAO was asked to (1) determine cyber threats, vulnerabilities, and the potential impact of attacks on critical infrastructure control systems; (2) determine the challenges to securing these systems; (3) identify private sector initiatives to strengthen the cybersecurity of control systems; and (4) assess the adequacy of public sector initiatives to strengthen the cybersecurity of control systems. To address these objectives, we met with federal and private sector officials to identify risks, initiatives, and challenges. We also compared agency plans to best practices for securing critical infrastructures. Critical infrastructure control systems face increasing risks due to cyber threats, system vulnerabilities, and the serious potential impact of attacks as demonstrated by reported incidents. Threats can be intentional or unintentional, targeted or nontargeted, and can come from a variety of sources. Control systems are more vulnerable to cyber attacks than in the past for several reasons, including their increased connectivity to other systems and the Internet. Further, as demonstrated by past attacks and incidents involving control systems, the impact on a critical infrastructure could be substantial.

NTIS

Command and Control; Computers; Protection; Security

20080034927 Idaho National Engineering Lab., Idaho Falls, ID, USA; Iowa State Univ., Ames, IA, USA; Guelph Univ., Ontario, Canada

Developing Multiple Diverse Potential Designs for Heat Transfer Utilizing Graph Based Evolutionary Algorithms

Muth, D. J.; Ashlock, D. A.; McCorkle, K. S.; Bryden, K. M.; Sep. 2006; 9 pp.; In English

Report No.(s): DE2007-911811; INL/CON-06-11722; No Copyright; Avail.: Department of Energy Information Bridge

This paper examines the use of graph based evolutionary algorithms (GBEAs) to find multiple acceptable solutions for heat transfer in engineering systems during the optimization process. GBEAs are a type of evolutionary algorithm (EA) in which a topology, or geography, is imposed on an evolving population of solutions. The rates at which solutions can spread within the population are controlled by the choice of topology. As in nature geography can be used to develop and sustain diversity within the solution population. Altering the choice of graph can create a more or less diverse population of potential solutions. The choice of graph can also affect the convergence rate for the EA and the number of mating events required for convergence. The engineering system examined in this paper is a biomass fueled cookstove used in developing nations for household cooking. In this cookstove wood is combusted in a small combustion chamber and the resulting hot gases are utilized to heat the stoves cooking surface. The spatial temperature profile of the cooking surface is determined by a series of baffles that direct the flow of hot gases. The optimization goal is to find baffle configurations that provide an even temperature distribution on the cooking surface. Often in engineering, the goal of optimization is not to find the single optimum solution but rather to identify a number of good solutions that can be used as a starting point for detailed engineering design. Because of this a key aspect of evolutionary optimization is the diversity of the solutions found. The key conclusion in this paper is that GBEAs can be used to create multiple good solutions needed to support engineering design.

NTIS

Biomass; Neural Nets

20080034939 Idaho National Engineering Lab., Idaho Falls, ID, USA

FY 06 Status of System Interface and Support Systems R & D Areas

Sherman, S. R.; Sep. 2006; 47 pp.; In English

Report No.(s): DE2007-911707; INL/EXT-06-11728; No Copyright; Avail.: Department of Energy Information Bridge

This document provides a summary of research and development activities performed in the Systems Interface and Support Systems area of the DOE Nuclear Hydrogen Initiative during FY 2006. Project cost and performance data obtained from the PICS system are presented and analyzed. Brief summaries of accomplishments and references are provided. A mapping of System Interface and Support Systems technical issues versus the work performed is updated and presented. Lastly, near-term research plans are given, and a description of the new UNLV high temperature heat exchanger program structure is provided.

NTIS

Hydrogen Production; Nuclear Power Plants; Support Systems

20080034995 Motorola, Inc., Schaumburg, IL, USA

Method and Apparatus for Deploying an Ad-Hoc Network

Ramadas, P., Inventor; Huang, Y., Inventor; Perkins, M. R., Inventor; 30 Aug 04; 10 pp.; In English

Contract(s)/Grant(s): NIST-70NANB2H3001

Patent Info.: Filed Filed 30 Aug 04; US-Patent-Appl-SN-10-929 510

Report No.(s): PB2008-100762; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method and apparatus for real-time ad-hoc network deployment is provided herein. During deployment, nodes that make up the network are periodically dropped in a serial fashion. During deployment, a node will immediately determine if it will become a network coordinator by determining if a piconet coordinator beacon is heard. If, during deployment, a beacon isn't heard, the node will become a piconet coordinator and will assume those responsibilities immediately.

NTIS

Computer Networks; Deployment; Patent Applications

20080035018 Government Accountability Office, Washington, DC, USA

Critical Infrastructure Protection: Sector-Specific Plans' Coverage of Key Cyber Security Elements Varies

Oct. 2007; 54 pp.; In English

Report No.(s): PB2008-101541; GAO-08-113; No Copyright; Avail.: CASI: [A04](#), Hardcopy

The nation's critical infrastructure sectors--such as public health, energy, water, and transportation--rely on computerized information and systems to provide services to the public. To fulfill the requirement for a comprehensive plan, including cyber aspects, the Department of Homeland Security (DHS) issued a national plan in June 2006 for the sectors to use as a road map to enhance the protection of critical infrastructure. Lead federal agencies, referred to as sector-specific agencies, are responsible for coordinating critical infrastructure protection efforts, such as the development of plans that are specific to each sector. In this context, GAO was asked to determine if these sector-specific plans address key aspects of cyber security, including cyber assets, key vulnerabilities, vulnerability reduction efforts, and recovery plans. To accomplish this, GAO analyzed each sector-specific plan against criteria that were developed on the basis of DHS guidance.

NTIS

Computer Information Security; Protection; Security; Information Transfer

20080035097 Sarnoff Corp., Princeton, NJ, USA

Method and System for Performing Adaptive Image Acquisition

Cheng, H., Inventor; 10 Aug 05; 19 pp.; In English

Contract(s)/Grant(s): HM1582-04-P-001; HM1582-04-C-0010

Patent Info.: Filed Filed 10 Aug 05; US-Patent-Appl-SN-11-200 869

Report No.(s): PB2008-102135; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An adaptive image acquisition system and method that generates virtual view of a surveillance scene to a user (operator), in which, the user operates the system. Through viewing the virtual view, the user controls sensors that create the virtual view. The sensors comprise at least one first sensor having a higher resolution than at least one second sensor. Images from the second sensor are processed to create an image mosaic that is overlaid with images from the higher resolution first sensor. In one embodiment of the invention, the first sensor is moved using Saccade motion. In another embodiment of the invention, a user's intent is used to control the Saccade motion.

NTIS

Patent Applications; Viewing; Imaging Techniques

20080035465 National Inst. of Standards and Technology, Gaithersburg, MD USA

Demonstration of Real-Time Tactical Decision Aid Displays

Davis, W. D.; Holmberg, D.; Reneke, P.; Brassell, L.; Vettori, R.; Aug. 2007; 31 pp.; In English

Report No.(s): PB2008-101873; NISTIR-7437; No Copyright; Avail.: CASI: [A03](#), Hardcopy

On September 22, 2005 the National Institute of Standards and Technology (NIST) conducted a demonstration of two prototype tactical decision aid computer interfaces in the city of Wilson, North Carolina. Members of the City of Wilson Fire Department, Wilson Memorial Hospital, Honeywell Inc, and NIST participated in the demonstration. Sensor and other building information from a simulated fire on a third floor wing of the hospital were displayed in realtime on the Honeywell ONYX FIRSTVISION1 fire panel and on laptop computers positioned in the hospital, on a fire truck, in the Wilson fire command van and at a Wilson fire station. The objective was to have the members of the Wilson Fire Department evaluate

the first responder information displays using a simulated real-time incident. The displays are designed to provide real-time building and emergency information to emergency responders, incident command, and dispatch centers. The concept of transmitting real-time building information to emergency responders was well received. The participants concerns with these systems centered on standardization, information overload, and reliability.

NTIS

Decision Support Systems; Display Devices; Emergencies; Fires; Transponders

20080035468 Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., Boston, MA, USA

Information-Centric Security (PAT-APPL-11-193 607)

Kimmel, G. D., Inventor; Domangue, E. L., Inventor; Adamouski, F. J., Inventor; 29 Jul 05; 31 pp.; In English

Contract(s)/Grant(s): N00014-04-C-0259

Patent Info.: Filed Filed 29 Jul 05; US-Patent-Appl-SN-11-193 607

Report No.(s): PB2008-101721; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system for encrypting a data encryption key includes a key encryption key generator configured to receive a public portion of a label, the label including an asymmetric key pair of the public portion and a private portion, the key encryption key generator being further configured to process the public portion of the label to obtain a key encryption key, and a data encryption key encoder configured to receive the key encryption key from the key encryption key generator and to receive a data encryption key from a random number generator, the encoder being further configured to encrypt the data encryption key using the key encryption key to produce an encrypted data encryption key and to provide the encrypted data encryption key to an encryption device.

NTIS

Computer Information Security; Information Systems; Patent Applications; Security

20080035562 Kusman (Brooks), P.C., Southfield, MI, USA; Michigan Univ., Ann Arbor, MI, USA

High Spatial Resolution X-Ray Computed Tomography (CT) Method and System

Clinthorne, N. H., Inventor; Sukovic, P., Inventor; 27 Oct 05; 25 pp.; In English

Contract(s)/Grant(s): CA-65637

Patent Info.: Filed Filed 27 Oct 05; US-Patent-Appl-SN-11-259 870

Report No.(s): PB2008-102022; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A high spatial resolution X-ray computed tomography (CT) system is provided. The system includes a support structure including a gantry mounted to rotate about a vertical axis of rotation. The system further includes a first assembly including an X-ray source mounted on the gantry to rotate therewith for generating a cone X-ray beam and a second assembly including a planar X-ray detector mounted on the gantry to rotate therewith. The detector is spaced from the source on the gantry for enabling a human or other animal body part to be interposed therebetween so as to be scanned by the X-ray beam to obtain a complete CT scan and generating output data representative thereof. The output data is a two-dimensional electronic representation of an area of the detector on which an X-ray beam impinges. A data processor processes the output data to obtain an image of the body part.

NTIS

High Resolution; Patent Applications; Spatial Resolution; Tomography; X Rays

20080035564 Jones, Tullar and Cooper, P.C, Arlington, VA, USA

Sensor-Network Processors Using Event-Driven Architecture

Manohar, R., Inventor; Kelly, C., Inventor; 6 May 05; 9 pp.; In English

Contract(s)/Grant(s): N00014-00-1-0564

Patent Info.: Filed Filed 6 May 05; US-Patent-Appl-SN-11-123 234

Report No.(s): PB2008-102114; No Copyright; Avail.: CASI: [A02](#), Hardcopy

Event-driven processor architectures are particularly suited for use in multiple sensor node networks and simulators of such networks. A first variation of the processor is particularly suited for use in a sensor node in a wireless sensor network. Through use of the event-driven architecture and special message and timing coprocessors, this embodiment of the invention is optimized for low energy requirements and data monitoring operations in sensor networks. A second embodiment of the invention includes modifications necessary for use of the processor in a network simulation protocol.

NTIS

Architecture (Computers); Communication Networks; Patent Applications

20080035638 National Inst. of Justice, Washington, DC, USA

Can We Talk: Public Safety and the Interoperability Challenge

Smith, B.; Tolman, T.; Apr. 2000; 6 pp.; In English

Report No.(s): PB2008-102297; NCJ-181729; No Copyright; Avail.: CASI: A02, Hardcopy

The ability to share information in real time between agencies is called interoperability. The basic idea is this: Persons who need to exchange information should be able to do so, even when they are using different technologies from different manufacturers, without the need for custom hardware or software to integrate them all. Its a little like the incompatibilities between various computer operating systems (e.g., Windows, Macintosh, Unix) but a lot more complicated. Broadly defined, interoperability refers to the ability to transmit all types of communications electronically, including voice, data, and images. This article focuses on one aspect: The ability of public safety agencies to talk to each other via radios.

NTIS

Interoperability; Radio Equipment; Safety; Real Time Operation

20080035643 Combustion Science and Engineering, Inc., Columbia, MD, USA; Edinburgh Univ., UK

Smoke Detector Algorithm for Large Eddy Simulation Modeling

Roby, R. J.; Olenick, S. M.; Zhang, W.; Carpenter, D. J.; Klassen, M. S.; Jul. 2007; 51 pp.; In English

Report No.(s): PB2008-101886; No Copyright; Avail.: National Technical Information Service (NTIS)

This study chronicles the development and integration of a smoke detector activation algorithm that describes the response time of a smoke detector into a Large Eddy Simulation (LES) fire model. Although the activation algorithm could be used with any CFD smoke movement model, the results here address specifically its application to the Fire Dynamics Simulator (FDS). The fire model predicts the smoke concentration and velocity adjacent to the detector while an algorithm based on characteristic velocity-based lag times describes the transport of smoke into the sensing chamber of the smoke detector. An Underwriters Laboratories Standard 217 fire test, as well as experimental data from two experimental multi-room compartment fires, were used for comparison and validation of the accuracy of the algorithm. A series of benchmark studies in a numerical wind tunnel provided a mechanism to establish the sensitivity of the model to the different input parameters. The algorithm was found to be very accurate in determining detector activation times for both high and low-velocity smoke flows. Additionally, it was found that the algorithm provides more accurate smoke detector activation times than other correlations based on optical density or temperature. The activation algorithm will be included in the next release of FDS (version 5.x).

NTIS

Algorithms; Fires; Large Eddy Simulation; Smoke; Smoke Detectors

20080036027 21st Century Systems, Inc., Silver Spring, MD, USA

Building a 3-1-1 System for Police Non-Emergency Calls: A Process and Impact Evaluation

Solomon, S. E.; Uchida, C. D.; Sep. 2003; 60 pp.; In English

Contract(s)/Grant(s): COPS-2000-CK-WX-K114

Report No.(s): PB2008-102310; Copyright; Avail.: National Technical Information Service (NTIS)

The COPS Office first requested the Federal Communications Commission (FCC) to set aside 3-1-1 for use as a national help number for non-emergencies. In 1997, the FCC agreed, reserving 3-1-1 nationwide for use as a voluntary, non-toll, non-emergency telephone number. COPS budgeted funds for system implementation, and by FY 2003, thirteen jurisdictions had received financial assistance. The subject of this report, the Austin Police Department (APD), was among those jurisdictions selected to receive federal assistance. In an earlier report, we described the necessary elements for APDs 3-1-1 system, including each step in the selection of hardware and software, procurement issues, training needs, system maintenance, and lessons learned. In this report we evaluate the implementation process.

NTIS

Emergencies; Police; Communication Equipment; Maintenance Training

20080036075 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Small Body GN&C Research Report: A Robust Model Predictive Control Algorithm with Guaranteed Resolvability

Acikmese, Behcet A.; Carson, John M., III; September 2, 2005; 15 pp.; In English; Original contains color illustrations

Report No.(s): JPL-D-32947; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40902>

A robustly stabilizing MPC (model predictive control) algorithm for uncertain nonlinear systems is developed that

guarantees the resolvability of the associated finite-horizon optimal control problem in a receding-horizon implementation. The control consists of two components; (i) feedforward, and (ii) feedback part. Feed-forward control is obtained by online solution of a finite-horizon optimal control problem for the nominal system dynamics. The feedback control policy is designed off-line based on a bound on the uncertainty in the system model. The entire controller is shown to be robustly stabilizing with a region of attraction composed of initial states for which the finite-horizon optimal control problem is feasible. The controller design for this algorithm is demonstrated on a class of systems with uncertain nonlinear terms that have norm-bounded derivatives, and derivatives in polytopes. An illustrative numerical example is also provided.

Author

Optimal Control; Models; Algorithms; Nonlinear Systems

20080036131 Heller Research Associates, Oakland, CA, USA; San Francisco State Univ., CA, USA; California Univ., Berkeley, CA USA

Effects of ‘Math Pathways and Pitfalls’ on Students’ Mathematics Achievement

Heller, J. I.; Curtis, D. A.; Rabe-Hesketh, S.; Verboncoeur, C. J.; Aug. 29, 2007; 85 pp.; In English

Report No.(s): PB2008-102339; No Copyright; Avail.: CASI: [A05](#), Hardcopy

This study addressed two sets of questions. First, the evaluation was designed to measure the impact of Mathematics Pathways and Pitfalls (MPP) on the mathematics that second-, fourth-, and sixth-grade students learn. The specific research questions that were addressed are: (a) What is the impact of MPP on students knowledge of the mathematics topics addressed, compared to that of students using the regular math curriculum; and (b) How equitable is the impact of MPP on students mathematics knowledge across levels of English language proficiency and entering mathematics ability. To contribute to the interpretation of the results, the research also examined the fidelity of lesson implementation as enacted within MPP classrooms, compared to the structure and processes that were intended by the curriculum designers. Questions that were addressed are: (a) How closely does MPP as enacted follow the structure, content, and discourse processes that were intended by the curriculum designers; and (b) How does MPP as enacted in classrooms that had greater student math score gains compare with MPP in classrooms with lower student gains.

NTIS

Schools; Students

20080036137 General Electric Co., Niskayuna, NY, USA

System and Method for Tube Bending

Zhang, W., Inventor; Jones, M. G., Inventor; Mika, D. P., Inventor; Farrell, B. H., Inventor; Graham, M. E., Inventor; 29 Jun 05; 16 pp.; In English

Contract(s)/Grant(s): 70NANB2H303

Patent Info.: Filed Filed 29 Jun 05; US-Patent-Appl-SN-11-170 360

Report No.(s): PB2008-100118; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for bending a tube in a pre-selected geometry includes deriving at least one processing parameter from the geometry, applying a thermal source circumferentially to the tube to heat the tube along at least one circumferentially directed path in accordance with the parameter and actively cooling the tube to a pre-selected temperature. The applying and active cooling steps are alternately performed a number of times. A system for bending the tube includes a thermal source for heating at least one region along the path on the tube, a tube advancing module for advancing the tube, an active cooling module for cooling the tube to a pre-selected temperature, a processing module to derive at least one processing parameter from the geometry and a control module configured to control the thermal source and active cooling module in accordance with the parameter. The alternate heating and cooling are performed a number of times.

NTIS

Bending; Patent Applications

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 *Electronics and Electrical Engineering*. For computer vision see 63 *Cybernetics, Artificial Intelligence and Robotics*.

20080035547 State Univ. of New York, Amherst, NY USA

Adaptive Digital Signature Design and Short-Data-Record Adaptive Filtering

Pados, Dimitiris A; Apr 2008; 147 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-04-2-0179; Proj-IIUB

Report No.(s): AD-A481473; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report covers the research performed to create and develop a digital signature design analysis and development methodology that will support robust multi-user communications in rapidly changing environments. Short-data-record adaptive filtering analysis and development was also performed to support the multi-user signature design algorithms in terms of its performance in and application to multiple-input-multiple-output (MIMO) systems.

DTIC

Adaptive Filters; Code Division Multiple Access; Digital Systems; Signatures

20080036328 Northwestern Univ., Evanston, IL USA

(QC Themes) Type-Two Quantum Computing in PBG-Based Cavities for Efficient Simulation of Lattice Gas Dynamics

Shahriar, Selim; Apr 26, 2008; 61 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0189

Report No.(s): AD-A481625; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481625>

The key challenge in this project was to realize a high-quality PBG structure in a crystalline thin film of diamond. This task proved to be extremely difficult, due to severe constraints. Significant technical hurdles in the context of lithography have to be overcome before a PBG based QC can be realized in NVD. The most promising approach would be to use the polished single crystal and would require research into developing techniques for polishing diamond, and incorporating such a film into E-beam lithography, as outlined at the end of this report. We have also pursued several other lines of work, resulting in demonstrations of complimentary technologies for realizing a QC. These include (a) arbitrary pattern lithography, using atomic interferometry, (b) a QC architecture using atomic ensembles as quantum bits, (c) ultra-low power non-linear optic effects in a tapered nanofiber, as an enabling technology for optically linking ensemble-based quantum bits, and (d) suppression of driver phase correlated fluctuations in the rotation of a quantum bit. Support from this grant led to two Ph.D. theses, and a total of 21 publications, including 5 journal papers.

DTIC

Cavities; Diamond Films; Gas Dynamics; Lattice Vibrations; Quantum Computation; Simulation

20080036574 Illinois Univ. at Urbana-Champaign, Urbana, IL USA

Computational Equipment for Support of Air Force Sponsored Programs for the Design of Advanced and Miniaturized Explosive and Advanced Propellant Systems

Stewart, D S; Buckmaster, John D; Jackson, Thomas L; May 2, 2008; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-06-1-0332; 05NM300

Report No.(s): AD-A481985; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This grant funded the acquisition of a 128 node/256 processor cluster computer that now supports the computational needs of the combined, Air Force-sponsored research groups of Prof. D. Scott Stewart (PI) in Mechanical Science and Engineering, (MechSE), Prof. John Buckmaster (Co-PI) in Aerospace Engineering (AE), and Thomas L. Jackson (Co-PI) in Computational Science and Engineering (CSE), all at the University of Illinois. The combined Stewart/Buckmaster/Jackson group continues to support advanced explosive system design and advanced propellant combustion and addresses critical areas needed for advanced high energy density devices central to the AF's mission. Stewart is currently supported by grants from AFRL Munitions Directorate and AFOSR/ Physical Mathematics and Applied Analysis (AFOSR/NE). Buckmaster and Jackson are supported independently by AFOSR/NE. Stewart's group in Mechanical Science and Engineering (MechSE) uses the equipment to carryout research simulations to model critical scientific experiments related to explosives devices of interest to the Munitions Directorate, (AFRL/RW), Eglin AFB, such as adaptable munitions, miniature and micro-munitions efforts and other new systems, in collaboration with AFRL/RW and other designated research teams. The simulations of shock and detonation physics are fully three dimensional (3D), multi-scale, multi-phase, involve high-pressure, highdensity multi-

material interactions, and require facilities to carry out large-scale calculations. The Buckmaster/Jackson group are engaged in carrying out large-scale, 3D, multi-material simulations of low Mach number burning of heterogeneous propellants of current interest to AFRL's Propulsion Directorate, Space and Missile Propulsion Division and AF supported contractors. These simulations require long term averaging of the burning of propellant beds and need computations on a fast, parallel computational platform with rapid turnaround for optimization.

DTIC

Computerized Simulation; Computers; Miniaturization; Propellants; Universities

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20080035242 Queens Univ., Kingston, Ontario Canada

Development of a Dynamic Biomechanical Model for Load Carriage: Phase 1, Part B: Technical Manual with Update for Fastrak Analysis and Report Program for LC Simulator

Stevenson, J M; Pearce, G W; Good, J A; Reid, S A; Aug 2005; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481124; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481124>

The objective of this report is to write a technical manual for the further development of the Fastrak software for the Load Carriage (LC) Simulator. The Fastrak system use has been extended to provide phase shift and amplitude information about the motion of the pack relative to the mannequin. A Fastrak purpose built computer program called APLCS was designed to produce specified statistical and graphical reports from the data files. This is a new software analysis program and can be used for several purposes: (a) it can examine the frequency content of the pack and person during standardized motions on the LC Simulator, (b) it can be used to determine whether a suspension system can be designed to transfer mechanical energy within the gait cycle to assist the person in walking, and (c) can be used to create a better dynamic biomechanical model (DBM) as it can help model the actions of the pack person interface force requirements. The hardware adaptations for use with this software were reported in PWGSC# W7711-0-7632-01 Phase I. This report is designed to document the software program's functions and replace Section 8.5.3 from the report of PWGSC# W7711-7-7420 Section B of the User's Manual for the Load Carriage Simulator (V1.02). This report is divided into four sections that describe: data files and their loading, statistical computations, tabular reports and graphical reporting.

DTIC

Biodynamics; Carriages; Dynamic Loads; Dynamic Models; Human Factors Engineering; Loads (Forces); Manuals; Simulators

20080035342 Air Force Research Lab., Wright-Patterson AFB, OH USA

Scientific and Graphic Design Foundations for C2

Havig, Paul; Ng, Foo M; Jun 2007; 52 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481259; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Whether designing from scratch or modifying an existing command and control 'C2' platform one should always take into account the vast amount of background research that has been performed in both the psychological as well as the graphical design literature. However, surveying this vast literature can be daunting as well as overwhelming if one's background is not in the applied science 'e.g., psychology'. A review is given of the most relevant issues in the literature as well as how the findings may be applied. For example, for graphical design the work of authors such as Tufte, Ware, and Healy is discussed, and how their approaches help one to better design graphical interfaces. Likewise, a review of the psychological literature will discuss issues such as attentional capacity issues 'e.g., attentional capture, change blindness' and memory issues 'short versus long term versus working memory', among others. Finally, a proposed method for taking into account and applying these principal for the design of an optimal C2 system is discussed.

DTIC

Command and Control; Computer Graphics; Graphs (Charts)

20080035348 George Mason Univ., Fairfax, VA USA

Interactive Planning for Capability Driven Air & Space Operations

Zaidi, Abbas K; Levis, Alexander H; Apr 30, 2008; 204 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49550-05-1-0106

Report No.(s): AD-A481270; GMU/SAL-08-502; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The report describes the progress made, during the reporting period (March 01, 2005 to Aug. 31, 2006), on research conducted to develop approaches for capability driven planning, and to identify/develop methodologies and tools to implement the approach. The report presents work on a temporal representational and reasoning formalism and its software implementation. It also presents findings on an examination of the need and nature of campaign of experimentation to explore approaches to planning in the context of network centric operations.

DTIC

Airspace; Military Operations; Planning; Software Development Tools

20080035351 Drexel Univ., Philadelphia, PA USA

A Reference Model for Agent-Based Command and Control Systems

Dugan, Christopher J; Modi, Pragnesh J; Kopena, Joseph B; Mongan, William M; Regli, William C; Mayk, Israel; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481275; XA-CERDEC/C2/NJ; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Standardization and the ability to integrate similar agent-based systems will be a key factor in the deployment of future military agent-based systems: multiple developers can coordinate in the development phase, integration with existing components will be streamlined in the deployment phase, and collaboration with similar systems (such as coalition forces) will be trivial. Unfortunately, there exists no taxonomy of terms that can describe concepts, definitions, and functional elements within agent-based systems. This makes accomplishing the above difficult if not impossible. In this paper, we describe a reference model for agent-based systems and show the methodology behind its development. Such a comprehensive reference model will facilitate adoption, adaptation, and integration of agent technologies into systems for use by government and private industry, with a particular focus on applications in military command and control.

DTIC

Command and Control; Computer Programming; Software Engineering

20080035361 General Accounting Office, Washington, DC USA

DOD Business Systems Modernization: Military Departments Need to Strengthen Management of Enterprise Architecture Programs

Hite, Randolph C; Johnson, Tonia; Eagle, Timothy; Epps, Elena; Holland, Michael; Lakhmani, Neela; LaPaza, Rebecca; Le, Anh; Paintsil, Freda; May 2008; 57 pp.; In English

Report No.(s): AD-A481316; GAO-08-519; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The military departments respective enterprise architecture programs have yet to advance to a level that can be considered mature. To effectively establish and leverage enterprise architectures as instruments of organizational transformation, research by us and others show that architecture programs should be founded upon both an institutional commitment and a measured and verified organizational capability to properly develop, maintain, and use the architecture to affect operational and technological change. Our framework for managing and evaluating the status of architecture programs consists of 31 core elements related to architecture governance, content, use, and measurement that are associated with five stages of maturity. In 2006, we reported that the Departments of the Air Force, Navy, and Army were in the initial stage of our framework, and they remain so today. This means that they have not fully satisfied all the core elements associated with the framework's second stage (establishing the management foundation for developing, maintaining, and using the architecture); nor have they fully satisfied the core elements associated with Stage 3 (developing the architecture), 4 (completing the architecture), and 5 (leveraging the architecture for organizational change). As we have previously reported, an organization generally needs to have achieved Stage 5 in our framework for it to have an effective architecture program because, at this stage, the full complement of architecture products and supporting management controls and structures are in place to guide and constrain information technology (IT) investments in a way that produces institutional results.

DTIC

Architecture (Computers); Commerce; Management Planning; Military Operations

20080035396 Space and Naval Warfare Systems Center, San Diego, CA USA

PAL Boot Camp: Preparing Cognitive Assistants for Deployment

Lange, Douglas S; Carlin, Michael; Ivanchenko, Volodymyr; Berzins, Valdis; Jun 2007; 19 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481417; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Most visions for decision support and information technology anticipate the use of machine learning to enable software to respond to an adapting environment, including the ability to learn capabilities while on-the-job. Currently, systems and software engineering processes hinder employment of task learning technology, because the adaptation it provides runs counter to our notions of stability. Similarly, systems must typically demonstrate satisfaction of requirements before deployment, rather than learn tasks while on the job. This paper introduces new problems for the field of software engineering and discusses an approach for preparing cognitive systems for deployment. We describe one approach to a boot camp for cognitive systems and present the results of simulations of the boot camp. The results of our experiments provide thresholds and patterns for knowledge, and the requirement for specific patterns of human use of cognitive systems. These results are then used to infer requirements for a boot camp and measures for the prediction of successful employment of the assistant.

DTIC

Cognition; Deployment; Software Development Tools

20080035403 Defense Advanced Research Projects Agency, Arlington, VA USA

COMPOEX Technology to Assist Leaders in Planning and Executing Campaigns in Complex Operational Environments

Kott, Alexander; Corpac, Peter S; Jun 19, 2007; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481435; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Advanced Research Projects Agency is developing transformational technologies to enhance the capability of military commanders and their civilian leaders to plan and conduct campaigns in a complex operational environment. Leaders must understand the operational environment, develop campaign plans that include multiple lines of effort such as security, governance, political-economic development, rule of law and employ all elements of national and international power. The Conflict Modeling, Planning and Outcomes Experimentation (COMPOEX) Program is developing an integrated set of decision aids to assist leaders in planning and executing campaigns. A powerful family of interacting models, developed in the most appropriate paradigm and able to be modified by the user, describes the operational PMESII environment. The Option Exploration tool enables multiple, concurrent actions in different domains to be executed and a range of possible outcomes identified. It can be used in the development of plan as well as evaluation of courses of action. The Campaign Planning tool provides a framework to develop, visualize and manage the comprehensive campaign plan. Leaders can see the interconnections between different lines of effort, understand the impact of actions across the entire plan and assess and modify the plan based on measured performance on the ground.

DTIC

Decision Support Systems; Military Operations; Planning; Software Development Tools

20080035414 Space and Naval Warfare Systems Command, Charleston, SC USA

Mapping Network Centric Operational Architectures to C2 and Software Architectures

Lenahan, Jack; Charles, Phil; Reed, Rebecca; Pacetti, Don; Nash, Mike; Jun 2007; 48 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481457; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We are interested in mapping operational architectures to command and control and software architectures. In his poignant paper, Dekker proposed a 'Taxonomy of Architectures' which provides an interesting spectrum of network centric operational configurations. The goal of this paper is to answer the following question: given the variety of architecture models presented by Dekker, what command and control model is appropriate for each, and what software architecture is appropriate for each? In particular, this research will examine if the German control free model applies to all of the different operational architectures and whether or not the service oriented architecture (SOA) is the appropriate software architecture solution for each of the models. Our gedanken experiment results show that the configuration of assets and how they were organized (commanded and controlled) actually increased their collective capabilities given an optimized hybrid SOA, MOMS (Message Oriented Middleware), and Agent Based software infrastructure. This means that any capability portfolio analysis or competency assessments which only focuses upon individual asset contributions, fails to account for the behavior of a team or the

possibility of 'collective swarm intelligence'. This almost by definition will lead to procurement decisions detrimental to the basic capability of the DoD.

DTIC

Command and Control; Service Oriented Architecture

20080035434 California Univ., Riverside, CA USA

Optimal Power Schedule for Distributed MIMO Links

Rong, Yue; Hua, Yingbo; Nov 2006; 3 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011; W911NF-04-1-0224

Report No.(s): AD-A481493; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we study a wireless network of distributed MIMO links that are located in a neighborhood with mutual interference. We aim to develop an optimal power schedule (OPS) to maximize a total throughput of the network. Our proposed OPS allows the source covariance matrices of all MIMO links to vary within a block of time slots. This new approach exploits both the spatial and temporal freedoms of distributed MIMO links. Our results show that the new approach outperforms the existing ones.

DTIC

MIMO (Control Systems); Schedules; Wireless Communication

20080035548 Global InfoTek, Inc., Reston, VA USA

A Software Agent Toolkit for Effective Information Processing in the Battle Command Domain

Gimber, Tedd W; Huhns, Michael N; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481497; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Commanders of combat units have traditionally desired as much information as possible to aid them in making key decisions. Ironically, we have reached the stage where there is now too much information available. A commonly proposed solution is to utilize software agents to collect information, select what is useful, and deliver it to the commander. By their nature, software agents are active, distributed, intelligent, and persistent computations, so they can enable the best information to be made available when and where it is needed. Unfortunately using such software agents effectively requires computer programming expertise not typically available to a battlefield commander. Global InfoTek Inc (GITI) is currently assembling a suite of agent development tools that will enable programmers to develop software agents that can be controlled and manipulated by the commanders in the field.

DTIC

Data Processing; Interoperability; Software Development Tools

20080035589 Georgia Tech Applied Research Corp., Atlanta, GA USA

High Performance Embedded Computing Software Initiative (HPEC-SI) Program Facilitation of VSIPL++ Standardization

Campbell, Daniel P; Apr 2008; 13 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-1-0179; Proj-HPEC

Report No.(s): AD-A481347; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Vector Signal and Image Processing Library (VSIPL) is an industry standard Application Programming Interface for embedded signal processing tasks. The High Performance Embedded Computing Software Initiative (HPEC-SI) program is a collaborative program to establish extensions to the VSIPL specification to support Object Oriented elements of the C++ programming language, and encapsulated support for data parallel processing. The program goals include the simultaneous threefold improvement in software portability, threefold improvement in developer productivity, and fifty percent improvement in software performance compared to standard practices. This report describes the efforts of the Georgia Tech Research Institute in support of the HPEC-SI program during the period from June 2006 through December 2007. These efforts included development of organizational strategies, participation in the HPEC-SI Applied Research and Development Working Groups, dissemination of program results to outside organizations via internet tools, and maintenance of a parallel computing software testbed for program participants, and development of an automated process for the configuration of certain types of computing nodes.

DTIC

Application Programming Interface; Computer Programming; Computer Programs; Software Engineering; Standardization

20080035590 Air Force Research Lab., Rome, NY USA

Hardware Based Function Level Mandatory Access Control for Memory Structures

Yan, Lok K; Apr 2008; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-230B

Report No.(s): AD-A481295; AFRL-RI-RS-TM-2008-18; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report presents the results of the mini-grant research project. It explores a possible explanation on why buffer overflows, format strings and other memory related vulnerabilities are still prevalent today. It is argued that this can be attributed to the required level of user interaction to apply today's solutions. Therefore, the researched solution was a hardware based instruction level mandatory access control mechanism that will be enabled by default whenever a user obtains a new computer with such a processor. It also presents the reasoning behind why instruction level is more desirable than function level access control mechanism, which was the original theory. The design and proof of concept demonstration as well as difficulties in achieving the desired proof are also presented.

DTIC

Access Control; Computer Storage Devices; Computers; Control Units (Computers)

20080035592 Evidence Based Research, Inc., Suffolk, VA USA

Work-Centered Approach to Insurgency Campaign Analysis

Leedom, Dennis K; Noble, David F; Eggleston, Robert G; Jun 2007; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper outlines the recent development of a prototype tool suite that implements a work-centered approach for insurgency campaign analysis. The analytical approach is built around the construction of a linked set of beliefs that form the work control structure of an insurgency movement and its operational campaign. The work control structure reflects a sensemaking model of how an organization such as an insurgency movement combines high level intent with work system capability to produce a stream of actions along various pathways of influence. The prototype tool suite enables the analyst to instantiate the set of beliefs with streams of observable events gleaned from intelligence reports and news reports. As these events are added to the model, the analyst uses them to adjust the evidentiary strengths of the belief elements and, ultimately, to identify emergent story lines that provide a plausible explanation of the insurgency movement's campaign strategy. The paper discusses how this approach offers advantages over existing methods of intelligence analysis. It then outlines the functional architecture of the tool suite and provides a brief hypothetical illustration of how it can be used to address the complexity of a modern insurgency movement.

DTIC

Information Management; Intelligence

20080035605 Tennessee Univ., Knoxville, TN USA

High Productivity Computing Systems (HPCS) Library Study Effort

Dongarra, Jack; Demmel, James; Luszczek, Piotr; Husbands, Parry; Mar 2008; 21 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-1-0239; Proj-AD60

Report No.(s): AD-A481262; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research team explores a rich feature set, large algorithmic variety, and detailed implementation considerations for one of the most fundamental computational kernels of computational science: LU factorization of a dense matrix by Gaussian elimination with partial pivoting. For the target implementation platforms and systems, they analyze and compare established shared and distributed memory environments as well as relatively new Partitioned Global Address Space programming languages, which include those coming from the High Productivity Computing Systems (HPCS) project. To give quantitative measures of each hardware platform metrics, combined with implementation characteristics, they compare scalability, raw and relative performance as well as the source code features, functionality, and absolute size breakdown as measured by Source Lines of Code (SLOC).

DTIC

Computer Programs; Computer Storage Devices; Computers; Libraries; Productivity

20080036054 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Adaptive Automation - Claims and Use Cases

Arciszewski, H. F. R.; vandeVen, J. G. M.; teBrake, G. M.; Neerincx, M. A.; April 2008; 42 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 013.25343

Report No.(s): TNO-DV 2007 A611; TD2007-0282; Copyright; Avail.: Other Sources

The Royal Netherlands Navy will in the (near) future be confronted with increasingly demanding missions that have to be carried out with fewer personnel. Smarter systems such as 'adaptive systems' operators will be supported in faster and better information processing. Which will enable an operator to improve their situation awareness and their overall performance. The chosen method to transfer knowledge from this program to the Royal Netherlands Navy is a set of objectives and claims with corresponding use cases, which can be included in common software and usability engineering processes. To explain what the achievements should be of an adaptive system, and some of the trade-offs to be faced when actually developing such a system. The result is an overview explaining in more detail how an adaptive system (concerning identification) would operate under certain conditions. Readers can find use cases but also the related pseudo code in the document. The results of this project aid in understanding the use of an adaptive system and how it supports an operator. With this knowledge the Royal Netherlands Navy can establish and test their point of view whether adaptive systems should be developed and for which tasks.

Author

Adaptive Control; Automation; Software Engineering; Computer Programming

20080036260 Colorado State Univ., Fort Collins, CO USA

Natural Environments for Testing and Training: Developing Geographic Analogs for an Expeditionary Army

Doe, III, William W; Bailey, Robert G; Harmon, Russell; King, W C; Palka, Eugene J; Nov 2006; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481238; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The 21st century Army will be engaged in numerous joint and expeditionary operations throughout the five regional Combatant Commanders areas of responsibility. Currently, Army forces are deployed globally in more than 120 countries. These regions contain a wide range of natural environments that present unique operational challenges to soldiers and equipment. The distribution of climate, terrain and other environmental factors, and their potential effects on Army operations, must be fully understood. There is a direct geographical and physical relationship between where the Army trains soldiers and tests equipment at U.S. installations to where it will deploy its forces. The conduct of any military enterprise is conditioned by the character of the area of operations--the military operating environment (Palka and Galgano, 2005). Military history and military geography, as well as lessons learned from current operations, provide ample evidence that understanding and adapting to the natural environment is a critical component of operational success. A revised framework for understanding the natural environments of operational areas, and their relationships to U.S. training and testing installations, is presented. This framework the Global Military Operating Environments (GMOE) is developed from a worldwide eco-regional classification system that provides a logical and scientifically based approach to characterizing the spatial distribution of climates and associated environmental factors. The GMOE framework allows for comparison of operational environments across the globe to those found on U.S. Army installations where training of soldiers and testing of equipment take place.

DTIC

Education; Military Operations; Lessons Learned; Classifications

20080036274 Army Communications Research and Development Command, Fort Monmouth, NJ USA

An Extensible Data Collaboration Framework Based on Shared Objects

Goldin, Marvin; Chase, Timothy; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481537; XA-CERDEC/C2/NJ; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481537>

Data sharing and collaboration are vital to the successful implementation of network-centric warfare. This paper discusses a novel approach to data sharing and collaboration based on sharing data objects instead of just sharing the data itself. Sharing objects permits not only data sharing, but also the sharing of the methods required to interpret the data. The net result is a shared object framework that enables multiple clients to create data objects locally, drive those objects to an interesting state and then share the objects and their subsequent future state transformations among interested clients. As described, the system is extensible because clients may introduce new objects as needed.

DTIC

Command and Control; Information Management; Multisensor Fusion; Software Development Tools

20080036275 Army Research Lab., Adelphi, MD USA

Gravitational Analysis of the In-Band Wormhole Phenomenon

Gopaul, Richard; Kruus, Peter; Sterne, Dan; Rivera, Brian; Nov 2006; 9 pp.; In English

Report No.(s): AD-A481538; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481538>

In-band wormhole attacks undermine routing by attracting network traffic that otherwise may have bypassed the attackers via alternate, lower-cost routes. The result gives the attackers control over the attracted traffic, allowing them to modify, delay, redirect, eavesdrop, or drop the traffic. In this paper we expand upon the gravitational analysis technique, first presented in Kruus et al. [2006], for evaluating the effects of in-band wormhole attacks on OLSR routing. The gravitational analysis technique examines individual network topologies and results in the creation of a gravitational chart for each topology. The gravitational charts contain the necessary data to define the attractiveness of a specific wormhole configuration and the penalty incurred by source-destination pairs affected by the wormhole path. We attempt to gain insight into both node and topology vulnerability to the in-band wormhole attack by analyzing the raw data contained within the gravitational charts using several new cost, attraction, and detection metrics defined in this paper. Analysis of the gravitational charts with respect to these metrics allows both topologies and the individual nodes and paths within a topology to be quickly compared and ranked. We can then easily identify those topologies that are most or least impacted by the wormhole and assess the specific topological characteristics responsible, facilitating more efficient and effective intrusion detection system design.

DTIC

Data Transmission; Security; Traffic

20080036276 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Efficient and Secure Distribution of Information Without the Need of a Central Organizing Entity

Gaughan, C J; Sagripanti, J L; Bottiger, M P; Anderson, G; Nov 2006; 5 pp.; In English

Report No.(s): AD-A481539; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481539>

In the pursuit of new research into the field of network sciences, we have chosen to focus on current logistical communication issues. The following research has been directed toward the application of basic swarm theory in managing data transfer securely over a dynamic network. The successful completion of this work will provide simple to compute solutions to currently intensive communication problems.

DTIC

Data Transmission; Security

20080036325 Army Research Lab., Aberdeen Proving Ground, MD USA

Reconfigurable Computing for Computational Science: A New Focus in High Performance Computing

Shires, Dale; Henz, Brian; Natoli, Vincent; Richie, David; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481620; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481620>

Computational science applications and advanced scientific computing have made tremendous gains in the past decade. Researchers are regularly employing the power of large computing systems and parallel processing to tackle larger and more complex problems in all of the physical sciences. For the past decade or so, most of this growth in computing power has been 'free' with increased efficiency more-or-less governed by Moore's Law. However, increases in performance are becoming harder to achieve due to the complexity of the parallel computing platforms and the software required for these systems. Reconfigurable computing, or heterogeneous computing, is offering some hope to the scientific computing community as a means to continued growth in computing capability. This paper offers a glimpse of the hardware and software associated with this new technology and discusses how the new paradigm functions for computational science.

DTIC

Parallel Processing (Computers); Physical Sciences

20080036340 Army Tank-Automotive Research and Development Command, Warren, MI USA

A Design Approach for Dynamic Reconfiguration of Unattended Sensors, Unmanned Systems, and Monitoring Stations

Skalny, Matthew W; Smuda, William; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481654; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481654>

The design and implementation of software for networked systems of diverse physical assets is a continuing challenge

to robotic and network sensor developers. The problems are often multiplied when reconfiguring or adding new elements to existing designs in order to meet the demands of changing tactics and missions, and to meet new requirements for interoperability and additional capabilities. Systems are often designed in a way such that configuration and reconfiguration may be difficult, time consuming, and costly. Interoperability between new and legacy systems may require significant changes to the code and design of a system. Static or closed designs can lead to a system that is difficult to add new sensors or payloads to. In this paper, we describe a design approach that utilizes Model Driven Engineering (MDE), the OSGi Service Platform framework (OSGi), and an open, flexible services oriented architecture to maximize software reuse and to ensure rapid development of new features and capabilities to meet the changing requirements for unmanned systems.

DTIC

Architecture (Computers); Interoperability

20080036360 Army Aeromedical Research Lab., Fort Rucker, AL USA

Helmet-Mounted Display Computer Model and Research Visualization Tool

Harding, T H; Martin, J S; Rash, C E; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481683; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481683>

As the Army increases its reliance upon helmet mounted displays (HMDs) or head-up displays (HUDs), it is paramount that displays are developed that meet the operational needs of the warfighter. During the development cycle, questions always arise concerning the operational requirements of the HMD. These include questions concerning luminance, contrast, color and resolution. To provide intelligent answers to these operational questions, a method has been devised to evaluate these issues. Integral to this method is a HMD simulation model. The model allows for contrast correct visualizations of see-through imagery. The imagery consists of symbology/situational maps overlaid over natural backgrounds. Using visual psychophysical procedures, observers judge the quality of the symbology for a range of luminance and background conditions. The simulated images were analyzed and statistical correlates were developed that could relate to the observer's ratings. Metrics were developed that could help predict the operational luminance requirements for HMD or HUD symbology.

DTIC

Computerized Simulation; Helmet Mounted Displays

20080036442 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

Integration and Optimization of Projectile Design Models

Farina, Anthony P; Chassapis, Constantine; Chen, Yin M; Nov 1, 2006; 6 pp.; In English

Report No.(s): AD-A481842; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481842>

This paper presents an approach towards the development of an integrated design environment with design optimization capabilities wherein the projectile design, geometry, or changes to those of an existing projectile, will be optimized with respect to performance requirement(s). Additionally, the design process will be simplified by the integration between predictive codes in this environment. This environment will include a procedure for making first cut or rough estimates in the initial stages of design so that lengthy and expensive design code runs can be reserved for promising design configurations.

DTIC

Computer Aided Design; Models; Optimization; Projectiles

20080036479 Reaction Engineering International, Salt Lake City, UT USA

A Software Framework for Blast Event Simulation

Swensen, D A; Denison, M K; Guilkey, James; Harman, Todd; Goetz, Richard; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W56HZV-05-C-0630

Report No.(s): AD-A481936; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481936>

Protection of US Army vehicles and personnel against landmine and IED threats is an increasingly important concern in the area of defense research. In this paper we describe the development of a Blast Computational Framework (BCF) that will provide an advanced modeling environment and a suite of tools for performing soil bound explosion simulations and their effects on vehicles and on the human occupants of the vehicles. The BCF will provide a virtual test-bed where disparate computational models can seamlessly interact with one another to provide a unified modeling solution for blast-vehicle-

occupant scenarios. The BCF is being developed using state-of-the-art component-based software architecture and will provide a suite of integrated models consisting of both new and existing simulation tools. The enhanced simulation capabilities provided by the BCF will serve to better protect the crews of existing vehicles and to help design next-generation vehicles as well.

DTIC

Computerized Simulation; Simulation; Software Development Tools

20080036487 Kentucky Univ., Lexington, KY USA

Using Coupled Eulerian And Lagrangian Grids To Model Explosive Interactions With Buildings

Lusk, B; Schonberg, W; Baird, J; Woodley, R; Noll, W; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481951; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481951>

This paper presents the development of a computational model that can be used to study the interactions between structures and detonating explosives contained within them. This model was developed as part of an effort to develop a rubble characterization model for use in AmmoSIM, an agent based urban tactical decision aid (UTDA) software for weapon-target pairing. The rubble pile created following the collapse of a building in a combat situation can significantly impact mission accomplishment, particularly in the area of movement and maneuver. The information provided by AmmoSIM will enable both platoon level and command center staff to make informed decisions concerning urban attack tactics. Computational models were created using a combination of AUTODYN 2D and 3D. The detonation was modeled using a 2D wedge, which is a common method used in AUTODYN. The information obtained from the wedge calculation was then written to a data file and subsequently remapped into a larger 3D Euler air grid. The air grid loaded with blast pressure information was coupled to interact with the Lagrangian building parts. The Riedel, Hiermaier and Thoma (RHT) Concrete Model from the AUTODYN material library was utilized to create the components of the building. Results of the latest models will be given. Additionally, the paper details the development of the model at length including topics such as grid sizing, computational cost comparisons, grid interactions, multi-solver coupling, strain erosion, and material parameters and selections.

DTIC

Buildings; Computerized Simulation; Lagrangian Function

20080036537 NASA Marshall Space Flight Center, Huntsville, AL, USA

Earth Global Reference Atmospheric Model 2007 (Earth-GRAM07)

Leslie, Fred W.; Justus, C. G.; July 13, 2008; 34 pp.; In English; 37th Committee on Space Research (COSPAR) Scientific Assembly, 13-20 Jul.2008, Montreal, Canada; Copyright; Avail.: CASI: A03, Hardcopy

GRAM is a Fortran software package that can run on a variety of platforms including PC's. GRAM provides values of atmospheric quantities such as temperature, pressure, density, winds, constituents, etc. GRAM99 covers all global locations, all months, and heights from the surface to approx. 1000 km). Dispersions (perturbations) of these parameters are also provided and are spatially and temporally correlated. GRAM can be run in a stand-alone mode or called as a subroutine from a trajectory program. GRAM07 is diagnostic, not prognostic (i.e., it describes the atmosphere, but it does not forecast). The source code is distributed free-of-charge to eligible recipients.

Derived from text

Applications Programs (Computers); FORTRAN; Computer Programs; Reference Atmospheres; Forecasting; Perturbation

20080036555 Maryland Univ., College Park, MD USA

The Maryland Large-Scale Integrated Neurocognitive Architecture

Reggia, J; Tagamets, M; Contreras-Vidal, J; Jacobs, D; Weems, S; Naqvi, W; Yang, C; Mar 2008; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-2-0272; Proj-BICA

Report No.(s): AD-A481261; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recent progress in neural computation, high performance computing, neuroscience and cognitive science suggests that an effort to produce a general-purpose, adaptive machine intelligence is likely to yield a qualitatively more powerful system than those currently existing. Here we outline our progress in developing a framework for creating such a large-scale machine intelligence, or neurocognitive architecture that is based on the modularity, dynamics and plasticity of the human brain. We successfully implemented three intermediate-scale parts of such a system, and these are described. Based on this experience, we concluded that for the short term, optimal results would be obtained by using a hybrid design including neural, symbolic

AI, and artificial life methods. We propose a three-tiered architecture that integrates these different methods, and describe a prototype mini-Roboscout that we implemented and evaluated based on this architecture. We also examined, via computational experiments, the effectiveness of genetic programming as a design tool for recurrent neural networks, and the speed-up obtained for adaptive neural networks when they are executed on a graphical processing unit. We conclude that the implementation of a large-scale neurocognitive architecture is feasible, and outline a roadmap for proceeding.

DTIC

Neural Nets; Computation

20080036570 Naval Postgraduate School, Monterey, CA USA

A Testbed for High Assurance and Dynamic Security

Nguyen, Thuy D; Irvine, Cynthia E; Levin, Timothy E; May 19, 2008; 23 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481979; NPS-CS-08-010; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Providing a stable testing environment for experimentation is a common goal of all Testbeds. To date, few, if any, have supported research in high assurance multilevel security (MLS), cross domain enterprise services and emerging Information Assurance technologies envisioned for the Global Information Grid and similar complex distributed enterprise networks. To facilitate this research, an MLS Testbed has been developed to support experimentation on, rapid prototyping of, and testing of the results of selected MLS technologies. The MLS Testbed integrates a variety of multi-vendor equipment and software to simulate a realistic network with dynamic and collaborative operational needs. This report describes the design of the MLS Testbed, the MYSEA MLS architecture and recent enhancements to the MYSEA software architecture to support IPsec-based dynamic security services.

DTIC

Architecture (Computers); Security

20080036589 Naval Air Warfare Center, China Lake, CA USA

Results of the Software Process Improvement Efforts of the Early Adopters in NAVAIR 4.0

Saint-Amand, David C; Hodgins, Bradley; Dec 2007; 44 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482027; NAWCWD-TP-8642; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper is an overview of the process improvement efforts of the Naval Air Systems Command's (NAVAIR) Air 4.0, Research and Engineering Competency. It focuses on 24 software engineering teams within the U.S., and specifically on the six teams that were early adopters: the AV-8B Joint System Support Activity; the E-2C, EA-6B, P-3C, and Tactical Aircraft Electronic Warfare Software Support Activities; and the F/A-18 Software Development Task Team. These teams ranged in size from less than 10, to more than 70 NAVAIR software engineers and support contractors. The process improvement efforts described in this paper began in the 1990s and early 2000s. Their process improvement tool sets included the Capability Maturity Model, the Capability Maturity Model (CMM) Integration, the Personal Software Process (PSP), the Team Software Process (TSP), the Earned Value Management System (EVMS), the High Performance Organization, and the Team Software Process for Multiple Teams (TSPm)SM. (U) By 2005, the early adopters had achieved impressive results: the first CMM Level 5 rating in the Navy, the second EVMS certification in the Federal Government, two teams achieving CMM Level 4 in less than half the normal time, reductions in software defect densities between 22 and 48%, reductions in the variances of the actual cost and schedule to within 10% of the estimates, and two TSP software teams realizing a net combined savings of \$2.746 million with the conclusion of their first TSP software development projects. These cost savings were six times the cost of AV-8B's and P-3C's investment in training and startup of PSP and TSP. The successes that NAVAIR's Air 4.0, Research and Engineering Competency, enjoyed helped to create a culture that is both interested in the continued pursuit and advancement of process improvement within its ranks, and desiring to spread process improvement to the larger organization.

DTIC

Computer Programming; Computer Programs; Electronic Warfare; Software Engineering

20080036605 Nebraska Univ., Omaha, NE USA

A Pilot Study to Compare Programming Effort for Two Parallel Programming Models (PREPRINT)

Hochstein, Lorin; Basili, Victor R; Vishkin, Uzi; Gilbert, John; Dec 28, 2007; 27 pp.; In English

Contract(s)/Grant(s): FA8750-05-1-0100

Report No.(s): AD-A482083; No Copyright; Avail.: Defense Technical Information Center (DTIC)

CONTEXT: Writing software for the current generation of parallel systems requires significant programmer effort, and the community is seeking alternatives that reduce effort while still achieving good performance. OBJECTIVE: Measure the

effect of parallel programming models (message-passing vs. PRAM-like) on programmer effort. DESIGN, SETTING, and SUBJECTS: One group of subjects implemented sparse-matrix dense-vector multiplication using message-passing (MPI), and a second group solved the same problem using a PRAM-like model (XMTC). The subjects were students in two graduate-level classes: one class was taught MPI and the other was taught XMTC. MAIN OUTCOME MEASURES: Development time, program correctness. RESULTS: Mean XMTC development time was 4.8 hours less than mean MPI development time (95% confidence interval, 2.0-7.7), a 46% reduction. XMTC programs were more likely to be correct, but the difference in correctness rates was not statistically significant ($p=.16$). CONCLUSIONS: XMTC solutions for this particular problem required less effort than MPI equivalents, but further studies are necessary which examine different types of problems and different levels of programmer experience.

DTIC

Computer Programming; Message Processing; Parallel Processing (Computers); Parallel Programming

20080036651 Naval Research Lab., Bay Saint Louis, MS USA

Validation of the Global Relocatable Tide/Surge Model PCTides

Posey, Pamela G; Allard, Richard A; Preller, Ruth H; Dawson, Gretchen M; Oct 17, 2007; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482182; NRL/JA/7320-06-6327; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Naval Research Laboratory (NRL) has developed a global, relocatable, tide/surge forecast system called PCTides. This system was designed in response to a U.S. Navy requirement to rapidly produce tidal predictions anywhere in the world. The system is composed of a two-dimensional barotropic ocean model driven by tidal forcing only or in conjunction with surface wind and pressure forcing. PCTides is unique in its ability to forecast tidal parameters for a user-specified latitude/longitude domain easily and quickly, and is especially useful in areas where observations are nonexistent. PCTides provides short-term (daily to weekly) predictions of water-level elevation and depth-averaged ocean currents. The system has been tested in numerous regions and validated against observations collected in conjunction with several navy exercises.

DTIC

Computer Programs; Forecasting; Ocean Models; Surges; Tides

20080036660 Army War Coll., Carlisle Barracks, PA USA

A New Architecture for Improved Human Behavior in Military Simulations

Burgess, Rene G; Apr 1, 2008; 41 pp.; In English

Report No.(s): AD-A482193; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Warfare has changed for the USA, and with this change has come an increased requirement for military leaders to be able to understand and win wars that are fought in the will of a population more than on the field of mounted warfare. Today's simulations and simulation training environments are insufficient to prepare these leaders for such a complex fight because they do not adequately model the human dimensions of modern warfare. It is imperative that the military improve conventional simulations to credibly model complex human behaviors. This paper investigates the current simulation training environment, and then proposes a specific architecture for improving conventional simulation environments to better reflect the complexity and rich cultural fidelity of the live operational environment. The Department of Defense can significantly enhance the portrayal of adversaries and target populations in its training simulations by using live human input harvested from a commercial-type online gaming environment. Increasing the quality of adversaries and simulated populations will create extremely challenging simulation training environments for military leaders and will prepare them for the difficulty of live operations.

DTIC

Education; Human Behavior; Models; Simulation

20080036673 Mei Technology Corp., San Antonio, TX USA

Interactive Multimedia Courseware Developed by Instructors

Wenzel, Brenda M; Jul 2001; 49 pp.; In English

Contract(s)/Grant(s): F41624-93-C-5002; Proj-1123

Report No.(s): AD-A482212; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report documents an evaluation of interactive multimedia courseware (ICW) developed by instructors using Experimental Advanced Instruction Design Advisor (XAIDA) as a authoring tool. The ICW developed by the instructors was implemented in classrooms for evaluation. Instructional effectiveness of the courseware was evaluated on three fronts - how

much students learned, efficiency with which they learned, and how they reacted to the learning experience. One hundred seventeen students and staff participated in the evaluation of eight ICW modules developed by their respective instructors. Overall, the courseware produced 8% to 125% increases in scores on factual knowledge tests. Students took from 15 to 36 minutes on average to complete the various courseware modules. The modules presented a nominal class period of 50 minutes. The majority of students had a positive learning experience. Notable is the increase in the percentage of students who prefer self-paced computer-based instruction (CBI) over instructor-based computer-assisted instruction (CAI) and group-paced classroom lectures. Before students participated in the evaluation, 40% preferred self-paced CBI and 35% preferred traditional classroom lectures. After participating in the evaluation, 55% of the students preferred self-paced CBI, 27% preferred classroom lectures, and 18% preferred CAI.

DTIC

Computer Assisted Instruction; Instructors; Learning; Multimedia

20080036695 Naval Research Lab., Washington, DC USA

A Hybrid Cognitive-Reactive Multi-Agent Controller

Bugajska, Magdalena D; Schultz, Alan C; Trafton, J G; Taylor, Matthew; Mintz, Farilee E; Oct 2002; 7 pp.; In English

Contract(s)/Grant(s): N00014-02-WX-20374

Report No.(s): AD-A482278; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this paper is to introduce a hybrid cognitive-reactive system, which integrates a machine-learning algorithm (SAMUEL, an evolutionary algorithm-based rule-learning system) with a computational cognitive model (written in ACT-R). In this system, the learning algorithm handles reactive aspects of the task and provides an adaptation mechanism, while the cognitive model handles cognitive aspects of the task and ensures the realism of the behavior. In this study, the controller architecture is used to implement a controller for a team of micro-air vehicles performing reconnaissance and surveillance.

DTIC

Control Theory; Controllers; Reactivity

20080036700 Carnegie-Mellon Univ., Pittsburgh, PA USA

Ambient Intelligence: The MyCampus Experience

Sadeh, Norman M; Gandon, Fabien L; Kwon, Oh B; Jul 2005; 28 pp.; In English

Contract(s)/Grant(s): F30602-02-2-0035; F30602-98-2-0135

Report No.(s): AD-A482307; CMU-ISRI-05-123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Over the past five years, the MyCampus group at Carnegie Mellon University has been developing and experimenting with Ambient Intelligence technologies aimed at enhancing everyday life. The project has drawn on multiple areas of expertise, combining the development of an open Semantic Web infrastructure for context-aware service provisioning with an emphasis on issues of privacy and usability. In this paper, we review key motivations behind the project, discuss the MyCampus Semantic Web infrastructure and report on our experience tailoring the architecture for different environments 'e.g. everyday campus life applications, office applications, museum tour guide'. This includes a discussion of Semantic e-Wallets aimed at reconciling user demands for context awareness and privacy as well as a description of different context-aware applications developed and evaluated during the course of the project. We also discuss our experience using Case-Based Reasoning 'CBR' functionality developed to overcome usability issues associated with capturing complex, context-sensitive user preferences. The paper concludes with a summary of lessons learned so far and of challenges still to be addressed.

DTIC

Computer Programming; Intelligence; Software Engineering

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

20080035429 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Dynamic Petri-Nets: A New Modeling Technique for the Topology of Distributed Sensor Networks

Graff, Charles J; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481486; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper introduces and describes a new extension to Petri-Nets that provides additional mechanisms for the modeling

of dynamic, distributed and concurrent behavior. The extensions provide for the creation and destruction of conventional Petri-Net Places and Transitions providing dynamic behavior of Petri-Net operation. We call this new Petri-Net model Dynamic Petri-Nets (DPN). With this new model, the structure of the Petri-Net, i.e. the interconnection of Places and Transitions, will evolve over time. The paper introduces specific rules for the Place/Transition modifications, and presents some new and well-known properties of Petri-Nets under these modifications. A Many Sorted Algebraic model of the DPN is presented that formally describes the techniques and relationships presented informally. Finally, an example of the use of these extensions is presented to represent the broadcast nature of mobile ad hoc and distributed sensor networks.

DTIC

Petri Nets; Topology

20080035534 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Using Query Languages and Mobile Code to Reduce Service Invocation Costs

Szymanski, R; Palmer, N; Chase, T; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481455; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper discusses an approach to reducing the overhead associated with service invocation while at the same time increasing the usefulness of the data returned by services. The described technique is based on shifting computation from the client side to the service side thereby reducing the number of calls the client must make to the service. It is shown that reductions in the number of service invocations can be substantial when the called service is part of a client initiated search algorithm. Performing the search on the service side greatly reduces the number of required service invocations. As a concrete example, this paper describes work being performed by CERDEC C2D (Communications Electronics Research, Development, and Engineering Center - Command and Control Directorate) at Fort Monmouth, NJ to expose a military mission plan as a web service through the use of simple SQL-like (Structured Query Language) statements optimized for mission data query.

DTIC

Client Server Systems; Cost Reduction; Query Languages

20080035604 Air Force Research Lab., Rome, NY USA

100X Joint Battlespace Infosphere (JBI)

Ramseyer, George O; Kwong-Yan, Lok; Linderman, Richard W; Mar 2008; 74 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-459T

Report No.(s): AD-A481253; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A high-performance information management architecture, based upon the JBI reference implementation, was developed and tested. The JBI reference implementation, developed at AFRL, specifies core services and a Common API (Application Program Interface) (CAPI) for a network-centric platform to support Command and Control communications. The 100X JBI meets the conceptual goals of the JBI by implementing the JBI CAPI and adhering to the standards established for the JBI core services. The 100X JBI was used in several experiments to evaluate its performance and test the CAPI and core services implementation. This report summarizes the experience in developing the 100X JBI reference implementation and the results of performance experiments.

DTIC

Architecture (Computers); Information Systems

20080036050 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Integrating Training Simulations and E-Learning Systems: The SimSCORM Platform

dePenning, H. L. H.; Boot, E. W.; Kappe, B.; July 2008; 25 pp.; In English

Contract(s)/Grant(s): V406; TNO Proj. 032.13224

Report No.(s): TD2008-0104; TNO-DV-2008-A259; Copyright; Avail.: Other Sources

TNO has studied the integration of e-learning and simulation and developed an approach based upon integration by means of de facto standards HLA and SCORM. The SimSCORM platform was build as proof of concept of this approach. This SimSCORM platform provides a dynamic integration of both types of systems. Although not a unique effort, TNO has chosen a rather distinctive and flexible approach. In TNO's approach, each learning task in the LMS is treated as a separate simulation component, which has its own direct link to the HLA simulation. This integration allows real-time, two-way interaction between one or more simulator(s) and the active learning task running in the LMS. The LMS, which can be any LMS as long as it is SCORM compliant, can be used for tracking, evaluation, and administration of training results, as well as for creating

or starting scenarios for the simulator. Furthermore, the SimSCORM platform promotes improved execution of joint training simulations (if necessary distributed), real-time assessment of learning processes, team training, the use of virtual instructors, without adaptations to the simulator or LMS provided they are respectively HLA and SCORM compliant.

Author

Educational Resources; Systems Integration; Computer Programs; Computer Systems Simulation

20080036252 Maryland Univ., College Park, MD USA

Component Based Routing: A New Methodology for Designing Routing Protocols for Manet

Baras, John S; Huang, He; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011; DAAD19-01-1-0494

Report No.(s): AD-A481449; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Large variation of performance due to various environment inputs is a major impediment of implementing existing routing protocols for MANET in the battlefield. Therefore, it is a major challenge to design a routing protocol that can adapt its behavior to environment alteration. In consideration of adaptability to the environment and flexibility in protocol construction, a novel component based routing protocol methodology is proposed in this paper. Distinguished from conventional investigation of routing protocols as individual entities, this paper will firstly generalize four fundamental components for MANET routing protocols. Then, a weak component diagnosis process is proposed to improve a weak component and enhance the overall performance. Finally, preliminary simulation results demonstrate the power of the component based methodology for improving overall performance and reducing performance variation. In conclusion, the evaluation and improvement at the component level is more insightful and effective than that at the protocol level.

DTIC

Protocol (Computers); Wireless Communication

20080036257 Naval Postgraduate School, Monterey, CA USA

Red Force Interaction in Situated Cognition

Miller, Gregory A; Lewis Miller, Nita; Shattuck, Lawrence G; Jun 2007; 38 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481300; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Efforts to maximize the impact of network centric warfare (NCW) rely upon the effective integration of human and technological agents. Combat and command and control models must represent the entirety of a network-centric organization, including both humans and non-human components which comprise any complex system. The Dynamic Model of Situated Cognition (DMSC) was introduced by Miller and Shattuck in 2003 as a tool to help analyze this kind of complex system. The model has been applied in a variety of contexts to analyze military command and control and extended and applied to areas broader than its original use. This paper proposes to extend the model by explicitly adding Red force cognitive processes. With the addition of adversary forces, aspects of information warfare can be modeled. This includes actions against an enemy's sensors and communications networks intended to reduce the quality of his information position and to disrupt the interaction between human and non-human elements of his command structure. Potential applications for the extension are proposed, including planning for and analyzing the effectiveness of 21st Century effects-based information operations against an enemy in both traditional and non-traditional conflicts.

DTIC

Cognition; Models; Complex Systems; Communication Networks

20080036259 Georgia Inst. of Tech., Atlanta, GA USA

Using YFilter Concepts for Fast Brokering in the Joint Battlespace Infosphere (JBI)

Fiore, Justin M; Zhao, Lei; Mooney, III, Vincent J; Mar 2008; 43 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-459T

Report No.(s): AD-A481335; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The use of YFilter concepts within the XML brokering task of the Joint Battlespace Infosphere (JBI) is described. Concepts from the YFilter were implemented and extended in the C++ language. The benefit of using YFilter concepts in the brokering task is to share as much processing between similar predicates as possible. The resulting reduction in brokering time

can enable faster performance and greater scalability in the JBI. The work presented includes an implementation of YFilter concepts in C++, integration with the 100X JBI, and performance analyses.

DTIC

Computers; Filters

20080036362 Johns Hopkins Univ., Laurel, MD USA

Modeling and Preliminary Simulation Studies for Packet-Based Precedence and Preemption for FCS Communications

Cole, Robert G; Chimento, Philip F; Sep 27, 2006; 9 pp.; In English

Report No.(s): AD-A481688; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481688>

In military networks, there had long been a requirement that some traffic be given precedence over other traffic. In the past, this has applied primarily to connection-oriented communication such as voice calls. With the advent of all-IP networks, applying the requirement to connectionless data, while maintaining QoS characteristics necessary for the correct operation of applications, presents challenges. In this paper, we describe our preliminary study of an approach to handling high-precedence IP traffic node-by-node.

DTIC

Command and Control; Queueing Theory; Simulation; Traffic

20080036556 Syracuse Univ., NY USA

Advanced Course in Engineering (ACE) - Cyber Security Boot Camp

Older, Susan; Apr 2008; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-05-2-0123; Proj-CSAE

Report No.(s): AD-A481252; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of the Advanced Course in Engineering on Cyber Security (ACE) was to develop next-generation cyber-security leaders, with a particular emphasis on educating future military leaders. ACE sought the best students at USA colleges and universities for this endeavor. ACE achieved its stated objectives by completely immersing students in the cyber-security discipline for ten weeks, through a combination of intense coursework, open-ended problems, and internship experiences at local government and industry cyber-security labs. While providing real-world problems, the ACE faculty taught the students to formulate clear problem statements, make reasonable assumptions, apply engineering tools and techniques, solve the problems to a certain depth, apply risk analysis to the solutions, and deliver those solutions on time. In addition to solving problems and delivering solutions on time, students learned to communicate through written reports and compelling presentations.

DTIC

Security; Education

20080036636 Defense Communications Agency, Arlington, VA USA

ARPANET Information Brochure

Mar 1978; 30 pp.; In English

Report No.(s): AD-A482154; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this brochure is to provide a description of the ARPANET and an overview of its operational management policies and procedures. ARPANET is an operational, resource sharing inter-computer network linking a wide variety of computers in CONUS, Hawaii, Norway, and England. Its communications system introduced the revolutionary technique of 'packet switching' where each message is broken up into small packets and each packet is switched to its destination over the quickest communications path available at any given instant. ARPANET was originally designed under a research and development program by the Defense Advanced Research Projects Agency in 1969, Management responsibility of the network was transferred to Defense Communications Agency on July 1, 1975.

DTIC

Arpa Computer Network; Computer Networks; Packet Switching

20080036666 Sage Solutions Group, Inc, Centreville, VA USA

Embedded Command and Control for the Soldier

Kamp, John; Mar 2008; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482203; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper explores a novel blending of the Soldier's tactical sensors with embedded sensors and systems in order to

provide Soldiers and their commanders with improved situational awareness. This paper will describe this concept, discuss some of the notional information exchanges, highlight some of the technical challenges and practical aspects of this approach to small unit battle command. The views contained in this article are those of the author and should not be interpreted as representing the official views of the Department of Defense.

DTIC

Command and Control; Embedding; Multisensor Fusion; Organizations; Situational Awareness

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CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

20080035187 Carnegie-Mellon Univ., Pittsburgh, PA USA

Beyond Brain Blobs: Machine Learning Classifiers as Instruments for Analyzing Functional Magnetic Resonance Imaging Data

Pereira, Francisco; Dec 2007; 213 pp.; In English

Contract(s)/Grant(s): HR0011-04-1-0041

Report No.(s): AD-A480989; CMU-CS-07-175; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480989>

The thesis put forth in this dissertation is that machine learning classifiers can be used as instruments for decoding variables of interest from functional magnetic resonance imaging (fMRI) data. There are two main goals in decoding Showing that the variable of interest can be predicted from the data in a statistically reliable manner (i.e. there's enough information present). Shedding light on how the data encode the information needed to predict, taking into account what the classifier used can learn and any criteria by which the data are filtered (e.g. how voxels and time points used are chosen). Chapter 2 considers the issues that arise when using traditional linear classifiers and several different voxel selection techniques to strive towards these goals. It examines questions such as whether there is redundant, as well as different kinds of, information in fMRI data and how those facts complicate the task of determining whether voxel subsets encode the desired information or whether certain choices of selection method or classifier are universally preferable. All the results presented were obtained through a comparative study of five fMRI datasets. Chapter 3 and Chapter 4 introduce the Support Vector Decomposition Machine, a new algorithm that attempts to sidestep the use of voxel selection by learning a low dimensional representation of the data that is also suitable for decoding variables of interest and has the potential to allow incorporation of domain information directly, rather than through the proxy of voxel selection criteria.

DTIC

Brain; Classifiers; Imaging Techniques; Machine Learning; Magnetic Resonance

20080035202 Oregon State Univ., Corvallis, OR USA

Very Fast Algorithms and Detection Performance of Multi-Channel and 2-D Parametric Adaptive Matched Filters for Airborne Radar

Marple, Jr , S L; Corbell, Phillip M; Rangaswamy, Muralidhar; Jun 5, 2007; 36 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481023; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481023>

In a seminal paper published in 2000, two algorithmic versions of the multichannel parametric adaptive matched filter (PAMF) applied to space-time adaptive processing (STAP) in an airborne radar application were shown to achieve superior test detection statistics over the conventional adaptive matched filter (AMF), which uses a non-parametric approach to estimate the detection weight vector. In fact, the performance of the PAMF approach is very close to the ideal matched filter (MF) detection statistics under exactly known covariance (the clairvoyant case). Improved versions of the two original multichannel PAMF algorithms, one new multichannel PAMF algorithm, and a new two-dimensional (2D) PAMF algorithm [all four with fast computational implementations] have been recently developed. In this paper, we provide the outline of the new 2D parametric algorithm and summarize the detection performance of 3 of the 4 new PAMF algorithms with actual Multi-Channel Airborne Radar Measurement (MCARM) data. In all cases, the performance is at least comparable to, and in

some cases superior to, the original multichannel PAMF algorithms presented in Rangaswamy et al (Apr 2000), while also achieving computational savings over the originals.

DTIC

Adaptive Filters; Airborne Radar; Algorithms; Detection; Matched Filters; Radar Filters

20080035208 Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ USA

The Design and Development of a Robotically Emplaced Hand Packed Shaped Charge

DeFisher, S; Baker, E; Wu, I; Wu, J; Richwald, A; Miller, G; Nov 1, 2006; 28 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481043; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481043>

The recent use of buried Improvised Explosive Devices (IEDs) has resulted in a high cost to the U.S. Army, in terms of both lives and materiel lost in the South West Asian (SWA) theater. The safe destruction of these types of devices is currently the responsibility of explosive ordnance disposal (EOD) operators. In an attempt to make a dangerous job safer, U.S. Army EOD personnel are increasingly using robots to emplace charges that can destroy deeply buried ordnance. In an attempt to destroy these deeply buried IEDs, ARDEC EOD and Energetics, Warheads, and Environmental Technology (EWET) personnel teamed to develop a high performance anti-IED shaped charge. This was a problem for which, at least up to this point, there had been no dedicated solution. Due to the urgent need to field such a device, any potential solution would be required to be loaded locally in theater in order to preclude complications associated with the normal acquisition process. In addition, any solution would have to be capable of being deployed via a remotely controlled robot. The efforts contained within this paper were conducted over an 8 month time period from the beginning of the first test to the time that the units were actually deployed to the theater of operation.

DTIC

Ordnance; Robots; Shaped Charges

20080035229 Johns Hopkins Univ., Laurel, MD USA

UXO Data Analysis

Nelson, Carl V; Keller, Mary R; Smith, Dexter G; Mar 29, 2002; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-SERDP-SEED-UXO-1216

Report No.(s): AD-A481095; STR-02-068; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481095>

Currently, sensor systems exist that can detect and localize buried metal objects of a wide size and depth range. These sensors typically measure the active and/or passive magnetic properties of buried metal objects. In some cases, the sensor measures the dielectric contrast of the buried object (e.g., ground penetrating radar (GPR)). While current technology has shown the ability to detect these buried metal objects discriminating the UXO from metal objects that pose no risk, i.e. clutter, is still a major problem. These clutter objects represent a false alarm (FA) to the detection system. The time to remediate a site with a high clutter to UXO ratio is not cost effective. Discrimination of UXO from clutter, a reduction in the false alarm rate (FAR), would lower the site cleanup cost. The report is divided into several sections. Section 2 describes the basic project objectives. Section 3 briefly describes the technical approach used in the UXO signature analysis and spatial signal processing. Section 4 summarizes the results of the project and Section 5 lists project recommendations. Section 6 summarizes some conclusions for the project while Section 7 makes recommendations for possible future work.

DTIC

Ammunition; Classifications; Signal Processing; Targets

20080035369 Kurzweil Technologies, Inc., North Andover, MA USA

War-Fighting in the Early 21st Century: A Remote-Controlled, Robotic, Robust, Size-Reduced, Virtual-Reality Paradigm

Kurzweil, Ray; Nov 27, 2006; 110 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481344; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Mr. Kurzweil discusses the speed at which information technologies is advancing and possible implications.

DTIC

Forecasting; Remote Control; Robotics; Virtual Reality; Warfare

20080035391 Brown Univ., Providence, RI USA

A System for Automatic Detection of Partially Occluded Objects from Real-World Images

Neskovic, Predrag; Wu, Liang; Cooper, Leon N; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-04-1-0357

Report No.(s): AD-A481407; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this work we consider the Bayesian Integrate And Shift (BIAS) model for learning object categories and test its performance on learning and recognizing different object categories from real-world images. In contrast to conventional learning algorithms that require hundreds or thousands of training examples, we show that our system can learn a new object category from only a few examples. In addition, our system provides information not only about the object category but also about the local regions within the object on which it is fixating. We tested the performance of the system on very challenging examples of partially occluded targets. The training was done on different instances of one category and tested on partially occluded examples that the system had never seen before. We demonstrate that the system is very robust to partial occlusions and clutter and can recognize a target even if it fixates on the occluded part.

DTIC

Bayes Theorem; Bias; Detection; Learning; Pattern Recognition; Targets

20080035395 Military Academy, West Point, NY USA

Towards Commanding Unmanned Ground Vehicle Movement in Unfamiliar Environments Using Unconstrained English: Initial Research Results

Burk, Robin; Haas, Andrew; Moxley, Frederick I; Knuth, Kevin; Ring, Benjamin; Jun 2007; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481414; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Sensemaking in the 21st century C2 environment will be critical not only for soldiers but also for autonomous equipment. Sensemaking by humans entails understanding the meaning and import of information, often conveyed via natural human language, about events and objects in the battlespace. Analogous sensemaking in autonomous and semi-autonomous UGVs requires cognitive robotics, i.e. the ability to link human language and concepts to robot perception and object recognition. Advanced sensemaking in UGVs would allow soldiers to send such equipment through urban environments using the same verbal instructions they would give another soldier. A robust natural language-based sensemaking capability in UGVs could also contribute information about the battlespace to the Global Information Grid while requiring few or no services in return. Recent work by Haas and Shimizu has demonstrated the ability of a simulated robot to respond correctly and without additional guidance to naively-produced navigational commands (expressed in unconstrained English) with ~80% accuracy. Our current work extends this approach to natural language processing into physical robots, introducing uncertainties of sensor perception, object recognition and language-to-environment mapping. The goal of this research is to quantify accuracy for a simple indoor environment and then more complicated environments, characterizing sources of error and identifying strategies to reliably overcome them.

DTIC

Command Guidance; English Language; Unmanned Ground Vehicles

20080035411 Cornell Univ., Ithaca, NY USA

Robust Detection of Stepping-Stone Attacks

He, Ting; Tong, Lang; Nov 2006; 9 pp.; In English

Contract(s)/Grant(s): DAAD19-01-2-0011; NSF-CCF-04244422

Report No.(s): AD-A481453; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The detection of encrypted stepping-stone attack is considered. Besides encryption and padding, the attacker is capable of inserting chaff packets and perturbing packet timing and transmission order. Based on the assumption that packet arrivals form renewal processes, and a pair of such renewal processes is also renewal, a nonparametric detector is proposed to detect attacking traffic by testing the correlation between interarrival times in the incoming process and the outgoing process. The detector requires no knowledge of the interarrival distributions, and it is shown to have exponentially decaying detection error probabilities for all distributions. The error exponents are characterized using the Vapnik-Chervonenkis Theory. An efficient algorithm is proposed based on the detector structure to detect renewal processes with linearly correlated interarrival times. It is shown that the proposed algorithm is robust against an amount of chaff arbitrarily close to the amount of chaff needed to mimic independent processes.

DTIC

Cryptography; Detection; Detectors; Warning Systems

20080035416 Carnegie-Mellon Univ., Pittsburgh, PA USA

Predictive Mover Detection and Tracking in Cluttered Environments

Navarro-Serment, Luis; Mertz, Christoph; Hebert, Martial; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0991

Report No.(s): AD-A481463; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the design and experimental evaluation of a system that enables a vehicle to detect and track moving objects in real-time. The approach investigated in this work detects objects in LADAR scan lines and tracks these objects (people or vehicles) over time. The system can fuse data from multiple scanners for 360 deg. coverage. The resulting tracks are then used to predict the most likely future trajectories of the detected objects. The predictions are intended to be used by a planner for dynamic object avoidance. The perceptual capabilities of our system form the basis for safe and robust navigation in robotic vehicles, necessary to safeguard soldiers and civilians operating in the vicinity of the robot.

DTIC

Collision Avoidance; Detection; Predictions; Robots; Tracking (Position)

20080035428 Ohio State Univ., Columbus, OH USA

Detecting and Correcting Mistakes in Information Fusion

Bharathan, Vivek; Josephson, John R; Nov 2006; 8 pp.; In English

Contract(s)/Grant(s): DAAD19-01-2-0009

Report No.(s): AD-A481485; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This article scrutinizes one inherent pitfall in automated information fusion - its fallibility as an artifact of dealing with the real world. Since it is highly desirable to avoid contamination of further processing by past mistakes, we investigate the nature of the recovery process in a prototype agent that performs the Level One Information Fusion task of entity tracking and re-identification, Smart-ASAS. Smart-ASAS attempts to solve this fusion task by treating it as one of Abductive Inference or Inference to the Best Explanation. We discover that the problem space bounding recovery from errors is exponential in nature, but investigate the possibility of handling this computationally complex problem with some proposed heuristics that would result in some satisfying solution.

DTIC

Correction; Data Processing; Detection; Errors; Multisensor Fusion

20080035507 Army Research Inst. for the Behavioral and Social Sciences, Orlando, FL USA

Use of Immersive Virtual Environments for Measuring and Training Situation Awareness

Lampton, Donald R; Riley, Jennifer M; Kaber, David B; Sheik-Nainar, Mohamed A; Endsley, Mica R; Nov 1, 2006; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481053; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481053>

Our paper describes the development and preliminary testing of three systems for unobtrusively measuring situation awareness (SA) during dismounted infantry squad-level exercises conducted with immersive Virtual Environment (VE) simulations. The SA measurement systems employ probes administered in the guise of normal radio communications, and systematic subjective ratings of squad leader behaviors and communications. Trials of the systems were conducted with three squads that differed in the experience level of the squad members and whether they had previously functioned together as intact squads. Results indicated that the measurement systems were unobtrusive and measured what they were designed to measure: squad leader SA. Ongoing modifications to the systems are described. Planned applications to other training domains are outlined.

DTIC

Education; Situational Awareness; Virtual Reality

20080035549 Cycorp, Inc., Austin, TX USA

Terrorism Knowledge Base (TKB)

Lenat, Douglas; Deaton, Chris; Apr 2008; 72 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F30602-03-C-0007; Proj-GENO

Report No.(s): AD-A481467; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this project was to support intelligence analysts by developing a comprehensive Terrorism Knowledge Base (TKB) which included information about terrorist events and terrorist groups and their members and activities, as well

as information captured by the analyst's use of the tool. Using that knowledge base, plus the knowledge base and inference engine of our company's Cyc(r) technology, the TKB was to exhibit sophisticated reasoning using domain knowledge, externally-stored data, common sense knowledge and knowledge about what the analyst has considered relevant or irrelevant and templated question-answering with explanations. Analysts were to be able to use the TKB to pose terrorism-related queries, and to help them derive answers to those questions, integrate data, correlate observations, compose explanations, and, in general, augment their ability to effectively complete the reasoning tasks that they need to perform.

DTIC

Knowledge Based Systems; Terrorism

20080035594 National Defense Univ., Washington, DC USA

Frameworks and Insights Characterizing Trends in Cyberspace and Cyberpower

Kramer, Franklin D; Starr, Stuart H; Wentz, Larry; Zimet, Elihu; Kuehl, Daniel; Jun 2007; 35 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481375; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the course of the Department of Defense's (DoD) 2006 Quadrennial Defense Review, it was observed that DoD lacks a coherent, holistic framework to formulate and assess policy issues associated with cyberspace and cyberpower. To redress that shortfall, the Under Secretary of Defense (Policy) directed the Center for Technology and National Security Policy (CTNSP), National Defense University (NDU), to undertake a cyberpower study. As stated in the study's Terms of Reference, 'there is a compelling need for a comprehensive, robust and articulate cyber power theory that describes, explains and predicts how our nation should best use cyber power in support of US national and security interests'. Consistent with that goal, this paper addresses four issues. First, it provides a holistic framework for addressing cyberpower issues and it summarizes the major findings of several studies that are being developed to characterize that framework. Second, it identifies and discusses potential Measures of Merit (MoMs) that can be applied to layers of that holistic framework. Third, to illustrate the types of analyses that are being pursued, a framework for tactical Influence Operations is introduced and applied. The paper concludes with some broad observations on the nature of the cyberpower problem.

DTIC

Cybernetics; Information Theory; Policies; Trends

20080036258 Army Research Lab., Aberdeen Proving Ground, MD USA

Emerging Staff Roles: Robotics NCO Task Analysis

Bowman, Elizabeth K; Pomranky, Regina A; Thomas, Jeffrey A; Jun 2007; 23 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481313; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The position of a new platoon asset, the Robotics NCO (RNCO), is introduced in the Objective Force Operational and Organizational (O&O) Plan (Unit of Action Maneuver Battle Lab, 2003). The RNCO is expected to assist the Platoon Leader in employing unmanned systems, to be a subject matter expert in platoon robotics systems, and to coordinate unmanned assets in support of reconnaissance and surveillance tasks (Unit of Action Maneuver Battle Lab, p3-18). The task analysis conducted in this experiment was designed to improve the fidelity of task descriptions and understand interactions with robotic systems operators. The task analysis identified major coordinating responsibilities for this role. Continuation of this effort will examine RNCO tasks in the context of the battle command interface to determine how best to visualize information for major functions. We will also focus on the RNCO responsibilities from a system of systems perspective and identify key staff interdependencies within the platoon and with higher echelons.

DTIC

Robotics; Reconnaissance; Expert Systems

20080036299 Army Research Lab., Aberdeen Proving Ground, MD USA

The Effects of Imperfect Automation on Concurrent Performance of Gunner's and Robotics Operator's Tasks in a Simulated Mounted Environment

Chen, Jessie Y; Terrence, Peter I; May 2008; 52 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481584; ARL-TR-4455; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481584>

In this study, we simulated a generic mounted environment and conducted an experiment to examine the performance and workload of the combined position of gunner and robotics operator. Aided target recognition (AiTR) (via tactile and visual

cueing) with imperfect reliability (false alarm-prone versus miss-prone) was provided to the participants to aid their gunnery task. Besides the gunnery task, participants performed robotics and communication tasks concurrently. Results show that when the robotics task was simply monitoring the video feed, participants had the best performance in the other two concurrent tasks and the lowest perceived workload, compared with the other robotics tasking conditions. Our data also show that there is a strong interaction between the type of AiTR unreliability and participants perceived attentional control. Overall, it appears that for high attentional control participants, false alarm-prone alerts were more detrimental than miss-prone alerts. For low attentional control participants, conversely, miss-prone automation was more harmful than false alarm-prone automation. Additionally, low spatial ability participants preferred visual cueing over tactile cueing, and high spatial ability participants favored tactile cueing over visual cueing.

DTIC

Artificial Intelligence; Robotics; Target Recognition

20080036301 Army Research Lab., Aberdeen Proving Ground, MD USA

Scalability of Robotic Displays: Display Size Investigation

Redden, Elizabeth S; Pettitt, Rodger A; Carstens, Christian B; Elliott, Linda R; May 2008; 63 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481586; ARL-TR-4456; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481586>

This study was an investigation of the effect of camera view display sizes on robotic tele-operation control performance in a realistic context. It took place at Fort Benning, Georgia, and used Soldiers from the Officer Candidate School. After training in the operation of the TALON robot system, each Soldier completed exercises using four different display sizes that were chosen to match the size and resolution of displays that might be used by dismounted Soldiers for other purposes in the near future. The terrain, targets, and hazards were counterbalanced along with the display size to control for the effect of learning. Display size and usability for robotic driving were evaluated, based on objective performance data, data collector observations, and Soldier questionnaires.

DTIC

Detection; Display Devices; Personnel; Robotics; Target Acquisition; Teleoperators

20080036330 Army Research Lab., Aberdeen Proving Ground, MD USA

Unmanned Aerial Vehicle (UAV)-Unmanned Ground Vehicle Teaming: UAV Guided Navigation

Chen, Jessie Y; Clark, Bryan R; May 2008; 32 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-62716AH70

Report No.(s): AD-A481627; ARL-TR-4462; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481627>

We simulated a military reconnaissance environment and examined the performance of ground robotics operators who needed to use sensor images from an unmanned aerial vehicle (UAV) to navigate their ground robot to the locations of the targets. We also evaluated participants spatial ability and examined if it affected their performance or perceived workload. Results showed that participants overall performance (speed and accuracy) was better when they had access to images from larger UAVs with fixed orientations, compared to other UAV conditions (baseline- no UAV, micro-air vehicle, and UAV with orbiting views). Participants experienced the highest workload when the UAV was orbiting.

DTIC

Cognition; Feedback; Navigation; Pilotless Aircraft; Robots; Teleoperators; Unmanned Ground Vehicles

20080036364 Florida Univ., Gainesville, FL USA

Energy and Location Optimization for Relay Networks with Differential Modulation

Cho, Woong; Yang, Liuqing; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481690; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481690>

In wireless networks, relay transmissions can enable cooperative diversity by forming virtual antenna arrays. The optimum resource allocation in such relay networks is critical to enhance their performance and efficiency. However, existing works on resource optimization only consider single-relay systems and focus on the power allocation. In this paper, we consider both the power optimization and the location optimization for systems with arbitrary number of relays. Equally attractive is that our investigation is tailored for differential modulations, which bypass the channel estimation at the receiver

and are particularly suitable for wireless relay networks. We first derive an upper bound of the error performance. Based on this bound, we then develop the optimum energy and distance allocation schemes that minimize the average system error. Analytical and simulated comparisons confirm that the optimized systems provide considerable improvement over un-optimized ones. In addition, we show that location optimization may be more critical than energy optimization.

DTIC

Modulation; Optimization; Position (Location); Protocol (Computers); Radio Relay Systems; Resource Allocation

20080036391 Wayne State Univ., Detroit, MI USA

Mobile Robot Enabled Detection of Explosives and Biological Agents

Auner, Gregory W; Pandya, Abhilash; Newaz, Golam; Gerhart, Grant; Hudas, Greg; Scott, Andrew; Jensen, Janet; Smolinski, Joseph; Brusatori, Michelle; Nov 1, 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAE07-03-C-L140; W56HZV-04-C-0044

Report No.(s): AD-A481746; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481746>

Detection of chemical agents such as explosives and biological agents in air and water is of current importance. The integration of micro sensors for agent detection into a robotic system can greatly enhance the safety and efficacy of the detection system. Our research aim is two-fold. 1) To create a sensing system that can detect chemical agents in explosives and biological agents in air and water and 2) to implement the detection technology into a handheld unit or a mobile robot system (such as ODIS-omni directional inspection system) that allows the soldier to deliver the sensing system to remote targets. In the case of explosives detection, the sensing system includes a thermoplastic polyurethane concentrator that absorbs the main vapor byproduct of TNT. This concentrator will release, in burst mode, higher levels of TNT vapor byproduct to allow detection under real environmental conditions. In addition, a biological sampling and concentration system can be implemented to detect small quantities of bacteria. Two methods of detection are implemented including a physical vapor detector and an optical probe detector. These lightweight miniature detection systems are integrated into a remote manipulator arm on the mobile robotic platform. The platform has an automatic scanning mode and motion control for flexible remote control.

DTIC

Detection; Explosives; Explosives Detection; Robots

20080036405 Sarnoff Corp., Princeton, NJ USA

Moving Target Indication from a Moving Camera in the Presence of Strong Parallax

Salgian, Garbis; Bergen, Jim; Samarasekera, Supun; Kumar, Rakesh; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481771; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481771>

We describe an algorithm for independent motion detection from video sequences recorded from a camera moving in a 3D rich environment. Such sequences are typical in the case of Unmanned Aerial Vehicles flying at low altitude over varied terrain and also for ground vehicles. We present detection results for both scenarios.

DTIC

Cameras; Moving Target Indicators; Parallax; Signal Processing; Targets; Video Signals

20080036432 Army Research Lab., Orlando, FL USA

Effectiveness of Gunnery and Robotic Control Performance in a Simulated Multi-Tasking Environment

Chen, Jessie Y; Joyner, Carla T; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481821; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481821>

In this study, we simulated a generic mounted crewstation environment and conducted an experiment to examine the workload and performance of the combined position of gunner and robotic operator. Results showed that gunner's target detection performance degraded significantly when s/he had to concurrently monitor, manage, or teleoperate an unmanned ground vehicle compared to the baseline condition (gunnery task only). Additionally, those with higher spatial ability (as measured by Spatial Orientation Test) performed significantly better than those with lower spatial ability. For the robotic tasks, participants detected significantly fewer targets when their robotic asset was semiautonomous instead of teleoperated, indicating overreliance on the aided target recognition capabilities available when task load was heavy (i.e., concurrent

performance of the gunnery task). Participants perceived workload increased consistently as the concurrent task conditions became more challenging. Finally, those with higher perceived attentional control performed better on a concurrent communication task in the more difficult tasking conditions. Implications for military personnel selection were discussed.

DTIC

Robotics; Simulation

20080036480 Bae Systems Advanced Information Technologies, Inc., Burlington, MA USA

The Agile Planner: Configurable C2 on the Move

Shaw, John; Russo, Alberto; James, Ron; Calnan, Paul; Sao Pedro, Michael; Pepyne, David; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481940; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481940>

Current Army C2 systems cannot integrate come as you are capabilities into operations making it difficult to combine participants into a cohesive force. This paper describes the Agile Planner concept developed by BAE AIT as robust approach for configurable C2 on the fly. With an Agile Planner, participants declare their capabilities when they register into the system. Once they do so, an Agile Planner can assemble a system architecture from these declared capabilities and determine how to employ the participants to accomplish a mission. The Agile Planner concept is illustrated with a case study showing its ability to robustly build Missile Defense from come as you are assets.

DTIC

Models; Planning; Resources Management; Scheduling

64

NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20080034886 NASA Glenn Research Center, Cleveland, OH, USA

High Speed Solution of Spacecraft Trajectory Problems Using Taylor Series Integration

Scott, James R.; Martini, Michael C.; August 2008; 22 pp.; In English; Astrodynamics Specialist Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains color illustrations

Report No.(s): NASA/TM-2008-215439; AIAA Paper 2008-6957; E-16609; Copyright; Avail.: CASI: [A03](#), Hardcopy

Taylor series integration is implemented in a spacecraft trajectory analysis code-the Spacecraft N-body Analysis Program (SNAP) - and compared with the code s existing eighth-order Runge-Kutta Fehlberg time integration scheme. Nine trajectory problems, including near Earth, lunar, Mars and Europa missions, are analyzed. Head-to-head comparison at five different error tolerances shows that, on average, Taylor series is faster than Runge-Kutta Fehlberg by a factor of 15.8. Results further show that Taylor series has superior convergence properties. Taylor series integration proves that it can provide rapid, highly accurate solutions to spacecraft trajectory problems.

Author

Spacecraft Trajectories; Runge-Kutta Method; Trajectory Analysis; Many Body Problem; Measure and Integration; Taylor Series

20080035205 Carnegie-Mellon Univ., Pittsburgh, PA USA

A Constraint Generation Approach to Learning Stable Linear Dynamical Systems

Siddiqi, Sajid M; Boots, Byron; Gordon, Geoffrey J; Jan 2008; 17 pp.; In English

Report No.(s): AD-A481034; CMU-ML-08-101; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481034>

Stability is a desirable characteristic for linear dynamical systems, but it is often ignored by algorithms that learn these systems from data. We propose a novel method for learning stable linear dynamical systems: we formulate an approximation of the problem as a convex program, start with a solution to a relaxed version of the program, and incrementally add constraints to improve stability. Rather than continuing to generate constraints until we reach a feasible solution, we test stability at each step; because the convex program is only an approximation of the desired problem, this early stopping rule can yield a higher-quality solution. We apply our algorithm to the task of learning dynamic textures from image sequences as well as to modeling biosurveillance drug-sales data. The constraint generation approach leads to noticeable improvement

in the quality of simulated sequences. We compare our method to those of Lacy and Bernstein [1, 2], with positive results in terms of accuracy, quality of simulated sequences, and efficiency.

DTIC

Dynamical Systems; Linear Systems; Stability

20080035221 Arizona Univ., Tucson, AZ USA

Numerical Investigations of Active Flow Control for Low-Pressure Turbine Blades

Fasel, Hermann F; Gross, Andreas; Balzer, Wolfgang; Mar 2008; 94 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0166

Report No.(s): AD-A481069; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481069>

The low-pressure turbine (LPT) produces the bulk net power in many jet engines. Changes in LPT efficiency can significantly affect overall engine efficiency. Modern LPTs have to drive larger fans at lower fan speeds and at the same time be less complex and lighter. The goal is a reduction in stage solidity without compromising performance. LPTs must operate efficiently over a large range of Reynolds numbers (1,000,000 during takeoff and 25,000 during high altitude cruise). Low Reynolds number operating conditions in combination with aggressive designs can lead to laminar separation, which can cause significant reductions in turbine and overall engine performance. In fact, Sharma (1998) reported increases of the loss coefficient as high as 300%. Prediction and control of suction side separation, without sacrificing the benefits of higher loading, is therefore, crucial for improved engine designs. It was recognized several years ago that active flow control (AFC) applied to LPT blades can counter such unfavorable conditions, and that AFC could lead to considerable performance improvements as well as to a reduction in component weight. In a broadly based experimental research program at the Air Force Research Laboratory (AFRL) at Wright-Patterson Air Force Base, Rivir and co-workers systematically explored the potential advantages of AFO using vortex generator jets (VGJs), both steady and pulsed, for LPT separation control. Pulsed blowing was shown to be much more efficient, requiring only a small fraction of the mass flow rate compared to the steady VGJs. Experimental observations show how steady angled injection results in the generation of streamwise vortices leading to free-stream momentum entrainment. These vortices maintain their coherence over a larger downstream distance than the counter rotating vortices generated by vertical injection and, therefore, facilitate more free-stream entrainment.

DTIC

Active Control; Flow; Flow Distribution; Low Pressure; Numerical Control; Turbine Blades

20080035340 Army Research Office, Research Triangle Park, NC USA

Human-Goal-Based Metrics for Models of Urban and Natural Terrain and for Approximation Theory

Lavery, John E; Nov 1, 2006; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481254; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In virtually all approximation theory, classical mathematical metrics, especially Sobolev norms, on linear spaces of smooth functions have been used as the measures of approximation. However, the assumption of smoothness is not generically applicable and most of the classical metrics used to measure how well one function approximates another do not provide information that is consistent with human perception and goals. In this paper, we construct metrics for approximation based on human goals. For urban and natural terrain, we introduce a difference-of-visibility or 'DV' metric. For the computational experiments, we use two univariate data sets that include 'discontinuities' (representing, for example, the sides of buildings). Computational results for observers at 595 positions indicate that, in the DV metric, the coarse-grid linear spline and the cubic L1 spline produce roughly equally accurate regions of visibility and that they are better approximants of real terrain than the conventional cubic spline, which has extraneous oscillation that leads to inaccurate visibility. Extensions of the DV metric involving weighting and extensions for measuring false negative and false positive error are described. A global difference-of-visibility metric is described. The approach in this paper is not limited to visibility and extends to many other situations. In all of these situations, the metric for the properties of a phenomenon in the context of a human goal should be the quantitative formulation of that human goal itself, not a metric that is adopted from unrelated mathematical concepts or other areas of applications.

DTIC

Approximation; Terrain

20080035364 Army Research Lab., Adelphi, MD USA

Wiener-Based Image Registration for Moving Target Indication

Kaplan, Lance M; Nasrabadi, Nasser M; Nov 2006; 9 pp.; In English; Original contains color illustrations
Report No.(s): AD-A481329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes two novel Wiener-based approaches for frame-to-frame image registration. The first approach, Local Wiener Registration, incorporates the cross-correlation between the two frames to determine the Wiener filter at each pixel location in order to predict the second frame from the first frame. The second approach, Block Wiener Registration, divides the image in nonoverlapping blocks and computer the Wiener filter for each block. The output of the Block Wiener Registration is the a weighted sum of the bank of Wiener filter outputs. By computing the Wiener filter for a few blocks in the imagery instead of at each pixel location, the Block Wiener Registration is significantly less computationally complex than the Local Wiener filter. Furthermore, both Wiener-based methods are able to compensate for localized motions of the background, e.g., parallax. Experimental results indicate that the Block Wiener Registration is nearly as effective as Local Wiener Registration and is orders of magnitude faster. Finally, both Wiener-based approaches outperform parametric registration approaches that account for the global changes from one frame to the next.

DTIC

Image Processing; Pattern Registration; Targets; Wiener Filtering

20080035384 Advanced Science and Automation Corp., Indianapolis, IN USA

Experimental Validation of a Coupled Fluid-Multibody Dynamics Model for Tanker Trucks

Wasfy, Tamer M; O’Kins, James; Smith, Scott; Apr 2008; 41 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W56HZV-05-C-0631

Report No.(s): AD-A481397; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Outline: *Motivation. *Objective. *Literature Review. *FE Formulation: -Solid: Frictional contact model, Simple tire model, Detailed tire model. -Fluid; -Free-surface model; -Fluid-structure coupling. *Validation Study. *Concluding Remarks.
DTIC

Dynamic Response; Finite Element Method; Fluid Dynamics; Trucks

20080035426 Howard Univ., Washington, DC USA

Assessing Image Fusion Methods for Unconstrained Outdoor Scenes

Zeng, J; Sayedelahl, A; Gilmore, T; Frazier, P; Chouikha, M; Nov 2006; 8 pp.; In English

Report No.(s): AD-A481483; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we assess nine recent pixel-level image fusion algorithms. These fusion algorithms are experimentally evaluated with quantitative assessment techniques. Finally, a new assessment paradigm for image fusion is provided.

DTIC

Images; Multisensor Fusion; Scene Generation

20080035546 Army Research Development and Engineering Command, Warren, MI USA

Utilizing Biomimetic Image Processing to Rapidly Detect Rollover Threats

Truong, Nancy; Agassounon, William; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481460; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Rollover incidents of military vehicles have resulted in soldiers incurring injuries or losing their lives. A recent report identified that one cause of vehicle rollovers is the driver’s inability to assess rollover threat, such as a cliff, soft ground, water, or culvert on the passenger side of the vehicle. The vehicle’s width hinders the driver’s field of view. To reduce the number of military vehicles rolling over, a road edge detection and driver warning system is being developed to warn the driver of potential rollover threats and keep the driver from veering off the side of the road. This system utilizes a unique, ultra-fast, image-processing algorithm based on the neurobiology of insect vision, specifically fly vision. The system consists of a Long-Wavelength Infrared (LWIR) camera and monochrome video camera system, a long-range laser scanner, a processing module in which a biomimetic image processor detects road edges in real-time, and a Driver’s Vision Enhancer (DVE) which displays the road image, detected boundaries and road-side terrain steepness in real-time for the driver.

DTIC

Biomimetics; Detection; Image Processing; Optical Measurement

20080036265 California Univ., Santa Cruz, CA USA

Detection and Discrimination at the Intersection of Statistical Signal Processing and Machine Learning

Milanfar, Peyman; Mar 31, 2008; 14 pp.; In English

Contract(s)/Grant(s): F49620-03-1-0387

Report No.(s): AD-A481518; MDSP-AFOSR-49620F; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481518>

This research program is aimed at developing a broad suite of techniques in detection, estimation, and reconstruction from images and video, which will help to advance the state of the art in automatic target recognition.

DTIC

Machine Learning; Signal Processing; Target Recognition

20080036293 California Univ., Santa Cruz, CA USA

Waveforms for Active Sensing: Optical Waveform Design and Analysis for Ballistic Imaging Through Turbid Media

Milanfar, Peyman; Apr 4, 2008; 59 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0047; 05NM271

Report No.(s): AD-A481573; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481573>

This program was intended to develop theory a broad range of algorithms and proof of concept in detection, estimation, and reconstruction of objects embedded in turbid media, which hamper visibility (such as fog, clouds, smoke, and other types of aerosol particles).

DTIC

Aerosols; Algorithms; Ballistics; Design Analysis; Imaging Techniques; Optical Equipment; Waveforms

20080036338 Carnegie-Mellon Univ., Pittsburgh, PA USA

Path Clearance Using Multiple Scout Robots

Likhachev, Maxim; Stentz, Anthony; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0012

Report No.(s): AD-A481649; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481649>

This paper presents the techniques that we have been developing recently to solve the problem of path clearance. In the path clearance problem the robot needs to reach its goal as quickly as possible without being detected by enemies. The problem is complicated by the fact that the robot does not know the precise locations of enemies, but has a list of their possible locations. Either the robot itself or scout robots can be used to sense these possible enemy locations before the robot traverses through them on the way to its goal. We have recently developed a general and efficient algorithm called PPCP (Probabilistic Planning with Clear Preference) for planning under uncertainty in the environment. In this paper we first describe how it can be applied to the problem of path clearance when there are no scout robots available and show that there are significant benefits of planning with PPCP over commonly used alternatives. We then explain a strategy for how to use the PPCP algorithm in case multiple scout robots are available and show that this strategy reduces the time it takes for the robot to reach its goal even further.

DTIC

Clearances; Military Operations; Planning; Robots

20080036363 Maryland Univ., College Park, MD USA

A Testbed for Comparing Trust Computation Algorithms

Theodorakopoulos, George; Baras, John S; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011; DAAD19-01-1-0494

Report No.(s): AD-A481689; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481689>

Trust is the expectation of a person about another person's behavior. Trust is important for many security related decisions about, e.g., granting or revoking privileges, controlling access to sensitive resources and information, or evaluating intelligence gathered from multiple sources. More often than not, the issue is complicated even further because the person making the decision has no direct trust relationship with every single subject whose trustworthiness needs to be evaluated. So, the decision maker needs to rely on recommendations by others, and then somehow aggregate the trust related information

that is collected. In this work we provide an algebraic framework in which we can describe multiple ways that trust related information can be aggregated to form a single value. We show the similarities and differences that the various so called trust computation algorithms have, and associate these with the algebraic properties of the framework that we consider.

DTIC

Algorithms; Computation; Decision Support Systems; Weighting Functions

20080036421 Florida Univ., Gainesville, FL USA

Enhanced Cutting Plane Techniques for Bi-Level Optimization Algorithms

Smith, J C; Apr 28, 2008; 12 pp.; In English

Contract(s)/Grant(s): FA9550-07-1-0404

Report No.(s): AD-A481809; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481809>

Bi-level optimization algorithms have been developed for use in a variety of problems, including network design and defense systems and optimization under uncertainty, and network interdiction applications. These algorithms often employ a technique that divides the decision-making process into a first-stage master problem wherein one set of decisions are determined, after which a set of separable second-stage problems are based on the first-stage decisions. The master problem determines an optimistic assessment of the costs incurred in the second stage; this assessment is then refined by a set of linear functions called cutting planes, which provide cause-and-effect relationships between the first- and second-stage decisions. However, these cutting planes are often ineffective in practical problems. The improvement of these cutting planes is the subject of this proposal. The investigator encountered a surprising feature of some bi-level problems, in which an exponential number of cutting planes may need to be generated at each stage. By reformulating the first-stage problem using slightly more variables and constraints, it was possible to capture all of these cutting planes with a single inequality in the new variable space. Problems that were thought to be impossible to optimality are shown to in fact be solvable within reasonable computational limits.

DTIC

Algorithms; Cutting; Decision Making; Optimization

20080036474 Military Academy, West Point, NY USA

Prediction of Local Penetration/Damage and Global Dynamic System Response for Lethality/Survivability: A Multi-Time Scale Approach

Miller, Y; Zhou, X; Sha, D; Tamma, K K; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0014

Report No.(s): AD-A481921; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481921>

The Future Combat Systems (FCS) will transform the Army into a faster, more agile force with more lethal and more survivable capabilities. The FCS requires computational technologies that can simulate and assess lethality and survivability of the combat systems under real battlefield situations involving the global structural dynamics at system level, and highly localized contact-impact, damage, failure, penetration, and fragmentation. In order to integrate the aforementioned capabilities into a stand alone computational code, a computational framework taking into consideration different mechanics descriptions and formulations, different physical events such as structural dynamics, contact-impact, damage, failure, penetration, and fragmentation need to be carefully addressed. In this regard, different computational formulations in space such as finite element methods and meshless methods, and in time such as implicit algorithms, explicit algorithms, and the like need to be seamlessly integrated. Existing technologies focus on an isolated physical event or a limited coupled physical event. A computational framework that can integrate the aforementioned multi-physical events for combat systems commonly encountered in real battlefield situations does not exist to-date. We address the above issues with applications to engineering problems, and the present approach compares well with experimental results.

DTIC

Damage; Dynamic Response; Lethality; Penetration

20080036577 General Dynamics Information Technology, Fairfax, VA USA

Validation and Implementation of Sensor Sweet Spot Selection Algorithms, Phase 1 (Year 1)

Kranz, Joseph; May 13, 2008; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481996; N00014-07-C-0144; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Phase I effort was to develop weighting factors that characterize the quality of the WAA sensor's received data at

various locations within the sensor's performance envelope. This effort involved extensive reviews and analysis of TECHEVAL and OPEVAL reports and other at-sea recorded data on WAA sensor performance. It has defined a detailed technical approach for locating, collecting, interpreting, formatting and restructuring the data into a Common Database. It also details the iterative relational analysis process utilized to establish predictable Sweet Spot contributors and to assess the positive affects of the resulting Sweet Spot tagged data. It is expected that the output of this research may trigger other Sweet Spot study efforts to dynamically demonstrate the resulting positive effect on contact solution generation capabilities.

DTIC

Algorithms; Detection; Spot (French Satellite); Target Acquisition

20080036604 Michigan Univ., Ann Arbor, MI USA

Nonlinear Wave Interaction with Submerged and Surface-Piercing Porous Structures

Nwogu, Okey; Demirbilek, Zeki; Sep 2006; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482079; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A coupled Boussinesq-boundary integral method is developed to simulate nonlinear water wave interaction with structures consisting of multiple layers with different physical and hydraulic characteristics. The flow field in the water region is modeled with a modified set of Boussinesq-type equations, with additional terms to account for the flow of water into/out of the porous region. The equations of motion for the porous regions include an empirical Forchheimer-type term for laminar and turbulent frictional losses, and an inertial term for acceleration effects. A boundary integral formulation based on Green's third identity is used to close the problem for the porous region. The coupled equations for the evolution of the free surface and boundary values of the tangential velocities are integrated in time using an iterative Crank-Nicolson scheme. At each time step, the Boussinesq problem is solved for the water region to determine the pressure at porous interface. The boundary integral problem for the porous region is then solved to determine the normal velocities along porous interface. The model is used to investigate wave interaction with a vertical surface-piercing porous structure and wave transmission over submerged breakwaters. Comparisons between the numerical model predictions and laboratory data show generally good agreement for both the wave field inside the structure and the reflection/transmission coefficients.

DTIC

Nonlinear Systems; Nonlinearity; Piercing; Porosity; Porous Materials; Water Waves; Wave Interaction

20080036609 Stevens Inst. of Tech., Hoboken, NJ USA

Semi-Analytical Approach to Three-Dimensional Shape Optimization Problems

Zabarankin, Michael; Apr 2008; 21 pp.; In English

Contract(s)/Grant(s): FA9550-07-1-0401

Report No.(s): AD-A482096; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A semi-analytical approach to three-dimensional (3-D) shape optimization problems for a viscous incompressible fluid under the assumption of zero (low) Reynolds number has been developed. It couples the theory of generalized analytic functions with the adjoint equations-based method. A solution to Stokes equations governing the behavior of the fluid has been reduced to integral equations based on the Cauchy integral formula for k-harmonically analytic functions. The fluid velocity and boundary shape are the state and design variables, respectively, and a shape optimization problem is to find shape minimizing the energy dissipation rate. In contrast to the classical optimal control theory, the shape optimization problem has been formulated as an optimal control problem with constraints in the form of integral equations. The optimality conditions (state, adjoint and design equations) for the optimal control problem have been derived. The advantage of the suggested approach is that the state and adjoint variables are single-variable functions, which being represented analytically in the form of series with unknown coefficients, can be accurately determined from the state and adjoint integral equations, for example, by minimizing the total squared error. The optimal shape has been found iteratively by a gradient-based method, in which at each iteration, the state and adjoint variables have been determined for an updated shape and the gradient for the cost functional with respect to the shape has been obtained by the adjoint equations-based method. The suggested semi-analytical approach has been illustrated for the drag minimization problem for motion of a solid body of revolution in the viscous incompressible fluid and has proved to be efficient and accurate.

DTIC

Optimization; Problem Solving; Shape Optimization; Shapes

20080036622 Yale Univ., New Haven, CT USA

The Mailman Algorithm: A Note on Matrix Vector Multiplication

Liberty, Edo; Zucker, Steven W; Jan 2008; 9 pp.; In English

Report No.(s): AD-A482124; TR-1402; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Given an $m \times n$ matrix A we are interested in applying it to a real vector $x \in \mathbb{R}^n$ in less than the straightforward $O(mn)$ time. For an exact, deterministic computation at the very least all entries in A must be accessed, requiring $O(mn)$ operations and matching the running time of naively applying A to x . However, we claim that if the matrix contains only a constant number of distinct values, then reading the matrix once in $O(mn)$ steps is sufficient to preprocess it such that any subsequent application to vectors requires only $O(mn \log(\max\{m, n\}))$ operations. Theoretically our algorithm can improve on recent results for dimensionality reduction and practically it is useful (faster) even for small matrices.

DTIC

Algorithms; Matrices (Mathematics); Vectors (Mathematics)

20080036632 Yale Univ., New Haven, CT USA

An Algorithm for the Rapid Evaluation of Special Function Transforms

O'Neil, Michael; Woolfe, Franco; Rokhlin, Vladimir; Apr 15, 2008; 44 pp.; In English

Contract(s)/Grant(s): N00014-07-1-0711

Report No.(s): AD-A482145; YALEU/DCS/TR-1399; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We introduce a fast algorithm for the numerical application to arbitrary vectors of several special function transforms. The algorithm requires $O(n \log(n))$ operations to apply to an arbitrary vector any $n \times n$ matrix such that the rank of any $p \times q$ contiguous submatrix is bounded by a constant times pq/n . These rank bounds are proven here for the case of the Fourier-Bessel transform. Numerical experiments demonstrate a much wider applicability. The performance of the algorithm is illustrated via several numerical examples.

DTIC

Algorithms; Discrete Functions; Fourier Transformation; Transformations (Mathematics)

20080036674 Army Engineer Research and Development Center, Vicksburg, MS USA

Evaluation of Two Numerical Wave Models with Inlet Physical Model

Lin, Lihwa; Demirbilek, Zeki; Jul 1, 2005; 14 pp.; In English

Report No.(s): AD-A482228; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper evaluates the performance of two numerical wave models, GHOST and STWAVE, with measurements made in an idealized inlet physical model. The emphasis of this paper is on the overall performance of these models in coastal inlets. Both wave models are similar in that they employ a finite-difference method to solve the wave action conservation equation for the steady-state wave spectral transformation. However, these models differ in the computation of diffraction, reflection, wave breaking, and representation of the directional spectrum transformation. The models' performance is compared with a new set of physical model data for four different idealized inlet configurations. Wave height is measured in the physical model by a linear array of capacitance wave gauges, and wave direction is measured by a remote-sensing video-camera system. The comparison with data is presented as mean absolute relative errors of wave height and mean absolute difference of wave direction. Both wave models produced similar results, but neither could accurately describe waves observed in the physical model in inlets and near structures. The mean absolute relative error of wave height prediction from models was between 22 and 40% as compared with the measured data. The mean absolute error of wave direction estimates ranged from 5 to 12 degrees. Overall, wave direction estimates from GHOST in inlets and near structures compared slightly better with measurements.

DTIC

Finite Difference Theory; Linear Arrays; Mathematical Models

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20080034861; Federal Highway Administration, Washington, DC USA

Deformation of Cohesionless Fill Due to Cyclic Loading

Hassiotis, S.; Xiong, K.; Oct. 2007; 82 pp.; In English

Report No.(s): PB2008-101773; No Copyright; Avail.: National Technical Information Service (NTIS)

Integral abutment bridges are becoming widely accepted for new construction of short to medium length highway bridges

of limited skew. Although they offer an economic alternative to the use of bearings, integral abutments present their own unique challenges. One area of concern is the development of passive pressures behind the abutment due to the cyclic loading of the soil during thermal movement of the superstructure. The challenge of the present work is to present to the engineering community the best estimate of the passive pressures behind the abutment. To meet the challenge, we review both, the classic earth pressure theories and the more recent displacement-dependent theories used to describe the development of passive pressures. The information is compared to (1) the soil-pressure data obtained from the Scotch-Road Integral Abutment Bridge that was instrumented by the Stevens Institute of Technology; (2) additional data on two full-scale tests that were obtained from the literature; and (3) data from laboratory tests found in literature. Finally, we suggest two K_p factors that should be used for the calculation of passive pressures behind a cyclically moving abutment. For relatively short bridges, the NCHRP curve for dense sand can be used. For longer bridges that experience large enough displacements to guarantee the applicability of the classic earth pressure theories, a Rankine pressure for dense sands was found adequate. For either case, a linear distribution of pressure is suggested.

NTIS

Deformation; Highways; Bridges (Structures); Pressure Distribution

20080035186 Battelle Pacific Northwest Labs., Richland, WA USA

Statistical Methods and Tools for UXO Characterization

Pulsipher, B A; O'Brien, R F; Gilbert, R O; Bates, D J; Wilson, J E; Sandness, G A; Hassig, N L; Anderson, K K; Nov 2004; 67 pp.; In English

Contract(s)/Grant(s): DE-AC05-76RL01830; Proj-UXO-1199

Report No.(s): AD-A480986; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480986>

The Strategic Environmental Research and Development Program (SERDP) issued a statement of need for FY01 titled Statistical Sampling for Unexploded Ordnance (UXO) Site Characterization that solicited proposals to develop statistically valid sampling protocols for cost-effective, practical, and reliable investigation of sites contaminated with UXO; protocols that could be validated through subsequent field demonstrations. The SERDP goal was the development of a sampling strategy for which a fraction of the site is initially surveyed by geophysical detectors to confidently identification areas and subsections (target areas, TAs) that had elevated densities of anomalous geophysical detector readings that could indicate the presence of UXO. More detailed surveys could then be conducted to search the identified TAs for UXO. SERDP funded three projects: those proposed by the Pacific Northwest National Laboratory (PNNL) (SERDP Project # UXO 1199), Sandia National Laboratory (SNL), and Oak Ridge National Laboratory (ORNL). The projects were closely coordinated to minimize duplication of effort and facilitate use of shared algorithms where feasible. This final report for PNNL Project 1199 describes the methods developed by PNNL to address SERDP's statement-of-need for the development of statistically-based geophysical survey methods for sites where 100% surveys are unattainable or cost prohibitive. This PNNL project focused on 4 objectives: Finding target areas of anomalies; Compliance assessment; Dig list stopping rules and Validation of statistical tools developed for TA detection. Figure I shows the relationship between these objectives and provides a brief summary of the main results, including developed software and sources of additional information.

DTIC

Ammunition; Characterization; Detection; Sampling; Statistical Analysis

20080035191 Carnegie-Mellon Univ., Pittsburgh, PA USA

Actively Learning Specific Function Properties with Applications to Statistical Inference

Bryan, Brent; Dec 2007; 214 pp.; In English

Contract(s)/Grant(s): FA8650-05-C-7264

Report No.(s): AD-A480995; CMU-ML-07-122; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480995>

Active learning techniques have previously been shown to be extremely effective for learning a target function over an entire parameter space based on a limited set of observations. However, in many cases, only a specific property of the target function needs to be learned. For instance, when discovering the boundary of a region such as the locations in which the wireless network strength is above some operable level, we are interested in learning only the level-set of the target function. While techniques that learn the entire target function over the parameter space can be used to detection specific properties of the target function (e.g. level-sets), methods that learn only the required properties can be significantly more efficient, especially as the dimensionality of the parameter space increases. These active learning algorithms have a natural application in many statistical inference techniques. For example, given a set of data and a physical model of the data, which is a function

of several variables, a scientist is often interested in determining the ranges of the variables which are statistically supported by the data. We show that many frequentist statistical inference techniques can be reduced to a level-set detection problem or similar search of a property of the target function, and hence benefit from active learning algorithms which target specific properties. Using these active learning algorithms significantly decreases the number of experiments required to accurately detect the boundaries of the desired 1 confidence regions. Moreover, since computing the model of the data given the input parameters may be expensive (either computationally, or monetarily), such algorithms can facilitate analyses that were previously infeasible. We demonstrate the use of several statistical inference techniques combined with active learning algorithms on several cosmological data sets.

DTIC

Communication Networks; Inference; Learning

20080035216 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Discrete Counting of Short Lived Isotopes With Low Background Detectors

Mar 2008; 68 pp.; In English

Report No.(s): AD-A481059; AFIT/GNE/ENP/08-M03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481059>

We consider radiation counting experiments used to measure quantities of materials that are short-lived with respect to the count durations. The HPS 13.31 statistical analysis seriously overestimates the uncertainty when the quantity and background are very low. We consider the case in which the objective is to quantify the number of atoms, n , that were present in a sample when it was drawn. Mathews and Gerts [JRNC, 2008] analyzed this case and developed formulas for the probability distribution of n , in order to develop experiment design processes that minimize the smallest detectable quantity of material, thus maximizing sensitivity for the detection problem. We extend their effort to the quantification problem: designing such experiments to find the count duration that yields the lowest possible minimum quantifiable quantity, given the other measurement parameters. A value of n is quantifiable if the precision of the measurement, defined as the width of the confidence interval for n divided by the mean value of n , is sufficiently likely to be better than a specified precision tolerance. Our analysis and methods are confirmed by Monte Carlo simulation.

DTIC

Counting; Detectors; Isotopes; Statistical Analysis

20080035220 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Estimation of the Number of Microbial Species Comprising a Population

Slattery, Melanie R; Mar 2008; 107 pp.; In English

Report No.(s): AD-A481067; AFIT/GAM/ENC/08-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481067>

The purpose of this research was to evaluate the appropriateness of using non-parametric estimators, specifically the Chao1, ACES, and Jackknife methods, for estimation of the number of unique species comprising a population. This research consisted of creating diverse populations, with a known number of species, and applying the aforementioned methods to samples drawn from the constructed populations. The analysis of the non-parametric methods was followed by the parametric fitting of several different distributions to the sample data, including the lognormal, gamma, and Weibull. These results were analyzed as well. Both types of methodologies were then applied to sample data from constructed wetlands, where little is known about the population size and composition. This research did not attempt to identify the underlying population distribution of the wetlands, but rather focused upon demonstrating that the use of parametric methods are more apt to provide better results in estimating the number of species in a natural population. This research discovered the use of the non-parametric methods is not an appropriate for species estimation. The use of these methods resulted in lower bounds, which were several standard deviations away from the true number of species, for the contrived populations. A parametric method was more accurate in representing the truth. Recommendations for further research are provided in this thesis.

DTIC

Estimates; Microorganisms; Nonparametric Statistics; Populations

20080035409 Evidence Based Research, Inc., Suffolk, VA USA

Challenges in Data Collection and Analysis in Multi-National Experimentation

Duncan, Jeff; Farrell, Philip S; Jun 2007; 47 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481447; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Military Warfighting Experimentation is an event used to learn whether a function, method, process, machine, etc will

work, or better stated, to learn ‘how it will work,’ in a simulated environment in order to make educated determinations for real world operations. In order to make these educated determinations, analysts must collect applicable data and analyze it in a manner/method which answers the questions or hypotheses being investigated. Is the appropriate data being collected and does the analysis plan reflect the aims of the experiment? These questions are applicable in any experimentation endeavor. Multi-national experimentation is no exception. Some of the same challenges that face multi-national experimentation face other types of experimentation while some are uniquely multi-national. We plan to focus upon our insights from experiments MNE4 (Multi-National Experiment 4) and UR 2015 (Urban Resolve 2015) as our basis of exploration realizing that not all findings presented are uniquely multi-national. Realizing that no two experiments are rarely the same, the purpose of this paper is not to create firm and fast rules for data collection and analysis in multi-national experimentation but to leverage findings for future experiments such that we do not ‘reinvent the wheel’. This should help advance and improve the overall community’s experimentation results and products.

DTIC

Data Acquisition; Experiment Design; Surveys

20080035410 Migma Systems, Inc., Walpole, MA USA

Nonparametric Classifier of Buried Mines Using MWIR Images

Ling, Bo; Trang, Anh H; Phan, Chung; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W909MY-05-C-0011

Report No.(s): AD-A481448; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Under Army SBIR Phase I funding, we have developed a nonparametric buried mine classifier using MWIR images. We start with our new image segmentation method based on the wavelet transform. Instead of thresholding the original MWIR images, we first apply the wavelet transform to MWIR image and estimate a threshold value in the corresponding wavelet domain. The small wavelet coefficients are associated with the noise and background clutters appeared in the original image. We then map this threshold in the wavelet domain back to MWIR image domain by applying the inverse wavelet transform. This new threshold is subsequently used to segment the MWIR images and extract small image chips (patches) containing potential buried mines for further detection and classification. In order to perform the statistical classification, we have applied Kolmogorov-Smirnov (KS) test, a powerful nonparametric statistical hypothesis test procedure. One major advantage of using KS test for buried mine detection is that we don’t need to make any assumptions of the underlying statistical distributions associated with the cluster intensity variation profiles.

DTIC

Classifiers; Mine Detectors

20080036291 North Carolina Univ., Chapel Hill, NC USA

Meeting of New Researchers in Statistics and Probability (10th). Held in Salt Lake City, UT on July 24-28, 2007

Gupta, Mayetri; May 2008; 9 pp.; In English

Contract(s)/Grant(s): N00014-07-1-0384

Report No.(s): AD-A481565; UNC-5-35762; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481565>

The Tenth Conference of New Researchers in Statistics and Probability, sponsored by the IMS, was held on the campus of the University of Utah in Salt Lake City, from July 24th to 28th, 2007. This yearly conference provides a unique opportunity for new researchers to exchange research ideas and initiate contacts amongst themselves in an informal setting as well as provide them an opportunity to interact with the invited senior participants. As part of the conference, each participant presented a talk or poster on their research. The meeting was structured to provide ample time and opportunities for them to discuss their research interests and life as new researchers over meals and a number of social activities. The majority of participants came from the USA, but also included researchers from Canada, Singapore, and Spain. The talk sessions were diverse in content, ranging from stochastic and space-time processes, semiparametric and nonparametric inference, data mining, classification and clustering techniques, methods for high-dimensional data, Bayesian methodology, statistical computing, and recent advances in survival analysis.

DTIC

Lakes; Probability Theory; Statistics

20080036320 Army Communications-Electronics Command, Fort Monmouth, NJ USA

LPI and BER Performance of a Chaotic CDMA System Using Different Detection Structures

Yu, Jin; Li, Hanyu; Yao, Yu-Dong; Vallesterio, Neil J; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481615; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481615>

Low probability of intercept (LPI) performance of a direct-sequence code division multiple access (DS-CDMA) system is investigated in this paper; both chaotic and pseudo-random binary spreading sequences are considered. Several intercept receiver structures, including energy detector, synchronous and asynchronous, coherent and noncoherent, are examined, and the expressions of the detection probabilities are derived. The bit error rate (BER) of the chaotic CDMA system is also investigated in the paper.

DTIC

Bit Error Rate; Code Division Multiple Access; Interception; Probability Theory

20080036357 Army Tank-Automotive Research and Development Command, Warren, MI USA

A Method to Predict the Reliability of Military Ground Vehicles Using High Performance Computing

Lamb, David A; Gorsich, David; Krayterman, Dmitriy; Choi, K K; Hardee, Ed; Youn, Byeng D; Ghiocel, Dan; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481677; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481677>

A method is presented to use the massively parallel environment of High Performance Computing (HPC) to more rapidly compute the reliability prediction of military ground vehicles. Current work, and future plans are discussed. Challenges already surmounted are indicated, as are those still to be met.

DTIC

Computerized Simulation; Parallel Processing (Computers); Reliability

20080036365 Army Engineer Research and Development Center, Vicksburg, MS USA

Estimation of Combined Wave and Storm Surge Overtopping at Earthen Levees

Hughes, Steven A; May 2008; 17 pp.; In English

Report No.(s): AD-A481691; ERDC/CHL-CHETN-III-78; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481691>

This Coastal and Hydraulics Engineering Technical Note (CHETN) provides empirical equations for estimating several parameters of unsteady flow resulting from the combination of steady storm surge overflow and overtopping of irregular waves at a trapezoidal-shaped earthen levee. Equations are given for the average overtopping discharge and the cumulative probability distribution of instantaneous overtopping discharge. On the landward-side slope, empirical equations can be used to estimate the mean flow depth, mean flow velocity, root-mean-square wave height, and velocity associated with the overtopping wave front. Worked examples illustrate application of the empirical equations. Earthen levees are used extensively in the USA to protect populations and infrastructure from periodic floods and high water due to storm surges. Overtopping of levees and dikes produces last-flowing, turbulent water velocities on the landward-side slope that can damage the protective grass covering and expose the underlying soil to erosion. If overtopping continues long enough, the erosion may eventually result in loss of levee crest elevation and perhaps breaching of the protective structure. Economics often dictate levee designs with crown elevations having a risk that some wave/surge overtopping will occur during extreme events. In addition, crown elevations for older levee systems may have been established without complete information about possible water levels that might occur during extreme events. Even levees that presently have sufficient freeboard to withstand all but the most extreme storms may become vulnerable to wave overtopping and storm surge overflow in the future if sea level continues to rise at projected rates. The cost and engineering challenges of raising all levees to elevations where overtopping will be within tolerable limits may be insurmountable.

DTIC

Coasts; Floods; Probability Distribution Functions; Storm Surges; Surges

20080036628 Yale Univ., New Haven, CT USA

A Fast Randomized Algorithm for Overdetermined Linear Least-Squares Regression

Rokhlin, Vladimir; Tygert, Mark; Apr 28, 2008; 15 pp.; In English

Contract(s)/Grant(s): N00014-07-1-0711; FA9550-07-1-0541

Report No.(s): AD-A482134; YALEU/DCS-TR-143; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We introduce a randomized algorithm for overdetermined linear least-squares regression. Given an arbitrary full-rank $m \times n$ matrix A with $m > n$, any $m \times 1$ vector b , and any positive real number ϵ , the procedure computes an $n \times 1$ vector x which minimizes the spectral norm $\|Ax - b\|$ to relative precision ϵ . The algorithm typically requires $O((\log(n) + \log(1/\epsilon))mn + n^3)$ floating-point operations. This cost is less than the $O(mn^2)$ required by the classical schemes based on QR-decompositions or bidiagonalization. We present several numerical examples illustrating the performance of the algorithm.

DTIC

Algorithms; Least Squares Method; Regression Analysis

66

SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20080035323 Office of Naval Research, Arlington, VA USA

Applying Spatial-Temporal Model and Game Theory to Asymmetric Threat Prediction

Wei, Mo; Chen, Genshe; Cruz, Jr., Jose B; Haynes, Leonard; Kruger, Martin; Jun 2007; 48 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481228; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Accurate predictions of enemy course of actions 'ECOA' are important to the command and control optimization strategies in long-lasting battles. In most Command and Control 'C2' applications, the existing techniques, such as spatial-temporal point models for ECOA prediction or Discrete Choice Model 'DCM', assume that insurgent attack features/patterns, or at least the trends of behavior patterns, are static. However, this static assumption is no longer true for intelligent and organized insurgents in recent antiterrorism war. These insurgents sometimes deliberately violate probability theory predictions so they can apply surprise attacks to create more casualties and spread terror. In this paper, a new game theoretic framework is proposed for modeling dynamic changes of enemy behavior features and predicting future threats. This framework semantically combines several different approaches; namely, a feature prediction game, higher level hybrid data fusion, techniques to provide concrete spatial-temporal modeling and prediction, emotion analysis of adversary rationality and non-rationality, deception identification and modeling, hierarchical knowledge representation, and a non-zero sum stochastic adversarial Markov game. We mainly describe the modification of existing spatial-temporal point models, the fusion of dynamic game feature selection technique and dynamic cohesiveness feature selection technique, the ontology about selected/unselected features, and construction of probability predictions.

DTIC

Asymmetry; Command and Control; Game Theory

20080035346 Intelligent Automation Systems, Inc., Rockville, MD USA

Game Theoretic Solutions to Cyber Attack and Network Defense Problems

Shen, Dan; Chen, Genshe; Cruz, Jr., Jose B; Blasch, Erik; Kruger, Martin; Jun 2007; 38 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-06-M-0237

Report No.(s): AD-A481265; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There are increasing needs for research in the area of cyber situational awareness. The protection and defense against cyber attacks to computer network is becoming inadequate as the hacker knowledge sophisticates and as the network and each computer system become more complex. Current methods for alert correlation to detect and identify network attacks rely on data mining approaches that use features or feature sets of network data to discover an attack. These approaches are useful for simple attacks but for complex or coordinated cyber intrusions, they have various issues such as false positive, limited scalability, limits on detecting new types of coordinated and sophisticated cyber attacks. Therefore, the cyberspace security requires next-generation network management and intrusion detection systems that combine both short-term sensor information and long-term knowledge databases to provide decision-support systems and cyberspace command and control.

In this paper, we propose a game theoretic high level information fusion based decision and control framework to detect and predict the multistage stealthy cyber attacks. The main focus of this paper is to address the cyber network security problem from a system control and decision perspective and revise the Markov game model with the knowledge of the cyber attack domain.

DTIC

Computer Networks; Game Theory

20080035359 Army Engineer Research and Development Center, Vicksburg, MS USA

Development of a Distributed Watershed Contaminant Transport, Transformation and Fate (CTT&F) Sub-Module for Military Installations

Johnson, Billy; Zhang, Zhonglong; Nov 2006; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Many U.S. Department of Defense installations contain soil, sediment, surface water, and groundwater environments contaminated with explosives and energetics. Modeling as part of watershed management to meet water quality goals is not new but most current models were developed and tested two decades ago. Watershed models are largely confined to lumped and semi-distributed surface water simulation. Models that reflect hydrologic and aquatic impacts from military conditions are rare. Watershed models that enable diagnostic, predictive, and operational applications in conjunction with monitoring and data collection programs are virtually non-existent across the board and are urgently needed within the scientific and modeling communities. To meet this need a physically based, distributed source Contaminant Transport, Transformation and Fate (CTT&F) sub-module was developed by the U.S. Army Engineer Research and Development Center, to simulate point and non-point sources across a watershed. The model operates on a cell by cell basis. Soil types, land uses, and other hydrologic characteristics can be varied spatially among cells. Potential chemicals are routed through the cells from the watershed divide to the outlet. The distributed, process-oriented structure of the model can be used for identifying critical source areas of non-point sources within the watershed, and can give insight on both the persistence and fate of explosives. The expectation is that a model of this type is able to quantify transport and transformation of multiple contaminants and can facilitate the assessment of the fate of distributed sources and lead to better management of the watershed environment for military installations. CTT&F can be linked to any distributed hydrologic model, assuming the hydrologic model provides the required flow and sediment transport fluxes. The ability of the model to simulate explosives in watersheds is demonstrated by a test case study in the laboratory environment.

DTIC

Contaminants; Contamination; Mathematical Models; Watersheds

20080035379 Defense Advanced Research Projects Agency, Arlington, VA USA

Next State Planning: A 'Whole of Government' Approach for Planning and Executing Operational Campaigns

Kott, Alexander; Hawley, Len; Brown, Glenn; Citrenbaum, Gary; Corpac, Peter S; Jun 2007; 34 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481384; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Defense Advanced Research Project Agency (DARPA) and U.S. Joint Forces Command (JFCOM), as part of the Integrated Battle Command program, have developed a planning process for leaders to plan and execute campaigns at the operational level of war. The 'Next State Planning' provides a process for operational leaders to plan campaigns along multiple political, military, economic, social, informational economic lines of effort and employ all elements of national power. Next State Planning divides a campaign into a sequence of well defined, short duration 'stepping stones' that can be achieved through coordinated, multiple domain, Line of Effort operations. Next states are defined in terms of objectives or end states rather than actions. It is an iterative planning process where the next state, N1, is well defined with specific actions planned to achieve it and next states N2-N are less defined. This postpones the decision as to how to achieve the state until closer to execution time, when uncertainties will have been considerably reduced. Metrics are established and next states evaluated against achievements on the ground. The plan, allocation of resources, next states and over all objectives are then modified based operations. It provides framework for executing civil and military operations.

DTIC

Economics; Military Operations; Operations Research; Planning

20080035401 Hampton Univ., VA USA

Energy-Aware Node Selection In A Distributed Sensor Network

Le, Qiang; Kaplan, Lance M; McClellan, James H; Nov 2006; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-008

Report No.(s): AD-A481430; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This work develops a resource management strategy for a wireless sensor network of bearings-only sensors. Specifically, the resource manager determines which nodes actively sense and communicate during each snapshot in order to achieve a tolerable level of geolocalization accuracy while attempting to maximize the effective lifetime of the network. This work compares three energy-related metrics. The traditional metric that summarizes the energy usage over a single snapshot consists of the first metric. The other two metrics represent the current lifetimes of the currently active node set and the next active node set. These metrics can achieve load balancing of the nodes without resorting to computationally demanding non-myopic optimization. For any of the three metrics, the activation decision is performed in a decentralized manner over the active set of nodes. Each active node transmits just far enough to reach all the active nodes for information sharing and the potentially active nodes for information handoff. In determining the active set, partial network knowledge is considered. The partial network approach assumes that a node only knows the location of itself, the previous active set, and neighboring nodes. Simulations demonstrate the advantage of the current lifetime metrics over the more traditional energy based metric.

DTIC

Energy Conservation; Multisensor Fusion; Wireless Communication

20080035402 Space and Naval Warfare Systems Command, Charleston, SC USA

A Quantitative Model-Driven Comparison of Command Approaches in an Adversarial Process Model

Regal, Robert; Reed, Rebecca; Largent, Matt; Jun 2007; 55 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481433; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this research, we will demonstrate that for a given mission, certain Command Approaches are more effective against other Command Approaches (e.g. Control Free may be more effective against Interventionist than Problem Solving). Lenahan identified metrics and techniques for adversarial C2 process modeling. We intend to further that work by developing a set of adversarial process models that will allow us to 'compete' Command Approaches (Control Free, Problem Solving and Interventionist) against each other. We will evaluate the conflict outcome, abstract process metrics and resource utilization rates (materiel and human). The intent is that this work will quantitatively examine the effect of varying Command Approaches for a specific mission and lay the foundation for future work in the area of C2 process and organization research. In the future, we would like to develop hybridized or unique command approaches that are most effective for specific mission portfolios.

DTIC

Command and Control; Mission Planning

20080035406 Connecticut Univ., Storrs, CT USA

Modeling and Agent-Based Simulation of Organization in a Stochastic Environment

Ruan, Sui; Gokhale, Swapna S; An, Woosun; Pattipati, Krishna R; Kleinman, David L; Jun 2007; 37 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-00-1-0101

Report No.(s): AD-A481443; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes a generic model and agent-based simulation to facilitate the analysis of interplay of information collection (task identification) and decision making (task execution) processes, as well as the information flow behaviors in organizations in the face of stochastic mission environments. In these mission environments, task arrivals are stochastic, the characteristics of tasks are not known a priori, but maybe inferred to a certain degree by undertaking the information collection or task identification processes. Through the information collection processes the organization collects the relevant attributes of tasks to estimate the resources necessary for their execution. This information is then used to allocate resources effectively for the execution of tasks. Our model, following structural contingency theory, depicts an organization as consisting of an information-processing, communication and coordination structure that is designed to achieve a specific set of goals, and is comprised of individuals with different information collecting and task execution capabilities. We develop a simulation toolkit based on a discrete event simulator, specifically the ANY LOGIC R simulation package, to quantify the performance of an organization based on this model. We illustrate our approach using a number of coordinating organizational structures operating in a stochastic mission environment.

DTIC

Decision Making; Simulation; Stochastic Processes

20080036270 California Univ., Santa Barbara, CA USA

Motion Coordination with Noisy Measurement in Natural and Artificial Swarms

Barooah, Prabir; Hespanha, Joao P; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-D-0004

Report No.(s): AD-A481531; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481531>

We consider the problem of controlling a group of mobile agents toward a formation defined by the desired relative positions between the agents. Each agent has available for control noisy measurements of its relative position with respect to a small set of neighbors. The motion of the group as a whole is due to a leader who moves independently of the other agents. We show that there are intrinsic limitations on the size of the group determined by the underlying network structure imposed by the requirement of local interaction, which determine how low a tracking error can be achieved. It is shown that the tracking error covariance is given by the matrix-valued effective resistance introduced by the authors in Barooah and Hespanha (2005). We show how the effective resistance of a node in the multi-agent graph scales with the distance of that node from the leader for a large class of graphs. These scaling laws ultimately dictate on what kind of graphs scalable motion coordination can be achieved. Apart from providing design guidelines for robotic swarms, these results shed light on the dynamics of collective motion of certain animal groups.

DTIC

Coordination

20080036273 Telcordia Technologies, Inc., Piscataway, NJ USA

Active Maintenance of Hierarchical Structures in Future Army Networks

Manousakis, Kyriakos; McAuley, Anthony J; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-2-01-0011

Report No.(s): AD-A481536; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481536>

The application of appropriate hierarchical structures is an efficient mechanism for improving the survivability and scalability of mobile ad hoc networks (MANETs). Due to network dynamics and infrastructureless character of MANET, however, the imposed hierarchy may harm the performance as the network environment evolves. This degradation can be prevented by adapting the hierarchy to the new network characteristics, so that the resulting hierarchy continues to be beneficial. This hierarchy maintenance is traditionally localized and driven by the constraint violations (feasibility) due to network dynamics. The traditional class of hierarchy maintenance is called passive, since it is triggered only by infeasibility. In this paper we present a new class of hierarchy maintenance algorithms, called active hierarchy maintenance. Unlike the Passive approach, Active Maintenance continuously operate for both preserving the feasibility and improving the evolving hierarchical structures. Our active maintenance algorithms operate locally using the same basic objective functions used in hierarchy creation. For a specific class of objective functions, we prove that the localized reconfigurations applied by the active maintenance result in global hierarchy quality improvement. Using an example of creating balanced size domains, our simulation results show that Active Local Maintenance preserves good hierarchy quality (cost increase is less than 50% of the global optimal), independently of the network dynamics. To the contrary, Passive Local maintenance shows rapid quality degradation (cost increase up to 400%)

DTIC

Communication Networks; Hierarchies; Maintenance; Optimization; Topology

20080036277 California Univ., Davis, CA USA

Energy-Aware Spectrum-Agile Medium Access in Fading

Chen, Yunxia; Zhao, Qing; Swami, Ananthram; Nov 2006; 9 pp.; In English

Contract(s)/Grant(s): DAAD19-01-2-0011

Report No.(s): AD-A481540; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481540>

This paper addresses the design of distributed cognitive medium access control (MAC) protocols for opportunistic spectrum access (OSA) under an energy constraint on the secondary users. The objective is to maximize the expected number of information bits that can be delivered by a secondary user during its battery lifetime without causing interference to primary users. By absorbing the residual energy level of the secondary user into the state space, we formulate the energy-constrained OSA problem as an unconstrained partially observable Markov decision process (POMDP) and obtain the optimal spectrum sensing and access policy. We analyze and reduce the computational complexity of the optimal policy. We also propose a

suboptimal solution to energy-constrained OSA, whose computational complexity can be systematically traded off with its performance. Numerical examples are provided to study the impact of spectrum occupancy dynamics, channel fading statistics, and energy consumption characteristics of the secondary user on the optimal sensing and access decisions.

DTIC

Communication Networks; Energy Consumption; Energy Spectra; Fading; Optimization; Spectra; Topology

20080036287 Naval Undersea Warfare Center, Newport, RI USA

Tactical Application of Gaming Technologies for Improved Battlespace Management

Silvia, David; Doris, Ken; Jan 2007; 39 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481559; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481559>

This paper discusses a research project that employs Gaming Technologies to improve the ability of military planners to more effectively locate and engage Time-Sensitive Targets (TST's). The battlespace is modeled and simulated through the use of Artificial Intelligence, Physics Modeling and Visualization capabilities employed in modern commercial computer games. This not only supports the ability to understand the spatial relationships of weapons, sensors, targets, and threats within the context of a mission but, also provides the ability to predict changes in these relationships through the mission's timeline. The rationale behind the selection of the specific technologies, as well as progress being made to develop a prototype workstation for future incorporation into the Tactical Tomahawk, is also detailed.

DTIC

Game Theory; Military Operations; Planning; Sensitivity; Targets; Warfare

20080036319 Army Research Lab., Aberdeen Proving Ground, MD USA

Multi-Million Atom Molecular Dynamics Simulations of Shocked Materials

Mattson, William D; Rice, Betsy M; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481611; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481611>

We describe a new extensible software system that performs multi-million atom molecular dynamics simulations. This new software system is based on a program environment and a set of components stored in shared object libraries that are executed by the program environment as specified by an XML description of the simulation. Fixed and scaled speedups for this software are demonstrated in molecular dynamics simulations of +/- quartz, using up 256 processors and up to 4.4 million atoms. Scaled speed up is over 80% of optimal on 256 processors and fixed speed up is also over 80% on 64 processors for system sizes as small as 1,000 atoms per processor. The outstanding scaling for both small and large systems is somewhat unusual, since other multimillion atom simulation codes tend to perform well only for very large systems.

DTIC

Molecular Dynamics; Simulation

20080036351 Army Research Lab., Aberdeen Proving Ground, MD USA

Patterned Armor Performance Against Multiple Impacts

de Rosset, William S; Sturdivant, Rodney; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481669; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481669>

Two approaches have been taken to model the effect of multiple impacts on patterned armor. The first is a simple analytical model that assumes a uniform random distribution of impacts. The second is a more sophisticated computer model that allows for a Gaussian distribution of impacts around the aim point. The analytic model is used to show how areas of weakness in patterned armor can affect performance. In addition, the analytic model can be exercised to conduct quick trade-off studies between patterned armor concepts. The computer model, developed specifically to determine the effects of a small number of impacts, is used to calculate the effects of dispersion of impact points and aim point.

DTIC

Armor; Mathematical Models

20080036404 Ohio State Univ., Columbus, OH USA

Decomposition Algorithms for Very Large Scale Stochastic Mixed-Integer Programs

Sen, Suvrajeet; Yuan, Yang; Jan 2007; 8 pp.; In English

Contract(s)/Grant(s): FA9550-07-1-0447

Report No.(s): AD-A481768; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481768>

The objectives of this project were to explore decomposition algorithms that solve optimization models under uncertainty. In order to accommodate a variety of future scenarios, our algorithms are designed to address large scale models. The main accomplishments of the project can be summarized as follows. 1) design and evaluate decomposition methods for stochastic mixed-integer programming (SMIP) problems (Yuan and Sen [2008]); 2) accelerate stochastic decomposition (SD) as a prelude to using SD for SMIP as well as a multi-stage version of SD (Sen et al [2007], Zhou and Sen [2008]); 3) develop a theory for parametric analysis of mixed-integer programs, and provide economically justifiable estimates of shadow prices from mixed-integer linear programming models (Sen and Genc [2008]). The first two relate to stochastic programming, whereas the last addresses one of the long-standing open questions in discrete optimization, namely, parametric analysis in MILP models. This paper (listed as [1]) is likely to have a long term impact on a variety of fields including discrete optimization, operations research, and computational economics.

DTIC

Algorithms; Cost Effectiveness; Decomposition; Economics; Integers; Linear Programming; Stochastic Processes

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THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20080035218 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Image Based Bidirectional Reflectivity Distribution Function Experiment

Hagg, Michael T; Mar 2008; 80 pp.; In English

Report No.(s): AD-A481063; AFIT/GEO/ENP/08-M03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481063>

This experiment is a proof of concept type experiment providing initial setup and discovery of pitfalls that need to be overcome for AFIT to set-up an image based BRDF acquisition tool. Custom fabricated parts including a robust camera rotation mount and large scale mirror solutions are discussed. Image data extraction including geometric pixel to surface area correlation and a discussion of radiometric quantities that need to be well documented to extract BRDF.

DTIC

Bidirectional Reflectance; Distribution Functions

20080035595 Air Force Research Lab., Hanscom AFB, MA USA

Mountain Wave Analysis Using Fourier Methods

Roadcap, John R; Oct 1, 2007; 73 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-2304

Report No.(s): AD-A481358; AFRL-RV-HA-TR-2007-1112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Eigenanalysis of temperature and wind profiles can reveal distinct resonances at mesoscale wavelengths. Fourier transform methods are well suited to analyze resonant modes such as mountain waves due, in part, to (1) their fast computation speed for large wave number domains compared to numerical forecast models and (2) their requirements for only a coarse horizontal background state. Common traits of Fourier mountain wave models include use of the Boussinesq approximation and neglect of moisture and Coriolis terms. Solutions are provided to linearized elliptic partial differential equations expressed in terms of height or velocity perturbation using complex phase functions. Lower boundary conditions are defined using the Fourier transform of the terrain height field which is typically modified to ensure linear assumptions are satisfied and to avoid effects associated with periodic horizontal boundary conditions. Two mountain wave models, Smith Three-Layer and Broutman MWFM-3, are examined. Both models have a strong theoretical basis and are well documented in the refereed literature. These models can allow for both hydrostatic and non-hydrostatic wave modes but do not permit more than one wind turning point in their representation of the phase functions. The two models have undergone limited verification for

real-world environments using aircraft and satellite data and have been compared with non-linear numerical model integrations. The Broutman MWFM-3 model, having been developed to include tropospheric and stratospheric wave propagation and having no theoretical limit on top height, is favored for testing in an operational forecast environment.

DTIC

Fourier Transformation; Mountains

20080036307 Army Research Lab., Aberdeen Proving Ground, MD USA

Scalability of Robotic Controllers: An Evaluation of Controller Options

Petitt, Rodger A; Redden, Elizabeth S; Carstens, Christian B; May 2008; 86 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481592; ARL-TR-4457; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481592>

This study, conducted at Fort Benning, Georgia, was an operational investigation of tele-operation control performance with the use of three different robotic control devices. Twelve Soldiers from the Officers Candidate School and three Soldiers from Headquarters Company, 1st Battalion, 11th Infantry Regiment served as participants. Before any training, Soldiers provided an initial evaluation of the intuitiveness of controller features. After training in the operation of the IRobot PackBot Robot system, each Soldier completed a driving course using three different controller types. Controller A was the largest of the three controllers and each control manipulation had a single function. Both controller A and controller B had a similar number of single-function controls; however, controller B's controls were laid in a different configuration and were smaller than controller A's. Controller C had the fewest controls and the controls were multi-functional. Soldiers were tasked to drive the robot and to perform operations such as surveillance using the robotic arm. We measured workload for each controller was measured by having the Soldiers complete the NASA (National Aeronautics and Space Administration) Task Load Index survey after they used each controller type. type and usability were evaluated, based on objective performance data, data collector observations, and Soldier questionnaires. The multifunctional controller was reported to be more difficult to learn and use than the controller with reduced control sizes because switching between functions was time consuming and confusing. This difficulty increased perceived workload. Soldiers also found that several robotic control functions (e.g., raising the control arm while turning the sensor head) could not be performed simultaneously with the multifunction controller. Findings indicate that reducing the size of the individual controls shows promise as a valid approach.

DTIC

Control; Controllers; Robotics

20080036572 Washington Univ., Seattle, WA USA

Analysis of TODWL PBL Wind Profiles Over Monterey Bay: Towards Ground Truth Winds for WindSAT and Other Remote Sensors

Foster, Ralph C; Brown, Robert A; May 29, 2008; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00173-03-1-G021

Report No.(s): AD-A481982; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Under this project we analyzed data from the TOWDL (Test of Wind Doppler Lidar) data acquired from February-March, 2002 and February, 2003 over and near Monterey Bay, CA to characterize the coherent structures and to compare them to our simple models of PBL roll vortices. This information is crucial for developing Cal/Val strategies and will help advance our fundamental understanding of the planetary boundary layer (PBL). A good model of the inhomogeneous flow at the proper footprint scales is essential to correct interpretation of surface comparison data. In many cases the inherent variability in Cal/Val may be in the natural turbulent and coherent structure nature of the winds rather than in the sensor signal. Since the satellite surface wind sensors appear to detect surface stress rather than surface wind, the variability in the surface stress, which is a nonlinear function of the surface wind, must be understood.

DTIC

Doppler Radar; Ground Truth; Models; Nonlinearity; Remote Sensors; Wind Profiles

20080036573 GMR Research and Technology, Inc., Concord, MA USA

An Analog-to-Information Approach Using Adaptive Compressive Sampling and Nonlinear Affine Transformations. Analog-to-Information GMR-UW Collaboration

Raz, Gil M; Nowak, Robert D; May 20, 2008; 23 pp.; In English

Contract(s)/Grant(s): N00014-07-M-0055

Report No.(s): AD-A481983; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The collaborative effort between GMR Research & Technology and the University of Wisconsin - Madison aimed at

finding novel approaches in reduced rate representation and sampling. The effort concentrated on exploring data-adaptive techniques and non-adaptive structured sensing, as well as comparing randomized projection based approaches to nonlinear affine (NoLAff) approaches. The approaches explored in this work share a common theme of improving upon purely random encoding. Adaptive sampling utilizes partial information from previous observations to focus subsequent observations onto relevant signal components, and provides significant improvements in the measurement signal-to-noise ratio. Toeplitz structured matrices are effective sensing structures that are efficient to generate and implement in practice. The acquisition process of NoLAff sampling can be approximately modeled using special deterministic sensing matrices, and the inherent structure can be leveraged to reduce decoding from convex optimization to hypothesis testing, which is efficient both computationally and from a data rate perspective.

DTIC

Analog Data; Compressibility; Information Systems; Multisensor Fusion; Nonlinear Systems; Nonlinearity; Sampling; Signal Processing

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PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography*; for geophysics, astrophysics, or solar physics see *46 Geophysics, 90 Astrophysics, or 92 Solar Physics*.

20080034707 Brookhaven National Lab., Upton, NY USA

Shielded Beam Delivery Apparatus and Method

Hershcovitch, A., Inventor; Montano, R. D., Inventor; 30 Aug 04; 12 pp.; In English

Contract(s)/Grant(s): DEAC02-98CH10886

Patent Info.: Filed 30 Aug 04; US-Patent-Appl-SN-10-932 653

Report No.(s): PB2008-100756; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An apparatus includes a plasma generator aligned with a beam generator for producing a plasma to shield an energized beam. An electrode is coaxially aligned with the plasma generator and followed in turn by a vortex generator coaxially aligned with the electrode. A target is spaced from the vortex generator inside a fluid environment. The electrode is electrically biased relative to the electrically grounded target for driving the plasma toward the target inside a vortex shield.

NTIS

Patent Applications; Shielding; Plasma Generators

20080034711 Rensselaer Polytechnic Inst., Troy, NY, USA

Novel Compact Pyroelectric X-Ray and Neutron Source

Aug. 2007; 196 pp.; In English

Contract(s)/Grant(s): DE-F07-04ID14596

Report No.(s): DE2007-915221; No Copyright; Avail.: Department of Energy Information Bridge

This research was focused on the utilization of pyroelectric crystals for generation of radiation. When in constant temperature pyroelectric crystals are spontaneously polarized. The polarization causes internal charges to accumulate near the crystal faces and masking charges from the environment are attracted to the crystal faces and neutralize the charge. When a pyroelectric crystal is heated or cooled it becomes depolarized and the surface charges become available. If the heating or cooling is done on a crystal in vacuum where no masking charges are available, the crystal becomes a charged capacitor and because of its small capacitance large potential develops across the faces of the crystal.

NTIS

Neutron Sources; Pyroelectricity

20080034712 Universidad Autonoma de Barcelona, Spain

Inclusive Jet Production Studies at the Tevatron using the CDF Detector

Francisco, O. N.; Mar. 2007; 158 pp.; In English

Report No.(s): DE2007-915133; No Copyright; Avail.: National Technical Information Service (NTIS)

Quantum Chromodynamics (QCD) is the gauge theory that governs the strong interactions between quarks and gluons inside hadrons like, for example, protons and neutrons. It shows two well established characteristics, related to the non-abelian nature of the theory, that dominate its phenomenology: asymptotic freedom and color confinement. The dependence of the

strong coupling, $\alpha_s(Q^2)$, with the hard scale is such that it decreases with decreasing the distance between partons. This allows to perform precise theoretical calculations at large energy transfer (short distances) using perturbative QCD (pQCD). On the other hand, the strength of the interaction increases with the distance between partons and thus colored quarks and gluons are forced to be confined inside colorless hadrons.

NTIS

Particle Accelerators; Quantum Chromodynamics

20080034713 Fermi National Accelerator Lab., Batavia, IL, USA

Design and Fabrication of a Multi-Element Corrector Magnet for the Fermilab Booster

Makarov, A.; Drennan, C.; DiMarco, J.; Harding, D. J.; Kashikhin, V. S.; Aug. 23, 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-07CH1139

Report No.(s): DE2007-915128; FERMI-LAB-CONF-07-432-TD; No Copyright; Avail.: National Technical Information Service (NTIS)

A new package of six corrector elements has been designed to better control the beam position, tune, and chromaticity in the Fermilab Booster synchrotron. It incorporates both normal and skew orientations of dipole, quadrupole, and sextupole magnets. These new corrector magnets will be installed in the Fermilab Booster ring in place of old style corrector elements. A severe space restriction and rapid slew rate have posed special challenges. The magnet design, construction, and performance are presented.

NTIS

Fabrication; Magnets

20080034719 Kent State Univ., OH, USA

Measurements of the Helium Form Factors at Jlab

Khrosinkova, E.; Jun. 11, 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC05-06OR23177

Report No.(s): DE2007-915102; JLAB-PHY-07-725; DOE/OR/23177-0146; No Copyright; Avail.: Department of Energy Information Bridge

An experiment to measure elastic electron scattering off ^3He and ^4He at large momentum transfers is presented. The experiment was carried out in the Hall A Facility of Jefferson Lab. Elastic electron scattering off ^3He was measured at forward and backward electron scattering angles to extract the isotope's charge and magnetic form factors. The charge form factor of ^4He will be extracted from forward-angle electron scattering angle measurements. The data are expected to significantly extend and improve the existing measurements of the three- and four-body form factors. The results will be crucial for the establishment of a canonical standard model for the few-body nuclear systems and for testing predictions of quark dimensional scaling and hybrid nucleon-quark models.

NTIS

Elastic Scattering; Electron Scattering; Form Factors; Helium; Backscattering

20080034766 Fitzpatrick Cella Harper and Scinto, New York, NY, USA

Polarized Light-Emitting Film and Method for Producing Same

Miyata, H., Inventor; Tolbert, S. H., Inventor; Molenkamp, W. C., Inventor; Schwartz, B. J., Inventor; Martini, I. B., Inventor; 12 Apr 05; 25 pp.; In English

Contract(s)/Grant(s): ONR-N00014-99-1-0568; ONR-N00014-04-1-0410

Patent Info.: Filed 12 Apr 05; US-Patent-Appl-SN-11-103 600

Report No.(s): PB2008-101191; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A polarized light-emitting layer that comprises a porous silica film formed on a substrate and a conjugated polymer held in the uniaxially oriented, tubular mesopores in the porous silica film. The film can emit fluorescence polarized in a direction parallel to the alignment direction of the mesopores. The film can act as a lasing layer with a low excitation threshold.

NTIS

Polarized Light; Porosity; Silicon Dioxide

20080034768 Stanford Linear Accelerator Center, CA, USA

Design of the Beam Delivery System for the International Linear Collider

Seryi, A.; Amann, J.; Arnold, R.; Asiri, F.; Bane, K.; Aug. 2007; 3 pp.; In English

Report No.(s): DE2007-915386; SLAC-PUB-12743; No Copyright; Avail.: National Technical Information Service (NTIS)

The beam delivery system for the linear collider focuses beams to nanometer sizes at its interaction point, collimates the

beam halo to provide acceptable background in the detector and has a provision for state-of-the art beam instrumentation in order to reach the ILC's physics goals. This paper describes the design details and status of the baseline configuration considered for the reference design and also lists alternatives.

NTIS

Halos; Beams (Radiation)

20080034769 Brookhaven National Lab., Upton, NY USA; Michigan Univ., Ann Arbor, MI, USA; Vanderbilt Univ., Nashville, TN, USA; Tennessee Technological Univ., Cookeville, TN, USA

Optimization of Virtual Frisch-grid CdZnTe Detector Designs for Imaging and Spectroscopy of Gamma Rays

Bolotnikov, A. E.; Abdul-Jabbar, N. M.; Babalola, S.; Camarda, G. S.; Cui, Y.; January 2007; 15 pp.; In English
Report No.(s): DE2007-915431; BNL-79223-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

In the past, various virtual Frisch-grid designs have been proposed for cadmium zinc telluride (CZT) and other compound semiconductor detectors. These include three-terminal, semi-spherical, CAPture, Frisch-ring, capacitive Frisch-grid and pixel devices (along with their modifications). Among them, the Frisch-grid design employing a non-contacting ring extended over the entire side surfaces of parallelepiped-shaped CZT crystals is the most promising. The defect-free parallelepiped-shaped crystals with typical dimensions of 5x5x12 mm³ are easy to produce and can be arranged into large arrays used for imaging and gamma-ray spectroscopy. In this paper, we report on further advances of the virtual Frisch-grid detector design for the parallelepiped-shaped CZT crystals. Both the experimental testing and modeling results are described.

NTIS

Gamma Rays; Imaging Techniques; Semiconductors (Materials); Spectroscopy

20080034770 Stanford Linear Accelerator Center, CA, USA

Study of Rare B-Meson Decays Related to the CP Observable $\sin(2\beta + \gamma)$ at the BABAR Experiment

Orimoto, T. J.; January 2007; 237 pp.; In English

Report No.(s): DE2007-915388; SLAC-R-845; No Copyright; Avail.: National Technical Information Service (NTIS)

Particle physics attempts to answer the question, 'what are the most fundamental constituents of matter and how do they interact.' The particles that we encounter day to day, such as electrons, photons, and protons, and the forces we experience, such as electromagnetism, only make up a small part of a much larger picture. The Standard Model of particle physics is the theory of fundamental particles, and how they interact through the electromagnetic, weak, and strong forces. The fundamental particles consist of three generations of fermions, a set of force-mediating vector bosons, and a scalar boson. The fundamental fermions, which make up all matter, consist of three generations of quarks and leptons that occur in pairs. All everyday matter is made up of first generation particles. The second and third generation particles, with the possible exception of the neutrinos, live for only a brief time, and are typically only observed by particle detectors. Quarks possess electric charge as well as 'color' charge, and interact via the strong, electromagnetic, and weak forces. The leptons, on the other hand, do not possess 'color' and only interact through the electromagnetic and weak forces.

NTIS

Mesons; Observation; Particle Decay

20080034772 Brookhaven National Lab., Upton, NY USA

ISO/GUM Uncertainties and CIAAW (Uncertainty Treatment for Recommended Atomic Weights and Isotopic Abundances)

Holden, N. E.; Jul. 2007; 9 pp.; In English

Report No.(s): DE2007-915432; BNL-79267-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The International Organization for Standardization (ISO) has published a Guide to the expression of Uncertainty in Measurement (GUM). The IUPAC Commission on Isotopic Abundance and Atomic Weight (CIAAW) began attaching uncertainty limits to their recommended values about forty years ago. CIAAWs method for determining and assigning uncertainties has evolved over time. We trace this evolution to their present method and their effort to incorporate the basic ISO/GUM procedures into evaluations of these uncertainties. We discuss some dilemma the CIAAW faces in their present method and whether it is consistent with the application of the ISO/GUM rules. We discuss the attempt to incorporate variations in measured isotope ratios, due to natural fractionation, into the ISO/GUM system. We make some observations

about the inconsistent treatment in the incorporation of natural variations into recommended data and uncertainties. A recommendation for expressing atomic weight values using a tabulated range of values for various chemical elements is discussed.

NTIS

Abundance; Atomic Weights; Isotopes

20080034773 Stanford Linear Accelerator Center, USA

Reconstruction of $B(\text{sup } -) \rightarrow D(\text{sup 'star'e})-v(\text{sup } -)(\text{sub } e)$ Decays and Determination of $V(\text{sub } cb)$

Schubert, J.; January 2007; 165 pp.; In English

Report No.(s): DE2007-915390; SLAC-R-876; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Mesons; Particle Decay; Particle Theory

20080034774 Hampton Univ., VA, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Pennsylvania State Univ., University Park, PA, USA

Quart Helicity Flip and the Transverse Spin Dependence of Inclusive DIS

Afanasev, A.; Strikman, M.; Weiss, C.; Sep. 2007; 8 pp.; In English

Contract(s)/Grant(s): PHY-0114343; PHY-0301841

Report No.(s): DE2007-915392; No Copyright; Avail.: Department of Energy Information Bridge

Inclusive DIS with unpolarized beam exhibits a subtle dependence on the transverse target spin, arising from the interference of one-photon and two-photon exchange amplitudes in the cross section. We argue that this observable probes mainly the quark helicity-flip amplitudes induced by the non-perturbative vacuum structure of QCD (spontaneous chiral symmetry breaking).

NTIS

Transverse Momentum; Spin; Broken Symmetry

20080034776 Stanford Linear Accelerator Center, CA, USA

Novel QCD Effects from Initial and Final State Interactions

Brodsky, S. J.; Sep. 2007; 14 pp.; In English

Report No.(s): DE2007-915359; SLAC-PUB-12805; No Copyright; Avail.: National Technical Information Service (NTIS)

Initial-state and final-state interactions which are conventionally neglected in the parton model, have a profound effect in QCD hard-scattering reactions. The effects, which arise from gluon exchange between the active and spectator quarks, cause leading-twist single-spin asymmetries, diffractive deep inelastic scattering, diffractive hard hadronic reactions, and the breakdown of the Lam-Tung relation in Drell-Yan reactions. Diffractive deep inelastic scattering also leads to nuclear shadowing and non-universal antishadowing of nuclear structure functions through multiple scattering reactions in the nuclear target. Factorization-breaking effects are particularly important for hard hadron interactions since both initial-state and final-state interactions appear. Related factorization breaking effects can also appear in exclusive electroproduction reactions and in deeply virtual Compton scattering. None of the effects of initial-state and final-state interactions are incorporated in the light-front wavefunctions of the target hadron computed in isolation.

NTIS

Quantum Chromodynamics; Inelastic Scattering

20080034798 Kirsch (Alan D.), Idaho Falls, ID, USA

System for Recovery of Daughter Isotopes from a Source Material

Tranter, T. J., Inventor; Todd, T. A., Inventor; Lewis, L. C., Inventor; Henscheid, J. P., Inventor; 28 Apr 05; 10 pp.; In English

Contract(s)/Grant(s): DE-AC07-99ID13727; DE-AC07-05ID14517

Patent Info.: Filed Filed 28 Apr 05; US-Patent-Appl-SN-11-117 046

Report No.(s): PB2008-101177; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The invention includes a method of separating isotopes from a mixture containing at least two isotopes in a solution. A first isotope is precipitated and is collected from the solution. A daughter isotope is generated and collected from the first isotope. The invention includes a method of producing an actinium-225/bismuth-213 product from a material containing thorium-229 and thorium-232. A solution is formed containing nitric acid and the material and iodate is added to form a

thorium iodate precipitate. A supernatant is separated from the thorium iodate precipitate and a second volume of nitric acid is added to the precipitate. The precipitate is stored and a decay product comprising actinium-225 and bismuth-213 is generated in the second volume of nitric acid which is then separated from the thorium iodate precipitate, filtered, and treated using at least one chromatographic procedure. The invention also includes a system for producing an actinium-225/bismuth-213 product.

NTIS

Isotopes; Patent Applications; Radioactive Isotopes; Bismuth Isotopes; Thorium Isotopes

20080034805 Lawrence Livermore National Lab., Livermore, CA USA

Compact X-Ray Source and Panel

Sampayon, S. E., Inventor; 5 May 05; 12 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG48

Patent Info.: Filed 5 May 05; US-Patent-Appl-SN-11-124 550

Report No.(s): PB2008-101171; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A compact, self-contained x-ray source, and a compact x-ray source panel having a plurality of such x-ray sources arranged in a preferably broad-area pixelized array. Each x-ray source includes an electron source for producing an electron beam, an x-ray conversion target, and a multilayer insulator separating the electron source and the x-ray conversion target from each other. The multi-layer insulator preferably has a cylindrical configuration with a plurality of alternating insulator and conductor layers surrounding an acceleration channel leading from the electron source to the x-ray conversion target. A power source is connected to each x-ray source of the array to produce an accelerating gradient between the electron source and x-ray conversion target in any one or more of the x-ray sources independent of other x-ray sources in the array, so as to accelerate an electron beam towards the x-ray conversion target. The multilayer insulator enables relatively short separation distances between the electron source and the x-ray conversion target so that a thin panel is possible for compactness. This is due to the ability of the plurality of alternating insulator and conductor layers of the multilayer insulators to resist surface flashover when sufficiently high acceleration energies necessary for x-ray generation are supplied by the power source to the x-ray sources.

NTIS

X Ray Sources; Electromechanical Devices; Electrodynamics

20080034830 McLeod and Moyne, P.C., Okeemos, MI, USA

Epitaxial Ferromagnetic Ni₃FeN

Loloe, R., Inventor; 25 Aug 04; 23 pp.; In English

Contract(s)/Grant(s): NSF-HMR98-02476

Patent Info.: Filed 25 Aug 04; US-Patent-Appl-SN-10-925 815

Report No.(s): PB2008-101104; No Copyright; Avail.: CASI: [A03](#), Hardcopy

An epitaxial Ni(sub 3)FeN film with unique magnetic properties such as single magnetic domain (even in a large scale 0.5 inch times 0.5 inch), which rotates coherently in response to the desired switching field with a very sharp transition is described. The magnetic hysteresis loop of this new magnetic nitride is close to the perfect ideal square with the same value of saturation magnetization, remnant magnetization, and magnetization right before switching (domain reversal). The switching field is tunable which make this material more attractive for magneto-resistive devices such as MRAM's, read heads and magnetic sensors.

NTIS

Epitaxy; Ferromagnetic Materials; Patent Applications

20080034831 Wooldridge (John P.), Kihei, HI, USA; California Univ., Berkeley, CA, USA

Preparation of Porous Pyrophoric Iron Using Sol-Gel Methods

Gash, A. E., Inventor; Satcher, J. H., Inventor; Simpson, R. L., Inventor; 24 Jun 05; 18 pp.; In English

Contract(s)/Grant(s): LLNL-W7405-ENG48

Patent Info.: Filed 24 Jun 05; US-Patent-Appl-SN-11-165 734

Report No.(s): PB2008-101102; No Copyright; Avail.: CASI: [A03](#), Hardcopy

New sol-gel methods can be employed to generate high surface area porous iron (III) oxide-based solids. Chemical reduction of such porous solids at low temperatures allows the preparation of high surface area porous iron with little sintering, with the only byproduct being water. The material is readily pyrophoric and has utility in new decoy flares. The material,

prepared by this synthetic route, eliminates the use of hot caustic leaching solutions. It does not require the incorporation of any hazardous materials or processes that are not already used in current production methods.

NTIS

Iron; Iron Oxides; Patent Applications; Porosity; Pyrophoric Materials; Sol-Gel Processes

20080034884 Kansas State Univ., Manhattan, KS, USA

Gelation in Aerosols; Non-Mean-Field Aggregation and Kinetics

Sorensen, C. M.; Chakrabarti, A.; August 2008; 20 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAG3-2360; NNC04GA74G; WBS 05=95240.04.03.03.02.04

Report No.(s): NASA/CR-2008-215280; E-16546; No Copyright; Avail.: CASI: [A03](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080034884>

Nature has many examples of systems of particles suspended in a fluid phase; colloids when in a liquid, aerosols when in a gas. These systems are inherently unstable since if the particles can come together, van der Waals forces will keep them together. In this work we studied the aggregation kinetics of particulate systems, most often aerosols. The emphasis of our work was to study dense systems and systems that gel since previous work had not considered these. Our work obtained a number of significant discoveries and results which are reported here.

Author

Aerosols; Gels; Colloids; Fractals; Particulates; Nanoparticles; Soot

20080034930 Idaho National Engineering Lab., Idaho Falls, ID, USA

Response of LaBr(sub 3)(Ce) Detector to 2-11 MeV Gamma Rays

Seabury, E. H.; Wharton, J. C.; Caffrey, A. J.; Oct. 2006; 6 pp.; In English

Report No.(s): DE2007-911790; INL/CON-06-11300; No Copyright; Avail.: National Technical Information Service (NTIS)

The development of lanthanum halide scintillation detectors has great potential application in field-portable prompt-gamma neutron activation analysis systems. Because the low-energy response of these detectors has already been well-characterized (1-(2)), we have measured their response to higher energy gamma rays in the region between 2 and 11 MeV. We have measured the response of a 2-inch (5.08 cm) by 2-inch long LaBr₃(Ce) detector to high energy gamma rays produced by neutron interactions on chlorine, hydrogen, iron, nitrogen, phosphorous, and sulfur. The response of the LaBr₃(Ce) detector is compared to that of HPGe and NaI(Tl) detectors.

NTIS

Bromides; Cerium; Gamma Rays; Lanthanum; Scintillation Counters

20080034997 Battelle Memorial Inst., Richland, WA, USA

Apparatus and Method for OSL-Based, Remote Radiation Monitoring and Spectrometry

Smith, L. E., Inventor; Miller, S. D., Inventor; Bowyer, T. W., Inventor; 31 Aug 04; 13 pp.; In English

Contract(s)/Grant(s): DE-AC0676RLO1830

Patent Info.: Filed Filed 31 Aug 04; US-Patent-Appl-SN-10-931 411

Report No.(s): PB2008-100751; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Compact, OSL-based devices for long-term, unattended radiation detection and spectroscopy are provided. In addition, a method for extracting spectroscopic information from these devices is taught. The devices can comprise OSL pixels and at least one radiation filter surrounding at least a portion of the OSL pixels. The filter can modulate an incident radiation flux. The devices can further comprise a light source and a detector, both proximally located to the OSL pixels, as well as a power source and a wireless communication device, each operably connected to the light source and the detector. Power consumption of the device ranges from ultra-low to zero. The OSL pixels can retain data regarding incident radiation events as trapped charges. The data can be extracted wirelessly or manually. The method for extracting spectroscopic data comprises optically stimulating the exposed OSL pixels, detecting a readout luminescence, and reconstructing an incident-energy spectrum from the luminescence.

NTIS

Gamma Rays; Luminescence; Monitors; Patent Applications; Spectrometers

20080035199 Geophex Ltd., Raleigh, NC USA

Dual Mode Operation of GEM-3 as TD/FD Sensor

Won, I J; SanFilipo, Bill; Shipman, Mike; Huang, Haoping; Jun 28, 2004; 22 pp.; In English

Contract(s)/Grant(s): Proj-UXO/1358

Report No.(s): AD-A481014; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481014>

Electromagnetic geophysical exploration tools come in two types, frequency domain and time domain. A frequency-domain system utilizes continuous sinusoidal signals at one or more discrete frequencies, and the measurement consists of amplitude and phase (or realliphase and imaginary quadrature) response at each frequency; a time domain system utilizes abrupt step or pulse signals, and the measurement consists of time-sampled transient responses. Historically, each has shown to be effective, but each with various claims of advantages over the other. In principle, time domain and frequency domain should provide equivalent information and one type of response to a target could be derived from the other. Complete equivalence can be shown for the ideal systems having infinite bandwidth/time interval and sample rate, and no noise. For real systems, it is not obvious how equivalent they are - i.e., does a particular flmedomain system provide some information not easily attained with a particular frequency-domain system and vice versa? Are there real advantages of each over the other? Until recently, technology constraints precluded building a sensor that could operate in both modes as effectively as a modeqailored system, so no one ever did. Frequency-domain systems usually employed tuned high-Q resonant circuits to efficiently concentrate energy at the desired discrete frequencies, changing frequencies required switching the tuning circuit, and each frequency was operated one at a time. Th%e-domain systems employed a charge/discharge circuit not readily operated in a continuous-wave mode.

DTIC

Ammunition; Detectors; Electromagnetism

20080035217 Army Tank-Automotive and Armaments Command, Warren, MI USA

High Speed Hazard Avoidance for Unmanned Ground Vehicles in Emergency Situations

Spenko, M; Overholt, J; Iagnemma, K; Nov 2006; 41 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481062>

Rapid hazard avoidance maneuvers will be required for unmanned ground vehicles operating at high speeds in rough changing terrain. Without rapidly decreasing speed in every situation, there is limited time to perform navigation calculations based on detailed vehicle and terrain models. This paper presents a novel method for high speed navigation and hazard avoidance based on the two dimensional trajectory space, which is a compact model-based representation of a robot's dynamic performance limits on natural terrain. Simulation and experimental results on a small high-speed UGV demonstrate the method's effectiveness performed either by selecting from a set of predetermined paths (i.e. search techniques over small spaces), or by reactive behaviors, which evoke a predetermined action in response to specific sensor signals. Since the majority of mobile robots have been designed for use on flat or slightly rolling terrain at speeds that do not excite vehicle dynamics, these techniques have not had to consider vehicle dynamics and vehicle/terrain interaction. This paper addresses the problem of navigation and hazard avoidance on flat, rough, and uneven terrain at speeds that excite the vehicle's dynamics.

DTIC

Emergencies; Hazards; High Speed; Unmanned Ground Vehicles

20080035320 Naval Research Lab., Washington, DC USA

A Micromachined Magnetic-Field Sensor Based on an Electron Tunneling Displacement Transducer

DiLella, D; Whitman, L J; Colton, R J; Kenny, T W; Kaiser, W J; Vote, E C; Podosek, J A; Miller, L M; Jan 2000; 14 pp.; In English

Report No.(s): AD-A481222; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe a micromachined magnetic-field sensor that is based on an electron tunneling transducer. This tunnel sensor is small, very sensitive, operates at ambient temperature and requires very little power. The measured resolution of the sensor is 0.3 nT/square root of Hz at 1 Hz. The limiting resolution, calculated based on fundamental noise sources, is 0.002 nT/square root of Hz at 1 Hz. The dominant source of the observed noise in the present device is low frequency air pressure fluctuations.

DTIC

Displacement; Electron Tunneling; Magnetic Fields; Microelectromechanical Systems; Micromachining; Transducers

20080035333 Naval Postgraduate School, Monterey, CA USA

South China Sea Warm Pool in Boreal Spring

Chu, Peter C; Chang, C P; May 1997; 13 pp.; In English

Report No.(s): AD-A481243; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the boreal spring of 1966, a warm-core eddy is identified in the upper South China Sea (SCS) west of the Philippines through an analysis of the U.S. Navy's Master Oceanographic Observation Data Set. This eddy occurred before the development of the northern summer monsoon and disappeared afterward. We propose that this eddy is a result of the radiative warming during spring and the downwelling due to the anticyclonic forcing at the surface. Our hypothesis suggests an air-sea feedback scenario that may explain the development and withdrawal of the summer monsoon over the SCS. The development phase of the warm-core eddy in this hypothesis is tested by using the Princeton Ocean model.

DTIC

China; Eddy Currents; Ocean Models; Seas

20080035375 Innovative Wireless Technologies, Forest, VA USA

Wireless Sensor Network With Geolocation

Silverstrim, James; Passmore, Roderick; Pahlavan, Kaveh; Sadler, Brian; Nov 1, 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911QX-04-C-0066

Report No.(s): AD-A481361; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Geolocation for indoor and urban areas is becoming an essential capability for military, public safety, and commercial wireless applications. These systems are crucial for situational awareness, enabling soldiers and first responders to complete their missions in a more secure, controlled environment that can save lives. Maintaining situational/positional awareness in indoor and urban environments is difficult because buildings, walls and other obstacles obstruct vision and RF propagation. Innovative Wireless Technologies (IWT) and Dr. Kaveh Pahlavan of Worcester Polytechnic Institute (WPI) partnered to develop an innovative cooperative geolocation solution to provide location accuracy of better than 1 meter for outdoor to indoor conditions. This solution is a variation of the WiMedia group multi-band orthogonal frequency division multiplexing (MB-OFDM) ultra wideband (UWB) waveform standard that has been developed for the commercial market. The UWB waveform developed by IWT provides extended range capability of over 250 meters at data rate of 300 kbps.

DTIC

Position (Location); Situational Awareness; Waveforms

20080035421 Superpower, Inc., Schenectady, NY USA

Research and Development of Second-Generation HTS Conductors Using Metal, Organic Chemical Vapor Deposition

Selvamanickam, V; Mar 2008; 14 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-07-1-0407

Report No.(s): AD-A481476; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main objective of this research project is to develop coated conductors with performance characteristics that are necessary for High Temperature Superconducting (HTS) devices being developed for military applications. The second objective of this program is to improve the in-field performance of J_c of high-current films. At present the J_c drops by a factor of 4 to 5 from the zero-field value to the value at 65K and 3T. The research team's goal is to reduce this drop by a factor of 2. By meeting that goal, a critical current of 500 A/cm can be achieved at 65k and 3T using a conductor with J_c of 1000#A/cm at 77K, self-field.

DTIC

Coatings; Conductors; High Temperature Superconductors; Metal Vapors; Vapor Deposition

20080035422 Michigan Univ., Ann Arbor, MI USA

Low-Loss 4-6 GHz Tunable Filter with 3-Bit High-Q Orthogonal RF-MEMS Capacitance Network

Sarabandi, Kamal; Park, Sang-June; El-Tanani, Mohammed A; Reines, Isak; Rebeiz, Gabriel M; Mar 23, 2008; 18 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-07-1-0409

Report No.(s): AD-A481477; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A low loss 4-6 GHz 3-bit tunable filter was designed and fabricated on a quartz substrate. A high-Q 3-bit orthogonal RF-MEMS capacitance network is presented and its significance on the filter Q is discussed. Detailed design equations for the

capacitively-loaded coupled open-loop,=2 resonators and realization of capacitive external coupling with source-load impedance loading are discussed. The measured filter shows an unloaded-Q of 85-170, an insertion loss of 1.5-2.8 dB (including connector loss), and the measured 1-dB bandwidth is 4.35 +/- 0.35% over the 4-6 GMz tuning range. The measured IIP3 and 1-dB power compression point at 5.91 GMz are > 40 dBm and 27.5 dBm, respectively. The unloaded Q and insertion loss can be improved to 125-210 and 1.8-1.1 dB with the use of a thicker bottom electrode. To our knowledge, this is the highest Q tunable planar filter to-date at this frequency range.

DTIC

Capacitance; Microelectromechanical Systems; Q Factors; Radio Frequencies; Tunable Filters

20080035427 Massachusetts Inst. of Tech., Cambridge, MA USA

Quantum Computation with Superconducting Quantum Devices

Orlando, Terry P; Apr 14, 2008; 17 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): F49620-01-1-0457

Report No.(s): AD-A481484; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This project has experimentally characterized the coherent quantum nature of the superconducting persistent current qubits which were fabricated in the trilayer niobium technology. The quantum levels of these qubits have been mapped out using both standard microwave frequency spectroscopy as well as a new technique of amplitude spectroscopy. Important to the future implementation of these qubits for quantum computing applications is the demonstration of microwave sideband cooling of the qubits as well as a resonant read-out scheme. In addition to characterizing the quantum nature of a single qubit, this work has also explored the use of Rapid-Single-Flux superconducting circuits to rapidly control the qubit system.

DTIC

Quantum Computation; Quantum Electronics; Superconducting Devices; Superconductivity

20080035433 Colorado State Univ., Fort Collins, CO USA

Spin Wave Propagation in Non-Uniform Magnetic Fields

Kabatek, Michael J; Smith, Kevin R; Wu, Mingzhong; Patton, Carl E; Nov 2006; 4 pp.; In English

Contract(s)/Grant(s): W911NF-04-1-0247; N00014-06-1-0889

Report No.(s): AD-A481491; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper reports high resolution time- and space-resolved imaging of spin wave propagation in magnetic thin films under spatially non-uniform magnetic field configurations. The experiment was carried out with a yttrium iron garnet film strip magnetized with a spatially non-uniform magnetic field parallel to the length of the film strip. Spin wave pulses were excited with a microstrip transducer at one end of the strip. The propagation of spin wave pulses was mapped with a time- and space-resolved inductive magnetodynamic probe. The wave number of the carrier for the spin wave pulses was found to increase in a spatially increasing magnetic field and decrease in a spatially decreasing magnetic field. The wave number change for a general spatially varying static field is reversible.

DTIC

Magnetic Fields; Magnons; Nonuniform Magnetic Fields; Pins; Wave Excitation; Wave Propagation

20080035438 Ohio State Univ., Columbus, OH USA

Fabrication Equipment for Periodic Material Assemblies and Ph Assemblies and Photonic Crystals (DURIP FY06)

Volakis, John L; Reano, Ronald M; Verweij, Henk; Apr 29, 2008; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-06-1-0389

Report No.(s): AD-A481505; ESL-60006136-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the purchased equipment to establish two laboratories at the Ohio State Univ. for the fabrication of a novel class of periodic assemblies (PAs) intended to emulate anisotropic media. Such media have already been shown to lead to novel modes, leading to high gain antennas and much smaller RF components. In essence, the purchased equipment are intended to demonstrate a new paradigm in material development for RF applications. The developed labs are (1) Low Temperature Co-fired Ceramics facility in the Dept of Electrical and Computer Engineering, and (2) a Robocasting/Inkjet facility in the Dept. of Materials Science and Engineering. These facilities became operational as part of this effort for a total cost of \$1,046,078 (\$671,078 in equipment and \$375,000 in lab renovations). The AFOSR funding was \$350,258. RF characterization equipment were also acquired for collaboration with the Univ. of Texas-San Antonio. Some textured and

periodic assemblies emulating anisotropic media were already fabricated and used to demonstrate the novel properties of such media.

DTIC

Anisotropy; Antennas; Crystals; Etching; Fabrication; High Gain; Hot Pressing; pH; Reactivity

20080035459 Air Force Research Lab., Eglin AFB, FL USA

Multifunctional Particulate Composites for Structural Applications

Jordan, Jennifer L; Richards, D W; Spowart, Jonathan E; White, Bradley; May 2008; 11 pp.; In English

Contract(s)/Grant(s): Proj-2306

Report No.(s): AD-A481075; AFRL-RW-EG-TP-2008-7409; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481075>

Particulate composites consist of individual particles of one material dispersed throughout and held together by a polymer binder. The mechanical and physical properties of the composite depend on the mechanical and physical properties of the individual components; their loading density; the shape and size of the particles; the interfacial adhesion; residual stresses; and matrix porosity. Highly-loaded particulate composites are multi-phase systems that have not typically been studied rigorously, to date. We are investigating whether or not higher-order microstructural features can have a profound effect on the static and dynamic mechanical response of these multi-phase ($n > 2$) polymer-metal-ceramic composites. We present several models for the elastic and plastic behaviors of these materials, and compare the predictions with experimental data from quasi-static loading techniques. The high strain rate compressive properties, using a split Hopkinson pressure bar, of these materials are also characterized.

DTIC

Composite Structures; Particulates; Structural Design

20080035476 Ladas and Parry, Los Angeles, CA, USA

Utilizing an Integrated Plasmon Detector to Measure a Metal Deposit Roughness on a Semiconductor Surface

Wei, D. T., Inventor; Scherer, A., Inventor; 16 Aug 05; 8 pp.; In English

Contract(s)/Grant(s): AFOSR-F49620-03-1-0418

Patent Info.: Filed Filed 16 Aug 05; US-Patent-Appl-SN-11-205 782

Report No.(s): PB2008-101690; No Copyright; Avail.: CASI: A02, Hardcopy

A method for monitoring the surface roughness of a metal, comprises impinging a laser beam onto the surface of a metal layer to induce the formation of a plasmon therein, and monitoring a current of decay electrons emitted by the plasmon.

NTIS

Deposits; Patent Applications; Plasmons; Semiconductors (Materials); Surface Roughness

20080035478 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Hyper Dispersion Pulse Compressor for Chirped Pulse Amplification Systems

Barty, C. P. J., Inventor; 23 Jun 05; 10 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG-48

Patent Info.: Filed Filed 23 Jun 05; US-Patent-Appl-SN-11-166-988

Report No.(s): PB2008-101716; No Copyright; Avail.: CASI: A02, Hardcopy

A grating pulse compressor configuration is introduced for increasing the optical dispersion for a given footprint and to make practical the application for chirped pulse amplification (CPA) to quasi-narrow bandwidth materials, such as Nd:YAG. The grating configurations often use cascaded pairs of gratings to increase angular dispersion an order of magnitude or more. Increased angular dispersion allows for decreased grating separation and a smaller compressor footprint.

NTIS

Amplification; Compressors; Patent Applications

20080035485 Parson Hsue & De Runtz, LLP, San Francisco, CA, USA

Guided Resonance Dielectric Filter Systems

Suh, W., Inventor; Solgaard, O., Inventor; Fan, S., Inventor; 8 Sep 04; 16 pp.; In English

Contract(s)/Grant(s): DAAD17-02-C-0101; NSF ECS-0200445

Patent Info.: Filed Filed 8 Sep 04; US-Patent-Appl-SN-10-936 837

Report No.(s): PB2008-101715; No Copyright; Avail.: CASI: [A03](#), Hardcopy

We theoretically introduce a new type of optical all-pass filter based on guided resonance in coupled photonic crystal slabs. The filter exhibits near-complete transmission for both on- and off-resonant frequencies and yet generates large resonant group delay. We further show that such a filter can be mechanically switched into a flat-top band rejection filter. We also show that a single photonic crystal slab can also function either as optical all-pass transmission or flat-top reflection filter for normally incident light. Both filter functions are synthesized by designing the spectral properties of guided resonance in the slab. The structure is extremely compact along the vertical direction.

NTIS

Dielectric Properties; Dielectrics; Optical Filters; Patent Applications

20080035530 Scully Scott Murphy and Presser, P.C., Garden City, NJ, USA

Method of Creating Defect Free High Ge Content (25%) SiGe-on-Insulator (SGOI) Substrates Using Wafer Bonding Techniques

Chu, J. O., Inventor; Cobb, M. A., Inventor; Saunders, P. A., Inventor; Shi, L., Inventor; 13 Sep 04; 12 pp.; In English

Contract(s)/Grant(s): N66001-00-C-8086

Patent Info.: Filed Filed 13 Sep 04; US-Patent-Appl-SN-10-939 736

Report No.(s): PB2008-101697; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for achieving a substantially defect free SGOI substrate which includes a SiGe layer that has a high Ge content of greater than about 25 atomic % using a low temperature wafer bonding technique is described. The wafer bonding process described in the present application includes an initial prebonding annealing step that is capable of forming a bonding interface comprising elements of Si, Ge and O, i.e., interfacial SiGeO layer, between a SiGe layer and a low temperature oxide layer. The present invention also provides the SGOI substrate and structure that contains the same.

NTIS

Bonding; Defects; Germanium; Insulators; Patent Applications; Semiconductors (Materials); Silicon; Substrates; Wafers

20080035533 Calffe Halter and Griswold, LLP, Cleveland, OH, USA

Spin Polarization of Charge Carriers

Heremans, J. J., Inventor; Chen, H., Inventor; 18 Aug 05; 12 pp.; In English

Contract(s)/Grant(s): DMR 0094055

Patent Info.: Filed Filed 18 Aug 05; US-Patent-Appl-SN-11-206 647

Report No.(s): PB2008-101698; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods and devices for producing spin polarized charge carriers are provided. The devices utilize semiconductors exhibiting spin orbit coupling, at least one barrier and at least one aperture. The at least one aperture is positioned such that charge carriers having a first polarization after reflecting off of the barrier can pass through the first aperture.

NTIS

Charge Carriers; Particle Spin; Patent Applications; Quantum Numbers

20080035535 UT-Battelle, LLC, Oak Ridge, TN, USA

Composite Scintillators for Detection of Ionizing Radiation

Dai, S., Inventor; Stephan, A. C., Inventor; Brown, S. S., Inventor; Wallace, S. A., Inventor; Rondinone, A. J., Inventor; 14 Sep 04; 29 pp.; In English

Contract(s)/Grant(s): DE-AC05-000R22725

Patent Info.: Filed Filed 14 Sep 04; US-Patent-Appl-SN-10-940 054

Report No.(s): PB2008-101695; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Applicant's present invention is a composite scintillator having enhanced transparency for detecting ionizing radiation comprising a material having optical transparency wherein said material comprises nano-sized objects having a size in at least one dimension that is less than the wavelength of light emitted by the composite scintillator wherein the composite scintillator is designed to have selected properties suitable for a particular application.

NTIS

Ionizing Radiation; Patent Applications; Radiation Measurement; Scintillation Counters

20080035536 Ranieri (Gregory C.) Law Office, Wall Township, NJ, USA

Terahertz Imaging for Near Field Objects

Federici, J. F., Inventor; Gary, D. E., Inventor; 18 Jan 05; 21 pp.; In English

Contract(s)/Grant(s): DAAD19-02-C-0085; DAAD19-03-C-0137

Patent Info.: Filed Filed 18 Jan 05; US-Patent-Appl-SN-11-037 507

Report No.(s): PB2008-101694; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Near field imaging using a THz imaging system is realized by utilizing an interferometric imaging detector array that includes detector elements disposed on a surface curved, physically or artificially, to match substantially the curvature of the wave front for received THz signals. Generally, the near field is an environment wherein the distance to an object of interest is on the order of 10-100 times larger than the physical size of the THz imaging array. Typical distances from the object or target to the imaging array is anticipated to be in the 0.5 m-50 m range. Curvature of the detector array corrects a distortion problem in prior THz imaging systems that utilized planar interferometric imaging arrays based on a planar wave front assumption for received THz signals.

NTIS

Imaging Techniques; Near Fields; Patent Applications

20080035606 Dinsmore and Shohl, Dayton, OH, USA

Spectrum Re-Use Employing Transfer Domain Communications Systems

Chakravarthy, V. D., Inventor; Stephens, J. P., Inventor; Shaw, A. K., Inventor; Temple, M. A., Inventor; 23 Sep 05; 22 pp.; In English

Patent Info.: Filed Filed 23 Sep 05; US-Patent-Appl-SN-11-234 298

Report No.(s): PB2008-102024; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system and method for spectrum re-use employing transfer domain communications systems is disclosed. An adaptive waveform technique reconfigures its fundamental modulation waveform depending on the spectral environment. Spectral interference, or other friendly user's presence, is estimated using general spectral estimation techniques. Once the frequency bands containing strong interference or signals of other users are identified, those frequency bands are removed prior to creating a time-domain Fundamental Modulation Waveform (FMW) using the appropriate inverse transform. The data is then modulated with these fundamental modulation waveforms to generate the digitally encoded waveforms. The digitally encoded waveforms representing the transmitted communication symbols do not contain energy at the spectral location of the interference. By repeating the spectral estimation and fundamental modulation waveform generation process, an adaptive waveform is created which adapts to the electromagnetic environment as needed.

NTIS

Patent Applications; Reuse; Spectra; Telecommunication

20080036022 Williams (Hovey), LLP, Kansas City, MO, USA

Mechanism for and Method of Biasing Magnetic Sensor

Kautz, D. R., Inventor; 14 Oct 05; 13 pp.; In English

Contract(s)/Grant(s): DE-AC04-01AL66850

Patent Info.: Filed Filed 14 Oct 05; US-Patent-Appl-SN-11-251 306

Report No.(s): PB2008-102013; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A magnetic sensor package having a biasing mechanism involving a coil-generated, resistor-controlled magnetic field for providing a desired biasing effect. In a preferred illustrated embodiment, the package broadly comprises a substrate; a magnetic sensor element; a biasing mechanism, including a coil and a first resistance element; an amplification mechanism; a filter capacitor element; and an encapsulant. The sensor is positioned within the coil. A current applied to the coil produces a biasing magnetic field. The biasing magnetic field is controlled by selecting a resistance value for the first resistance element which achieves the desired biasing effect. The first resistance element preferably includes a plurality of selectable resistors, the selection of one or more of which sets the resistance value.

NTIS

Patent Applications; Amplification; Capacitors; Magnetic Fields

20080036089 O'Keefe, Egan and Peterman, LLP, Austin, TX, USA

Systems and Methods for Rotation of Objects

Grant, C. W., Inventor; 27 Sep 04; 17 pp.; In English

Contract(s)/Grant(s): N00019-03-C-0063

Patent Info.: Filed Filed 27 Sep 04; US-Patent-Appl-SN-10-951 276

Report No.(s): PB2008-100691; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Systems and methods for rotating objects that shift the center of gravity of an object from a position outside the rotation axis area of the object to a position within the rotation axis area of the object.

NTIS

Patent Applications; Rotation

20080036097 Dickstein Shapiro Moring and Oshinsky, LLP, Washington, DC, USA

Carbon Nanotube-Based Electronic Devices Made by Electrolytic Deposition and Applications Thereof

Tiano, T., Inventor; Gannon, J., Inventor; Carey, C., Inventor; Farrell, B., Inventor; Czerw, R., Inventor; 28 Mar 05; 20 pp.; In English

Contract(s)/Grant(s): F19628-03-C-0075; N41756-02-M-1043

Patent Info.: Filed Filed 28 Mar 05; US-Patent-Appl-SN-11-090 193

Report No.(s): PB2008-100694; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Carbon nanotube-based devices made by electrolytic deposition and applications thereof are provided. In a preferred embodiment, the present invention provides a device comprising at least one array of active carbon nanotube junctions deposited on at least one microelectronic substrate. In another preferred embodiment, the present invention provides a device comprising a substrate, at least one pair of electrodes disposed on the substrate, wherein one or more pairs of electrodes are connected to a power source, and a bundle of carbon nanotubes disposed between the at least one pair of electrodes wherein the bundle of carbon nanotubes consist essentially of semiconductive carbon nanotubes. In another preferred embodiment, a semiconducting device formed by electrodeposition of carbon nanotubes between two electrodes is provided. The invention also provides preferred methods of forming a semiconductive device by applying a bias voltage to a carbon nanotube rope. The plurality of metallic single-wall carbon nanotubes are removed (e.g., by application of bias voltage) in an amount sufficient to form the semiconducting device. The devices of the invention include, but not limited to, chemical or biological sensors, carbon nanotube field-effect transistors (CNFETs), tunnel junctions, Schottky junctions, and multi-dimensional nanotube arrays.

NTIS

Patent Applications; Electrodeposition; Microelectronics; Field Effect Transistors; Electric Potential

20080036114 Chicago Univ., Chicago, IL USA

Method for Detection and Imaging Over a Broad Spectral Range

Yefremenko, V., Inventor; Gordiyenko, E., Inventor; Pishko, V., Inventor; Pishko, O., Inventor; Novosad, V., Inventor; 27 Jul 05; 11 pp.; In English

Contract(s)/Grant(s): DE-W-31-109-ENG-38

Patent Info.: Filed Filed 27 Jul 05; US-Patent-Appl-SN-11-190 784

Report No.(s): PB2008-101755; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of controlling the coordinate sensitivity in a superconducting microbolometer employs localized light, heating or magnetic field effects to form normal or mixed state regions on a superconducting film and to control the spatial location. Electron beam lithography and wet chemical etching were applied as pattern transfer processes in epitaxial Y--Ba--Cu--O films. Two different sensor designs were tested: (1) a 3 millimeter long and 40 micrometer wide stripe and (2) a 1.25 millimeters long, and 50 micron wide meandering-like structure. Scanning the laser beam along the stripe leads to physical displacement of the sensitive area, and, therefore, may be used as a basis for imaging over a broad spectral range. Forming the superconducting film as a meandering structure provides the equivalent of a two-dimensional detector array. Advantages of this approach are simplicity of detector fabrication, and simplicity of the read-out process requiring only two electrical terminals.

NTIS

Imaging Techniques; Patent Applications; Spectra

20080036115 Orrick, Herrington and Sutcliffe, LLP, Irvine, CA, USA; California Univ., Berkeley, CA, USA

Formation of a Field Reversed Configuration for Magnetic and Electrostatic Confinement of Plasma

Rostoker, N., Inventor; Binderbauer, M., Inventor; Qerushi, A., Inventor; Tahsiri, H., Inventor; 19 May 05; 39 pp.; In English

Contract(s)/Grant(s): N00014-99-1-0851

Patent Info.: Filed 19 May 05; US-Patent-Appl-SN-11-134 776

Report No.(s): PB2008-102100; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method for containing plasma and forming a Field Reversed Configuration (FRC) magnetic topology are described in which plasma ions are contained magnetically in stable, non-adiabatic orbits in the FRC. Further, the electrons are contained electrostatically in a deep energy well, created by tuning an externally applied magnetic field. The simultaneous electrostatic confinement of electrons and magnetic confinement of ions avoids anomalous transport and facilitates classical containment of both electrons and ions. In this configuration, ions and electrons may have adequate density and temperature so that upon collisions they are fused together by nuclear force, thus releasing fusion energy. Moreover, the fusion fuel plasmas that can be used with the present confinement system and method are not limited to neutronic fuels only, but also advantageously include advanced fuels.

NTIS

Electrostatics; Patent Applications; Plasma Control; Plasmas (Physics)

20080036271 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Higher-Order Blind Signal Feature Separation: An Enabling Technology for Battlefield Awareness

Su, Wei; Kosinski, John A; Nov 2006; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481532; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481532>

Higher-order transform blind signal feature classification is discussed for separating bar-shaped, circular, squared, circular-squared, and offset-diamonded constellation patterns of digital linear signals. This technique is used for automatic modulation classification of unknown signals. The higher-order transform technique is powerful in distinguishing the geometrical patterns of the signal constellations and can be used to sort a large amount of modulation schemes into several pattern groups with smaller amount of modulation schemes so a fine modulation classification can be performed more effectively and reliably on each pattern group. Robustness of higher-order cumulants is discussed to show that the constellation pattern separation is less sensitive to variations in signal-to-noise ratio.

DTIC

Classifications; Frequency Modulation

20080036312 Army Research Lab., Aberdeen Proving Ground, MD USA

Detection and Localization of Vibrotactile Signals in Moving Vehicles

Krausman, Andrea S; White, Timothy L; May 2008; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481600; ARL-TR-4463; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481600>

The focus of this research was to examine how well participants could detect and localize tactile signals while riding in moving vehicles. A ride motion simulator (RMS) was used to simulate a Bradley fighting vehicle or high mobility multipurpose wheeled vehicle traversing a cross-country course or gravel road. Two tactile display systems were used to provide signals. The wireless tactile control unit (WTCU) employed a vibrating motor similar to that of a cell phone or pager, and the Tactile Communications System (TACTICS) employed a plunger motor, which creates a tapping sensation. The signal strength of the TACTICS was driven at the optimal operating characteristics (TACTICS 1) or at operating characteristics similar to those of the WTCU system (TACTICS 2). For each system, eight factors were positioned at 45-degree intervals (cardinal compass points) in two adjustable belts (plunger motor belt and pancake motor belt) worn around each participant's waist. Participants received tactile signals during a baseline (stationary) condition and while moving on the RMS. Results show that the TACTICS 1 performed consistently across all conditions, which may be because of the stronger, more distinct tactile signal generated by the TACTICS 1. Detection of tactile signals was affected by terrain, with fewer signals detected on the crosscountry terrain. Additionally, the south factor was detected less frequently than the other locations when participants were moving over the cross-country terrain.

DTIC

Detection; Mobility; Position (Location); Random Vibration; Signal Detection; Signal Processing

20080036385 California Univ., Santa Barbara, CA USA

Biosensor Assay Enhancement Through AC Electrokinetic Microstirring

Sigurdson, M; Feldman, H; Meinhart, C D; Nov 2006; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-03-D-0004

Report No.(s): AD-A481736; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481736>

A microstirring tool is developed to improve binding rates in biosensor devices by an order of magnitude. AC electric fields generate fluid motion through the well documented but unexploited phenomenon, Electrothermal Flow, where the circulating flow redirects or stirs the fluid, providing more binding opportunities between suspended and wall-immobilized molecules. Simulations and experiments show improvement by a factor of 6-13. This is applicable to diffusion limited assays of different formats, from handheld microfluidic to benchtop microarray. Electrothermal microstirring is a tool that can be incorporated in existing devices, to speed up, for example, food-borne pathogen detection, or portable medical diagnostics. DTIC

Alternating Current; Assaying; Augmentation; Bioinstrumentation; Electrokinetics

20080036491 White Sands Missile Range, NM USA

Test Operations Procedure (TOP) 5-2-521 Pyrotechnic Shock Test Procedures

Nov 20, 2007; 33 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481968; WSMR-TOP-5-2-521; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481968>

This TOP provides guidance for the laboratory simulation of pyrotechnic shock tests via resonant fixtures. The pyrotechnic event is characterized by short transient excitations (less than 4 msec) of high amplitude (3000 g's) and high frequencies (10 kHz). The transients are typically induced by the activation of missile ordnance components such as explosive bolts, cable cutters, pyrovalves, flexible linear shape charges, and primer cords. This document describes instrumentation, test fixture design, and data collection and processing procedures required to achieve a successful test program. The focus will be on metal to metal impact testing of resonant fixtures tuned to the appropriate test specification. DTIC

Data Acquisition; Pyrotechnics; Shock Tests

20080036492 White Sands Missile Range, NM USA

Test Operations Procedure (TOP) 5-2-599 Creep Test Procedures

Nov 20, 2007; 25 pp.; In English

Report No.(s): AD-A481970; WSMR-TOP-5-2-599; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481970>

This TOP outlines various tests which can be performed to determine creep data for metals, plastics, fasteners, metal-to-metal adhesives, and continuous fiber-reinforced ceramic composites. A general discussion of creep behavior in materials is presented along with the selection criteria utilized for the various test methods. Common creep test procedures and guidance are provided which includes test equipment requirements, test conduct, data processing, data presentation, and data analysis techniques. DTIC

DTIC

Creep Tests; Metal-Metal Bonding; Plastic Deformation

20080036575 Michigan Univ., Ann Arbor, MI USA

Demonstration and Modeling of Material Responses Achieved Through Contradirectional Coupling

Grbic, Anthony; May 14, 2008; 19 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-07-1-0029

Report No.(s): AD-A481989; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the development of broadband and reduced-loss negative permeability and negative refractive index metamaterials at microwave frequencies. The reported structures exhibit fractional bandwidths that are greater than 40%. Simulation and experimental results are described which confirm the electromagnetic properties of the proposed structures. Analytical modeling of the proposed structures is also discussed. DTIC

DTIC

Broadband; Electromagnetic Radiation; Losses; Permeability; Refractivity

20080036585 Texas A&M Univ., College Station, TX USA

Modeling Interfaces Through an Extension of Continuum Mechanics to the Nanoscale with Application to Fracture and Debonding of Composites

Walton, Jay R; Sendova, Tsvetanka; Mar 31, 2008; 5 pp.; In English

Contract(s)/Grant(s): FA9550-06-1-0242

Report No.(s): AD-A482015; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report summarizes the progress made in developing the theoretical underpinnings for a new theory of brittle fracture based upon an extension of continuum mechanics to the nanoscale. In contrast to classical fracture theories, the new theory predicts bounded crack tip stresses and strains by including a novel boundary condition arising from the jump momentum balance enforced on fracture surfaces which are modeled as dividing surfaces with excess physical properties including surface free energy, surface tension and surface entropy. As a result of the bounded crack tip stresses and strains, it was necessary to introduce a new notion of crack tip Energy Release Rate (ERR), a new fracture criterion based this new ERR and a method to estimate from first principles the corresponding Critical ERR (cERR). Estimates of the cERR for diamond, silicon and silicon-carbide compared favorably with published NIST data with no adjustable parameters.

DTIC

Composite Materials; Continuum Mechanics; Debonding (Materials); Fractures (Materials); Fracturing; Momentum

**71
ACOUSTICS**

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution*. For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion and Power*.

20080035108 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Validation of Target Modeling for Minehunting Sonar Frequencies

Sabel, J. C.; Wuesson, B. A. J.; Groen, J.; November 2007; 46 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 015.33942

Report No.(s): TNO-DV 2007 A466; TD2007-0202; Copyright; Avail.: Other Sources

This report describes the validation of an acoustic modelling method for extended target echoes, by comparing measured data from near-field acoustic scans with simulated data. The similarity achieved between these data supports the conclusion that the modelling is valid for convex targets that are not acoustically transparent.

Author

Underwater Acoustics; Targets; Echoes; Echo Sounding; Sonar

20080035121 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

On the Relevance of Nonacoustic Factors Influencing the Annoyance Caused by Environmental Sounds - A Literature Study

Vos, J.; April 2008; 22 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 032.13157

Report No.(s): TNO-DV 2008 A147; TD2008-0059; Copyright; Avail.: Other Sources

The annoyance caused by environmental sounds is only in part related to the noise dose. Nonacoustic factors have systematic effects on annoyance also. In the present literature study we explored what nonacoustic factors may be considered as potential tools to reduce the annoyance. Studies designed to test the effect of the nonacoustic factors in an independent way are particularly relevant. The results of these studies showed that 1) a change in the attitude towards, in fact, the quality of noise management, resulted in a change in the annoyance, 2) availability of information about a noise mitigating measure diminishes annoyance, 3) information exchange may decrease annoyance, and 4) a fair procedure in the distribution of noise may result in less annoyance. The relevance to annoyance of 5) having voice in a decision process, however, could not be confirmed. Due to various methodological imperfections, however, most results of such experiments do not permit drawing firm conclusions. Examples of the experimental shortcomings are an inadequate way of measuring annoyance, the use of exceptionally high sound exposure levels or embedment of the pertinent process in a too narrow context. Both in field and in more elaborate laboratory experiments, these issues warrant to be investigated further.

Author

Acoustics; Earth Environment; Noise (Sound)

20080035182 Naval Undersea Warfare Center, Newport, RI USA

Passive Sonar Tracking on Multibeam Intensities

Graham, Marcus L; Jun 2007; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A480974; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480974>

Partial contents: Sonar Processing Architectures, Intensity Data, Single Target Tracking Results History, Basic Model, Estimation Algorithm, Fixed Amplitude, Varying width Targets, Improving SNR & Separability.

DTIC

Sonar; Targets

20080035195 Washington Univ., Seattle, WA USA

Development of Mid-Frequency Multibeam Sonar for Fisheries Applications

Horne, John K; Jones, Christopher D; Wolfson, Mike A; Jan 2007; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-05-1-0670

Report No.(s): AD-A481004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481004>

The long-term goal of this program is to investigate the utility of mid-frequency (~10 kHz) acoustics to detect, enumerate, and identify pelagic fish distributions. Objectives of this research include: comparisons of fish backscatter models, models of mid-frequency sound propagation, development of a mid-frequency multibeam sonar, and backscatter measurements using split-beam echo sounders and the multibeam sonar.

DTIC

Fisheries; Frequencies; Sonar

20080035196 Naval Undersea Warfare Center, Newport, RI USA

DECAF - Density Estimation for Cetaceans from Passive Acoustic Fixed Sensors

Thomas, Len; Marques, Tiago; Borchers, David; Stephenson, Catriona; Moretti, David; Morrissey, Ronald; DiMarzio, Nancy; Ward, Jessica; Mellinger, David; Martin, Steve; Jan 2007; 8 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481007>

Determining the density and distribution of cetacean species is fundamental to understanding their basic biology, and also to monitoring and mitigating the effect of man-made impacts on their populations. However, this task is difficult because most cetacean species occur at low density and over enormous areas, and because they spend relatively little time at the surface where they can be seen using standard, visual surveys. Our primary long-term goal is to develop and test methods for estimating cetacean density based on detecting the sounds cetaceans make underwater, using fixed hydrophones. There are many potential configurations of such devices, so if it does prove possible to estimate density reliably using passive acoustics, an important second goal (not addressed in this work) is to determine which configuration is best for each of a common suite of monitoring scenarios.

DTIC

Acoustics; Estimates; Marine Mammals; Signal Detectors

20080035400 Army Research Lab., Adelphi, MD USA

Acoustic Transient Source Localization From an Aerostat

Scanlon, Michael; Reiff, Christian; Noble, John; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481429; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Army Research Laboratory (ARL) has conducted experiments using acoustic sensor arrays suspended below tethered aerostats to detect and localize transient signals from mortars, artillery and small arms fire. The airborne acoustic sensor array calculates an azimuth and elevation to the originating transient, and immediately cues a collocated imager to capture the remaining activity at the site of the acoustic transient. This single array's vector solution defines a ground-intersect region or grid coordinate for threat reporting. Unattended ground sensor (UGS) systems can augment aerostat arrays by providing additional solution vectors from several ground-based acoustic arrays to perform a 3D triangulation on a source location. The aerostat array's advantage over ground systems is that it is not as affected by diffraction and reflection from man-made structures, trees, or terrain, and has direct line-of-sight to most events.

DTIC

Acoustic Measurement; Acoustics; Airships; Arrays; Position (Location); Signal Detection; Signal Detectors; Sound Generators

20080035407 Army Aeromedical Research Lab., Fort Rucker, AL USA

A Dual-Mode Noise-Immune Stethoscope for Use in Noisy Vehicles

Houtsma, Adrianus J; Curry, Ian P; Sewell, John M; Bernhard, William N; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481444; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In combat casualty and civilian environments, an unmet need exists for a stethoscope that can hear heart and especially breathing sounds while inside helicopters, fixed-wing aircraft, or ambulances where noise levels preclude auscultation with standard stethoscopes. Without this capability, patients can suffer from unidentified collapsed lungs or loss of intubation integrity with the threat of loss of life. A conventional acoustic stethoscope will not function in background noise levels beyond 80-85 dB. Electronic stethoscopes, in combination with mechanical impedance-matched transducer designs, can extend this range to about 90 dB. This is, unfortunately, not enough for helicopter noise levels that can reach 110 dB. The use of an ultrasound transmitter and receiver, however, provides an essentially noise-free auscultation channel since transportation vehicles do not produce acoustic energy at ultrasound carrier frequencies of 2-3 MHz. Clean and noise-free heart and breath sounds have been obtained in broadband noise fields of intensities as high as 120 dB. A hybrid stethoscope has been developed that allows auscultation by ultrasound Doppler as well as by electro-mechanical means. Pros and cons of making Doppler sounds subjectively similar to conventional sounds by nonlinear signal processing will be discussed, as well as potentially functional and meaningful aspects of Doppler signals that are not found in conventional stethoscope sounds.

DTIC

Aircraft Noise; Background Noise; Noise Reduction; Stethoscopes

20080035418 Maryland Univ., College Park, MD USA

Vehicle Fingerprinting Using Drive-By Sounds

Cevher, V; Chellappa, R; Gurbuz, A C; Shah, F; McClellan, J H; Nov 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-02-0008

Report No.(s): AD-A481471; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We estimate a vehicle's speed, width, and length by jointly estimating its acoustic wave-pattern using a single passive acoustic sensor that records the vehicle's drive-by noise. The acoustic wave-pattern is estimated using three envelope shape (ES) components, which approximate the shape of the received signal's power envelope. We incorporate the parameters of the ES components along with estimates of the vehicle engine RPM and number of cylinders to form a vehicle profile vector. This vector provides a compressed statistics that can be used for vehicle identification and classification. Vehicle speed estimation and classification results are provided using field data.

DTIC

Acoustics; Signal Detectors; Signal Processing

20080035437 Army Research Lab., Adelphi, MD USA

Analysis of Windscreen Degradation on Acoustic Data

Tran-Luu, Duong; Solomon, Latasha; Nov 2006; 6 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481504; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Windscreens have long been used to filter undesired wind noise from acoustic data. However, little research has been conducted to study the effects on acoustic data when windscreens are exposed to harsh environmental conditions. The physical property of a foam windscreen is inevitably degraded when exposed to prolonged periods of UV rays and dust such as that in Iraq and Afghanistan. This degradation, if not accounted for, can result in significant accuracy errors of mission sensitive technology used to process acoustic data for purposes such as localization and tracking of targets of interest. The following research compares, in a controlled anechoic environment, the frequency and phase response of a clean windscreen to that of several windscreens with varying amounts of dust and sun exposure.

DTIC

Acoustic Properties; Degradation; Signal Transmission; Sound Waves; Windshields

20080036396 Washington Univ., Seattle, WA USA

Special Award in Ocean Acoustics

Ewart, Terry E; May 21, 2008; 5 pp.; In English

Contract(s)/Grant(s): N00014-98-1-0117

Report No.(s): AD-A481752; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481752>

The final performance report summarizes the work accomplished during the ten years of support: (1) Publication of results of the 1996 Synthetic Aperture Sonar (SAS) Cruise, (2) completion of the APL Acoustic Tank associated with Ph.D. obtained by Garfield Mellema, (3) summary of the validity of the Markov approximation studies with Dr. Frank Henyey, (4) description of the 'Detect' algorithm, (5) description of collaborations with other researchers, (6) description of work in final stages, (7) revisit of the dilemma of the upper turning point phase and intensity fluctuations, and (8) collection of movies/photographs/papers from Dr. Ewart's 52 years of research at APL.

DTIC

Acoustics; Oceans; Sonar; Synthetic Apertures

20080036426 Army Aeromedical Research Lab., Fort Rucker, AL USA

Performance of the Communication Enhancement and Protective System (CEPS) Under Sustained High and Low Temperatures

Gordon, Elmaree; Houtsma, Adrianus J; May 2008; 30 pp.; In English

Report No.(s): AD-A481814; USAARL-2008-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481814>

The USAARL conducted airworthiness testing on the Communication Enhancement and Protection System (CEPS). The test plan included conducting acoustic performance evaluations of the CEPS to determine if the CEPS would maintain clear and audible communications to the ear of the user and all its components would remain operational after exposure to sustained high and low temperatures conditions (Department of Defense Test Method Standard for Environmental Engineering Considerations and Laboratory Tests MIL-STD-810F). The CEPS met the test criteria after the high temperature operation test (49 deg C) and the high temperature storage tests (52 deg C). The device failed to meet the criteria after the maximum high temperature storage test (63 deg C), possibly because of a component failure. The device met the test criteria after the low temperature operation test (-19 deg C) and after one iteration each of a 4-hr low temperature storage test conducted at -21 deg C and -33 deg C. The device failed the test criteria after one low temperature storage test (-46 deg C), possibly because of component failure. In each case of component failure, the tube of the right microphone had become detached from the faceplate; measurements were erratic or could not be completed and testing was ended. It is recommended that the CEPS not be stored at temperatures higher than 52 deg C longer than 6 hours or below -33 deg C, and must be protected from condensation after exposure to low temperature operation and storage.

DTIC

Aircraft Reliability; Augmentation; Ear Protectors; High Temperature; Low Temperature; Protection; Protectors

20080036642 Naval Research Lab., Bay Saint Louis, MS USA

Low-Frequency Current Variability Observed at the Shelfbreak in the Northeastern Gulf of Mexico: November 2004-May 2005

Carnes, Michael R; Teague, William J; Jarosz, Ewa; Oct 22, 2007; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A482167; NRL/JA/7330-07-7187; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Fourteen acoustic Doppler current profilers (ADCPs) were deployed on the shelf and slope for 1 year just west of the DeSoto Canyon in the Northeastern Gulf of Mexico by the Naval Research Laboratory (NRL) as part of its Slope to Shelf Energetics and Exchange Dynamics (SEED) project. The winter and spring observations are discussed here in regards to the low-frequency current variability and its relation to wind and eddy forcing. Empirical orthogonal function (EOF) analyses showed that two modes described most of the current variability. Wind-forced variability of the along-shelf flow was the main contributor in Mode 1 while eddies contributed much of the variability in Mode 2. Wind-stress controlled currents on the shelf and slope at time scales of about a week. On longer time scales, variations in the currents on both the outer shelf and slope appear to be related to seasonal variations in the time-cumulated wind stress curl. Winds were dominant in driving the along-shelf transports, particularly along the slope. However, the effective wind stress component was found to be aligned with the west Florida shelf direction rather than the local shelf direction. Eddy intrusions, which were more numerous in winter

and spring than in summer and fall, and winds were found to contribute significantly to cross-shelf exchange processes.
DTIC

Doppler Effect; Gulf of Mexico; Gulfs; Low Frequencies; Ocean Currents; Variability

20080036688 Boston Univ., Boston, MA USA

Spatial Hearing in Echoic Environments

Shinn-Cunningham, Barbara G; Feb 29, 2008; 15 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0260

Report No.(s): AD-A482250; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In complex acoustic environments including command and control settings multiple acoustic sources vie for attention. The ability to locate and understand each acoustic signal is degraded by the presence of reverberant energy as well as the presence of competing sound sources. This study explored the effects of echoic energy on the ability to segregate and analyze and localize communication signals. Results demonstrate that the human auditory system is able to cope with many of the degradations caused by room acoustics. When selectively attending to one sound in a mixture of sound the greatest perceptual contribution of spatially separating competing sound sources is in enhancing sound source segregation and allowing selective attention to be directed effectively. In anechoic space any salient feature that differentiates target from masker is sufficient to enable accurate segregation and selective attention. However features that would be redundant in anechoic space yield additive gains in reverberant space. Directional localization accuracy is degraded by reverberation while distance accuracy is enhanced. Collaborations with neurophysiologists and computational researchers lend insights into the mechanisms that contribute to how listeners process sound in complex reverberant environments.

DTIC

Acoustics; Binaural Hearing; Hearing; Signal Transmission; Sound Localization; Sound Waves

20080036696 Naval Postgraduate School, Monterey, CA USA

Uncertainty in Acoustic Mine Detection Due to Environmental Variability

Chu, Peter C; Vares, Nick A; Keenan, Ruth E; Jan 2004; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482282; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Uncertainty in acoustic bottom target detection due to environmental variability for a shallow sea (30 m water depth) is investigated using the Navy's Comprehensive Acoustic Simulation System/Gaussian Ray Bundle model for a generic Very High Frequency (VHF) forward looking sonar. The effects of imprecise bottom type and wind speed data are evaluated to determine the impact of this variability on bottom target detection. The acoustic uncertainty due to the wind variability is more sensitive to muddy sand than to and sandy silt. Maximum acoustic uncertainty due to wind variability is 9 dB for the muddy sand and 6 dB for the sandy silt. For the bottom target detection, the wind speed accuracy is extremely important. If wind speed uncertainty exceeds 7 kts, the bottom target is unlikely to be detected. The signal excess variability is small and operational benefits may be maximized with slightly better sonar. Deep transducer (depth: 25 m) demonstrates substantial signal excesses up to 23 dB compared to 7 dB for shallow transducer (depth: 5.18 m). Therefore, to increase the probability of bottom target detection utilizing the generic VHF forward looking sonar, placement of the transducer deeper in the water column is recommended.

DTIC

Detection; Mine Detectors; Ocean Bottom; Soils; Sonar; Sound Detecting and Ranging; Target Acquisition; Variability; Wind Velocity

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ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20080035269 Semiotic Engineering Associates, LLC, Albuquerque, NM USA

Multivariate PEM/FT Spectrometry: Intrinsic Data Fusion And Applications for IED and CB Defense

Buican, Tudor N; Carrieri, Arthur H; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481200; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481200>

We present recent developments in the theory of a new class of active multivariate FT spectrometers and describe their

potential uses in the optical detection and identification of improvised explosive devices (IEDs) and CB agents and contaminants. This technology is based on the use of dual ultra-high-speed (UHS) birefringence interferometers for the simultaneous and independent modulation of both illumination and collected beams, and employs photoelastic modulators (PEM) as the birefringent elements in these interferometers. With typical scan rates of 104 105 interferograms per second and broad spectral range, these instruments can rapidly collect multivariate spectral data describing, in a correlated way, the comprehensive excitation, emission, and delay/lifetime spectral properties of the sample/target. The intrinsic process of data fusion that melds the multivariate spectral data into one interferogram signal allows for the simultaneous and correlated use of all three spectral variables for improved discrimination and identification of chemical species of interest.

DTIC

Multisensor Fusion; Multivariate Statistical Analysis; Spectrometers

20080035274 Clark-Atlanta Univ., GA USA

Automated Synthetic Hyperspectral Image Generation for Clutter Complexity Metric Development

Fadiran, Oladipo O; Molnar, Peter; Kaplan, Lance M; Nov 1, 2006; 7 pp.; In English

Contract(s)/Grant(s): G-41-Z93-G4

Report No.(s): AD-A481207; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481207>

Imaging sensors and automatic target recognition (ATR) algorithms are an integral part of modern combat systems. We present a method to automate the efficient synthesis of hyperspectral images used as aid in the evaluation and development of ATR algorithms. To ensure reliable inferences from these processes, it is required that the different levels of difficulty for ATR performance are adequately represented in the generated images. We employ the Digital Imaging and Remote Sensing Image Generation (DIRSIG) software for the image synthesis, and model each image as a function of the input parameters needed for the image synthesis. The computational complexity of image generation makes gradient-based, and similar adaptive schemes inappropriate for sampling this multidimensional function. We present a progressive adaptive sampling algorithm based on the equalization of the histogram of the already obtained samples. The algorithm requires no prior knowledge of how the images vary with the inputs used in their synthesis, and the computational overhead is minimal. The images generated with the aid of this algorithm are compared to those generated from a combination of random, and even spaced input parameters to DIRSIG. An improvement in diversity with respect to ATR performance is recorded for the images generated using the adaptive sampling algorithm.

DTIC

Clutter; Imagery; Target Recognition

20080036304 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Mass Spectral Fragmentation of VX

Rohrbaugh, Dennis K; May 2008; 31 pp.; In English

Report No.(s): AD-A481589; ECBC-TR-618; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481589>

The objective of this study was to provide structural identification of VX fragment ions formed during mass spectrometric analysis, elucidation of fragmentation pathways, and a compilation of tandem mass spectral product ion spectra to aid in detection and confirmation of trace levels of VX in complex matrices. Fragmentation was observed and is reported here for both electron ionization and chemical ionization (methane) conditions. Isotopic labeling analysis using d5-VX was performed to provide confirmation of selected structural assignments, particularly for the m/z 139 ion for which two structures have been proposed in the literature.

DTIC

Fragmentation; Mass Spectroscopy; Spectra

20080036366 Army Research Lab., Aberdeen Proving Ground, MD USA

Using Quantum Mechanics to Predict Shock Properties of Explosives

Romero, N A; Mattson, W D; Rice, B M; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481692; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481692>

The almost exponential increase in computer power over the last few decades has opened up the venue for increasingly more advanced and accurate computer simulations. As little as ten years ago, quantum mechanical calculations were restricted

to predictions of static properties of systems containing tens of atoms, thus limiting first principles explorations to gas phase chemical and physical processes. With today's computers, quantum mechanical calculations can easily be performed for solids and liquids, thus opening up exploration into condensed phase physico-chemical processes. In this work, we demonstrate the ability of quantum mechanical approaches, in particular the density-functional method, to predict shock properties of condensed phase energetic materials.

DTIC

Explosives; Quantum Mechanics

20080036433 Jacksonville State Univ., AL USA

Initial Chemical Events in CL-20 Under Extreme Conditions: An Ab Initio Molecular Dynamics Study

Isaev, Olexandr; Kholod, Yana; Gorb, Leonid; Qasim, Mohammad; Fredrickson, Herb; Leszczynski, Jerzy; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481822; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481822>

CL-20 (Octahydro-1,3,4,7,8,10-hexanitro-5,2,6- (iminomethenimino)-1H-imidazo[4,5-b]-pyrazin, C₆H₆N₁₂O₁₂), is an emerging energetic chemical that may replace RDX, however its degradation pathways are not well-known. In the present study molecular structure, electrostatic potential, vibrational spectrum and dynamics of thermal decomposition of CL-20 have been investigated by static and dynamic methods of ab initio computational chemistry. Based on good corresponding between predicted and computed data we concluded that the results of computational chemistry calculations can be used to guide predictions of the chemical behavior and degradation pathways of emerging contaminants in the environment.

DTIC

Chemical Reactions; Explosives; Molecular Dynamics

20080036451 Army Research Lab., Aberdeen Proving Ground, MD USA

Polymeric Nitrogen: The Ultimate, Green High Performing Energetic Material

Ciezak, Jennifer A; Rice, Betsy M; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481864; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481864>

High-energy-high-density materials that offer increased stability, vulnerability, and are environmentally safe are being aggressively pursued to meet the requirements of the DoD Joint Visions and Future Force. It was proposed nearly two decades ago, polymeric nitrogen would exceed all of these requirements, with energy release nearly five times that any conventional energetic material in use today, In this paper, we describe an experiment in which a meta-stable polymeric form of nitrogen has been synthesized under high-pressure using sodium azide as the starting material. Recent characterization and ideas for future work are discussed.

DTIC

Raman Spectra; X Ray Absorption; X Ray Diffraction

20080036489 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Quantitative UV Absorbance Spectra of Chemical Agents and Simulants

Lochner, J M; Hyre, Aaron M; Christesen, Steven D; Gonser, Kristina R; Mar 2008; 42 pp.; In English

Report No.(s): AD-A481958; ECBC-TR-611; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481958>

The quantitative UV absorption spectra of selected chemical agents and simulants have been measured for wavelengths in the near UV from 200 to 400 nm. Although these data are of interest in their own right, they are also necessary for predicting the sensitivity of UV Raman based detection systems. Of particular interest are the absorption values at 248.25 nm and 262 nm as these correspond to excitation wavelengths used by UV Raman based surface contamination detectors currently under development. These wavelengths are produced by KrF excimer lasers and quadrupled Nd:YLF lasers, respectively. This report collates these data in a presentable form.

DTIC

Absorption Spectra; Ultraviolet Absorption; Ultraviolet Spectra

20080036571 Texas A&M Univ., College Station, TX USA

Laser Manipulation of Nuclear Transitions

Kocharovskaya, Olga; Apr 14, 2008; 15 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-1-0016

Report No.(s): AD-A481980; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The project is focused on theoretical and experimental studies of the quantum coherence effects at the atomic and nuclear transitions in solids. The main results are the following. 1. Electromagnetically Induced Transparency (EIT) and all-optical writing and probing of quantum coherence in room temperature solids are demonstrated experimentally in the first time. 2. The method for coherent suppression of excited state absorption in laser crystals is suggested. It opens the prospects for realization of the variety tunable solid state lasers including UV and VUV ranges. 3. High-efficient THz generation by means of resonant three-level mixing based on EIT in solids is predicted. 4. EIT in gamma-ray range of frequencies at the nuclear transitions via the nuclear level crossing is demonstrated experimentally in the first time. 5. Slowing of the gamma-ray photons due to the absorption line doublet is demonstrated in the first time. 6. Modifications of the Mossbauer absorption spectra under the action of laser radiation demonstrated experimentally in the first time. 7. The method for suppression of the inhomogeneous line broadening of the Mossbauer spectra is suggested.

DTIC

Lasers; Solids

73

NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

20080034720 Argonne National Lab., IL, USA

Reactivity-Worth Estimates of the OSMOSE Samples in the MINERVE Reactor R1-MOX, R2-UO₂ and MORGANE/R Configurations

Zhong, Z.; Klann, R. T.; Jul. 23, 2007; 18 pp.; In English

Contract(s)/Grant(s): DE-AC02-06CH11357

Report No.(s): DE2007-915031; ANL-AFCI-196; No Copyright; Avail.: National Technical Information Service (NTIS)

An initial series of calculations of the reactivity-worth of the OSMOSE samples in the MINERVE reactor with the R2-UO₂ and MORGANE/R core configuration were completed. The calculation model was generated using the lattice physics code DRAGON. In addition, an initial comparison of calculated values to experimental measurements was performed based on preliminary results for the R1-MOX configuration.

NTIS

Estimates; Nuclear Reactors; Reactivity; Uranium Oxides

20080034721 Argonne National Lab., IL, USA

Scalability of the Natural Convection Shutdown Heat Removal Test Facility (NSTF) Data to VHTR/NGNP RCCS Designs

Vilim, R. B.; Feldman, E. E.; Jun. 30, 2005; 78 pp.; In English

Contract(s)/Grant(s): DE-AC02-06CH11357

Report No.(s): DE2007-915029; ANL-GENIV-049; No Copyright; Avail.: Department of Energy Information Bridge

Passive safety in the Very High Temperature Reactor (VHTR) is strongly dependent on the thermal performance of the Reactor Cavity Cooling System (RCCS). Scaled experiments performed in the Natural Shutdown Test Facility (NSTF) are to provide data for assessing and/or improving computer code models for RCCS phenomena. Design studies and safety analyses that are to support licensing of the VHTR will rely on these models to achieve a high degree of certainty in predicted design heat removal rate. To guide in the selection and development of an appropriate set of experiments a scaling analysis has been performed for the air-cooled RCCS option. The goals were to (1) determine the phenomena that dominate the behavior of the RCCS, (2) determine the general conditions that must be met so that these phenomena and their relative importance are preserved in the experiments, (3) identify constraints specific to the NSTF that potentially might prevent exact similitude, and

(4) then to indicate how the experiments can be scaled to prevent distortions in the phenomena of interest.

NTIS

Cavities; Computer Programs; Cooling Systems; Free Convection; High Temperature; High Temperature Tests; Nuclear Reactors; Shutdowns; Test Facilities

20080034928 Idaho National Engineering Lab., Idaho Falls, ID, USA

Utilization of Actively-Induced, Prompt Radiation Emission for Nonproliferation Applications

Blackburn, B. W.; Jones, J. L.; Moss, C. E.; Milhalczko, J. T.; Hunt, A. W.; Aug. 2006; 17 pp.; In English

Report No.(s): DE2007-911808; INL/CON-06-11167; No Copyright; Avail.: National Technical Information Service (NTIS)

The pulsed Photonuclear Assessment (PPA) technique, which has demonstrated the ability to detect shielded nuclear material, is based on utilizing delayed neutrons and photons between accelerator pulses. While most active interrogation systems have focused on delayed neutron and gamma-ray signatures, the current requirements of various agencies necessitate bringing faster detection and acquisition capabilities to field inspection applications. This push for decreased interrogation times, increased sensitivity and mitigation of false positives requires that detection systems take advantage of all available information. Collaborative research between Idaho National Lab (INL), Idaho State University's Idaho Accelerator Center (IAC), Los Alamos National Laboratory (LANL), and Oak Ridge National Laboratory (ORNL), has focused on exploiting actively-induced, prompt radiation signatures from nuclear material within a pulsed photonuclear environment. To date, these prompt emissions have not been effectively exploited due to difficulties in detection and signal processing inherent in the prompt regime as well as an overall poor understanding of the magnitude and yields of these emissions. Exploitation of prompt radiation (defined as during an accelerator pulse/(photo) fission event and/or immediately after (< 1 ms)) has the potential to dramatically reduce interrogation times since the yields are more than two orders of magnitude greater than delayed emissions. Recent preliminary experiments conducted at the IAC suggest that it is indeed possible to extract prompt neutron information within a pulsed photon environment. Successful exploitation of prompt emissions is critical for the development of an improved robust, high-throughput, low target dose inspection system for detection of shielded nuclear materials.

NTIS

Emission; Photonuclear Reactions

20080034929 Idaho National Engineering Lab., Idaho Falls, ID, USA

Safety Assurance for ATR Irradiations

Grover, S. B.; Tomberlin, T. A.; Oct. 2006; 8 pp.; In English

Report No.(s): DE2007-911794; INL/CON-06-01209; No Copyright; Avail.: National Technical Information Service (NTIS)

The Advanced Test Reactor (ATR) located at the Idaho National Laboratory (INL) is the worlds premiere test reactor for performing high fluence, large volume, irradiation test programs. The ATR has many capabilities and a wide variety of tests are performed in this truly one of a kind reactor, including isotope production, simple self-contained static capsule experiments, instrumented/controlled experiments, and loop testing under pressurized water conditions. Along with the five pressurized water loops, ATR may also have gas (temperature controlled) lead experiments, fuel boosted fast flux experiments, and static sealed capsules all in the core at the same time. In addition, any or all of these tests may contain fuel or moderating materials that can affect reactivity levels in the ATR core. Therefore the safety analyses required to ensure safe operation of each experiment as well as the reactor itself are complex. Each test has to be evaluated against stringent reactor control safety criteria, as well as the effects it could have on adjacent tests and the reactor as well as the consequences of those effects. The safety analyses of each experiment are summarized in a document entitled the Experiment Safety Assurance Package (ESAP). The ESAP references and employs the results of the reactor physics, thermal, hydraulic, stress, seismic, vibration, and all other analyses necessary to ensure the experiment can be irradiated safely in the ATR. The requirements for reactivity worth, chemistry compatibilities, pressure limitations, material issues, etc. are all specified in the Technical Safety Requirements and the Upgraded Final Safety Analysis Report (UFSAR) for the ATR. This paper discusses the ESAP process, types of analyses, types of safety requirements and the approvals necessary to ensure an experiment can be safely irradiated in the ATR.

NTIS

Advanced Test Reactors; Reactor Safety

20080034931 Idaho National Engineering Lab., Idaho Falls, ID, USA

International Reactor Physics Experiment Evaluation Project (IRPhEP)

Briggs, J. B.; Sartori, E.; Scott, L.; Sep. 2006; 8 pp.; In English

Report No.(s): DE2007-911764; INL/CON-06-01060; No Copyright; Avail.: Department of Energy Information Bridge

Since the beginning of the Nuclear Power industry, numerous experiments concerned with nuclear energy and technology have been performed at different research laboratories, worldwide. These experiments required a large investment in terms of infrastructure, expertise, and cost; however, many were performed without a high degree of attention to archival of results for future use. The degree and quality of documentation varies greatly. There is an urgent need to preserve integral reactor physics experimental data, including measurement methods, techniques, and separate or special effects data for nuclear energy and technology applications and the knowledge and competence contained therein. If the data are compromised, it is unlikely that any of these experiments will be repeated again in the future. The International Reactor Physics Evaluation Project (IRPhEP) was initiated, as a pilot activity in 1999 by the by the Organization of Economic Cooperation and Development (OECD) Nuclear Energy Agency (NEA) Nuclear Science Committee (NSC). The project was endorsed as an official activity of the NSC in June of 2003. The purpose of the IRPhEP is to provide an extensively peer reviewed set of reactor physics related integral benchmark data that can be used by reactor designers and safety analysts to validate the analytical tools used to design next generation reactors and establish the safety basis for operation of these reactors. A short history of the IRPhEP is presented and its purposes are discussed in this paper. Accomplishments of the IRPhEP, including the first publication of the IRPhEP Handbook, are highlighted and the future of the project outlined.

NTIS

Reactor Physics; Energy Technology; Technology Utilization

20080036664 Naval Research Lab., Washington, DC USA

Test of Models for Electron Transport in Laser Produced Plasmas

Colombant, D G; Manheimer, W M; Busquet, M; Jan 2005; 41 pp.; In English

Report No.(s): AD-A482201; XB-NRL/MR/6700; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper examines five different models of electron thermal transport in laser produced spherical implosions. These are classical, classical with a flux limit f , delocalization, beam deposition model, and Fokker-Planck solutions. In small targets, the results are strongly dependent of f for flux limit models, with small f 's generating very steep temperature gradients. Delocalization models are characterized by large preheat in the center of the target. The beam deposition model agrees reasonably well with the Fokker-Planck simulation results. For large, high gain fusion targets, the delocalization model shows the gain substantially reduced by the preheat. However flux limitation models show gain largely independent of f , with the beam deposition model also showing the same high gain.

DTIC

Electron Transfer; Laser Plasmas; Plasma Diffusion; Transport Properties

74 OPTICS

Includes light phenomena and the theory of optical devices; for specific optical devices see also *35 Instrumentation and Photography*. For lasers see *36 Lasers and Masers*.

20080034702 Applied Materials, Inc., Santa Clara, CA, USA

Hetero-Junction Electron Emitter with Group III Nitride and Activated Alkali Halide

Maldonado, J. R., Inventor; Machuca, F. J., Inventor; Coyle, S. T., Inventor; 25 Mar 05; 28 pp.; In English

Contract(s)/Grant(s): N66001-03-C-8023

Patent Info.: Filed Filed 25 Mar 05; US-Patent-Appl-SN-11-090 094

Report No.(s): PB2008-101214; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A photocathode is capable of generating an electron beam from incident light. The photocathode comprises a light permeable support having a light receiving surface and an opposing surface. A Group III nitride layer is provided on the opposing surface of the support. The Group III nitride layer comprises at least one Group III element and nitrogen. An alkali halide layer is provided on the Group III nitride layer. The alkali halide can be a cesium halide, such as cesium bromide or iodide.

NTIS

Alkali Halides; Electron Sources; Emitters; Nitrides; Patent Applications; Photocathodes

20080034791 Ross (Sheridan) PC, Denver, CO, USA

All-Optically Prepared and Controlled Nematic Liquid Crystal Light Valve

Furtak, T. E., Inventor; Yi, Y., Inventor; 13 Sep 05; 8 pp.; In English

Contract(s)/Grant(s): NSF-DMR-0213918

Patent Info.: Filed Filed 13 Sep 05; US-Patent-Appl-SN-11-225 918

Report No.(s): PB2008-101164; No Copyright; Avail.: CASI: [A02](#), Hardcopy

The present invention provides a device that acts as an optical switch to control the intensity of a light beam through the action of a second control beam. This behavior is achieved through photoinduced anisotropy that develops in a monomolecular layer coating the inside surfaces of a liquid crystal cell. One of the surfaces is permanently aligned prior to assembly by illuminating the surface with polarized light in the presence of oxygen. The other surface retains reversible behavior, adapting anisotropy according to the orientation of the polarization of the control beam. Accordingly, an optically controlled liquid crystal light valve is provided that does not require contact-rubbing methods in order to permanently align one of the layers coating an inside surface of the cell.

NTIS

Light Valves; Liquid Crystals; Patent Applications; Switches

20080034936 Idaho National Engineering Lab., Idaho Falls, ID, USA

Investigation of Tunable Diode Spectroscopy for Monitoring Gases in Geothermal Plants

Partin, J. K.; Aug. 2006; 35 pp.; In English

Report No.(s): DE2007-911726; INL/EXT-06-11811; No Copyright; Avail.: National Technical Information Service (NTIS)

The results of an investigation directed at the development of instrumentation for the real-time monitoring of gases, such as hydrogen sulfide (H₂S) and chloride (HCl), in geothermal process streams is described. The geothermal power industry has an interest in the development of new low maintenance techniques since improved capabilities could lead to considerable cost savings through the optimization of various gas abatement processes. Tunable diode laser spectroscopy was identified as a candidate technology for this application and a commercial instrument was specified and procured for testing. The measurement principle involved the use of solid state diode lasers and frequency modulation techniques. The gallium arsenide diode lasers employed emit light in the 0.7 to 2.0 micron region of the electromagnetic spectrum. This region contains the overtone and combination absorption bands of a number of species of industrial interest, including H₂S and HCl. A particular device can be tuned over a small range to match the absorption line by changing its applied temperature and current. The diode current can also be sinusoidally modulated in frequency as it is tuned across the line. This modulation allows measurements to be conducted at frequencies where the laser intensity noise is minimal; and therefore, very high signal-to-noise measurements are possible. The feasibility of using this technology in various types of geothermal process streams has been explored. The results of laboratory and field studies are presented along with new advances in laser technology that could allow more sensitive and selective measurements to be performed.

NTIS

Diodes; Spectroscopy; Semiconductor Lasers

20080034996 Haynes Befel and Wolfeld, LLP, Half Moon Bay, CA, USA; California Univ., Berkeley, CA, USA

Self-Seeded Single-Frequency Laser Peening Method

Dane, C. B., Inventor; Hackel, L., Inventor; Harris, F. B., Inventor; 26 Oct 05; 16 pp.; In English

Contract(s)/Grant(s): DE-W-7405-ENG48

Patent Info.: Filed Filed 26 Oct 05; US-Patent-Appl-SN-11-258 807

Report No.(s): PB2008-100752; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method of operating a laser to obtain an output pulse having a single wavelength, comprises inducing an intracavity loss into a laser resonator having an amount that prevents oscillation during a time that energy from the pump source is being stored in the gain medium. Gain is built up in the gain medium with energy from the pump source until formation of a single-frequency relaxation oscillation pulse in the resonator. Upon detection of the onset of the relaxation oscillation pulse, the intracavity loss is reduced, such as by Q-switching, so that the built-up gain stored in the gain medium is output from the resonator in the form of an output pulse at a single frequency. An electronically controllable output coupler is controlled to affect output pulse characteristics. The laser acts a master oscillator in a master oscillator power amplifier configuration. The laser is used for laser peening.

NTIS

Frequencies; Lasers; Patent Applications; Peening

20080035000 Greer, Burns and Crain, Chicago, IL, USA

Microwave Frequency Electro-Optical Beam Deflector and Analog to Digital Conversion

Nunnally, W., Inventor; Gahl, J., Inventor; Renkoski, T., Inventor; 24 Sep 04; 23 pp.; In English

Contract(s)/Grant(s): DASG60-02-G-0015

Patent Info.: Filed Filed 24 Sep 04; US-Patent-Appl-SN-10-949 030

Report No.(s): PB2008-102148; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The phase velocity of an optical wave is effectively reduced to that of a microwave frequency electromagnetic signal in this optical deflector. The electro-optic effect is used for a controlled deflection of an optical beam. The angle of beam deflection varies in accordance with an applied voltage, which may be a signal in the microwave frequency range. A device of the invention includes a birefringent crystal having transmission line conductors arranged to create an electric field in the crystal in response to an applied voltage, and mirrors arranged to create a multi-bounce path through the crystal for a light beam directed into the crystal on an entrance path that is non parallel to the mirrors. The multi-bounce path effectively slows the velocity of the optical wave to that of the voltage wave, permitting deflection or modulation of the beam by microwave frequency electrical signals. Devices of the invention may also modulate or deflect an optical beam in accordance with lower frequency signals. A preferred embodiment uses a microwave frequency deflection cell of the invention to conduct analog to digital conversion of analog signals ranging into the microwave frequency range.

NTIS

Analog to Digital Converters; Deflectors; Electro-Optics; Frequency Converters; Microwave Frequencies; Patent Applications

20080035155 Lenart (Robert P.), Pittsburgh, PA, USA

Phase Offset Integrated Solid Immersion Mirror and Lens for a General Phase Front

Itagi, A. V., Inventor; Schlesinger, T. E., Inventor; 12 Oct 04; 9 pp.; In English

Contract(s)/Grant(s): 70NANB1H3056

Patent Info.: Filed Filed 12 Oct 04; US-Patent-Appl-SN-10-962 775

Report No.(s): PB2008-102140; No Copyright; Avail.: CASI: [A02](#), Hardcopy

An apparatus comprises a condenser for directing electromagnetic radiation to a focal point, the condenser comprising a first interface on a first side of a longitudinal axis for directing a first plurality of rays of the electromagnetic radiation to a focal point and a second interface on a second side of the longitudinal axis for directing a second plurality of rays of the electromagnetic radiation to the focal point, wherein the first and second interfaces are shaped such that at the focal point, the second plurality of rays are about 180 degrees out of phase with respect to the first plurality of rays.

NTIS

Electromagnetic Radiation; Lenses; Mirrors; Patent Applications; Submerging

20080035318 Hampton Univ., VA USA

Resonant and Nonresonant Nonlinear Optical Spectroscopy of CDSE Quantum Dots for Nonlinear Photonic Applications

Seo, Jae T; Ma, Seong M; Yang, Qiquang; Battle, Russell; Creekmore, Linwood; Jackson, Ashley; Skyles, Tifney; Scales, Patrice; Lee, Kwang; Pugh-Thomas, Devin; Nov 2006; 50 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD17-02-C-0107; W911NF-04-1-0393

Report No.(s): AD-A481220; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The cubic nonlinearity of semiconductor quantum dots with resonant (1h 2e) and nonresonant excitations was investigated with Z-scan and four-wave mixing (FWM) spectroscopy. Z-scan spectroscopy revealed positive nonlinear absorption and negative nonlinear refraction of CdSe quantum dots. The hyperpolarizability of the quantum dots with resonant degenerative FWM was almost two-orders higher than that with nonresonant excitation. The possible physical origins of the cubic nonlinearity of the quantum dots were dominant two-step resonant absorption with resonant excitation and multiple nonlinear processes including a large contribution of the electronic polarization process with both resonant and nonresonant excitations.

DTIC

Cadmium Selenides; Four-Wave Mixing; Nonlinearity; Photons; Quantum Dots; Spectroscopy

20080035367 Maryland Univ., College Park, MD USA

Physics-Based Detectors Applied to Long-Wave Infrared Hyperspectral Data

Broadwater, Joshua; Chellappa, Rama; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481339; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Long-wave infrared (LWIR) hyperspectral image (HSI) data presents an interesting challenge for automatic target

detection algorithms. LWIR HSI data is useful for both day and night operations, but weak signatures like disturbed soil can be problematic for standard matched-filter techniques. In this paper, we augment the standard matched-filter techniques with physics-based information particular to HSI data. Our results show that these physics-based detectors provide improved detection performance with quick processing times.

DTIC

Imagery; Infrared Radiation

20080035460 Chicago Univ., Chicago, IL USA

Use of Multiple Optical Vortices for Pumping, Mixing and Sorting

Curtis, J. E., Inventor; Koss, B. A., Inventor; Grier, D. G., Inventor; 4 Nov 05; 18 pp.; In English

Contract(s)/Grant(s): DMR-9730189; DMR-980595

Patent Info.: Filed Filed 4 Nov 05; US-Patent-Appl-SN-11-266 989

Report No.(s): PB2008-101693; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A method for creating large numbers of high-quality optical traps in arbitrary three-dimensional configurations and dynamically reconfiguring the traps under computer control. The method uses computer-generated diffractive optical elements to convert one or more optical tweezers into one or more optical vortices. The method involves combining the optical vortex technique with the holographic optical tweezer technique to create multiple optical vortices in arbitrary configurations. The method also involves employing the rotation induced in trapped particles by optical vortices to assemble clusters of particles into functional micromachines, to drive previously assembled micromachines, to pump fluids through microfluidics channels, to control flows of fluids through microfluidics channels, to mix fluids within microfluidics channels, to transport particles, to sort particles and to perform other related manipulations and transformations on matter over length scales.

NTIS

Optical Equipment; Optical Pumping; Patent Applications; Vortices

20080035461 Wilmer Cutler Pickering Hale and Dorr, LLP, New York, NY, USA

Catadioptric Single Camera Systems Having Radial Epipolar Geometry and Methods and Means thereof

Kuthirummal, S., Inventor; Nayar, S. K., Inventor; 23 May 05; 43 pp.; In English

Contract(s)/Grant(s): NSF ITR-00-85864

Patent Info.: Filed Filed 23 May 05; US-Patent-Appl-SN-11-135 830

Report No.(s): PB2008-101714; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Catadioptric single camera systems capable of sampling the lightfield of a scene from a locus of circular viewpoints and the methods thereof are described. The epipolar lines of the system are radial, and the systems have foveated vision characteristics. A first embodiment of the invention is directed to a camera capable of looking at a scene through a cylinder with a mirrored inside surface. A second embodiment uses a truncated cone with a mirrored inside surface. A third embodiment uses a first truncated cone with a mirrored outside surface and a second truncated cone with a mirrored inside surface. A fourth embodiment of the invention uses a planar mirror with a truncated cone with a mirrored inside surface. The present invention allows high quality depth information to be gathered by capturing stereo images having radial epipolar lines in a simple and efficient method.

NTIS

Cameras; Patent Applications

20080035505 Mirick, OConnell, DeMallie, and Lougee, LLP, Westborough, MA, USA

Method of Producing Polarizers for Polarized Optical Probes

Chinnock, R. B., Inventor; Melanson, J. S., Inventor; 7 Oct 05; 17 pp.; In English

Contract(s)/Grant(s): NIH-1 R43 CA103083-01

Patent Info.: Filed Filed 7 Oct 05; US-Patent-Appl-SN-11-245 846

Report No.(s): PB2008-101689; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods of creating tooling designs for, and the production of, one or more polarizer groups on a workpiece. Each such group includes an optically transmitting substrate with one or more discrete polarizer pixels thereon. The polarizer groups are used with optical instruments having a number of optical channels. In the method, one or more physical characteristics of at least one optical channel of the optical instrument are measured. Based on the determined physical characteristics, one or more discrete polarizer groups to be created on the substrate are defined, by defining for each such group a location on the substrate for the group, the size, shape and location within the group of each polarizer pixel of the group, and the polarization orientation

for each such polarizer pixel of the group. The area of each polarizer pixel is then filled with tooling information that will establish its polarization orientation. A workpiece carrying one or more such polarizer groups is then manufactured from this tooling design.

NTIS

Optical Equipment; Patent Applications; Polarizers

20080035508 Lathrop and Gage, LC, Boulder, CO, USA

Free Electron Laser, and Associated Components and Methods

Brownell, J. H., Inventor; 26 Sep 03; 13 pp.; In English

Contract(s)/Grant(s): DAAD 19-99-1-0067; NSF-ECS-0070491

Patent Info.: Filed Filed 26 Sep 03; US-Patent-Appl-SN-10-529 343

Report No.(s): PB2008-101688; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system generates FIR laser radiation. An electron source generates an electron beam. A grating horn interacts with the electron beam to produce the FIR laser radiation. The grating horn may comprise a flat base and a pair of grating elements attached to the base, each of the grating elements being ruled with a grating period, the grating elements oriented in phase and in substantial symmetry about a normal to the flat base.

NTIS

Free Electron Lasers; Patent Applications; Laser Beams

20080035511 Delaware Univ., Newark, DE, USA

Antimonide-Based Optical Devices

Lohokare, S., Inventor; Prather, D. W., Inventor; 21 Jan 05; 9 pp.; In English

Contract(s)/Grant(s): MDA972-00-1-0023

Patent Info.: Filed Filed 21 Jan 05; US-Patent-Appl-SN-11-040 430

Report No.(s): PB2008-101705; No Copyright; Avail.: CASI: [A02](#), Hardcopy

An optical device includes an antimonide-containing substrate, and an antimonide-containing n-doped layer provided on the substrate. The optical device further includes an antimonide-containing i-doped layer provided on the n-doped layer, an antimonide-containing p-doped layer provided on the i-doped layer, and an antimonide-containing p(sup +)-doped layer provided on the p-doped layer.

NTIS

Antimonides; Gallium Antimonides; Optical Equipment; Patent Applications

20080035537 Massachusetts Inst. of Tech., Cambridge, MA USA

Information Transmission and Entanglement Distribution Over Bosonic Channels

Shapiro, Jeffrey H; Personick, Stewart D; Guha, Saikat; Mar 2008; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8750-06-2-0069; Proj-INFO

Report No.(s): AD-A481431; No Copyright; Avail.: Defense Technical Information Center (DTIC)

High-sensitivity photodetection systems have long been limited by noises of quantum-mechanical origin. Nevertheless, analyses and designs of optical communication systems have seldom employed fully quantum treatments. As a result, these works do not establish the ultimate limits on optical communication performance. This program established an inner bound on the capacity region for the Bosonic broadcast channel, and showed that this inner bound is in fact the capacity region if a new minimum output entropy conjecture is true. Evidence supporting this minimum output entropy conjecture was obtained, and its relation to a previous minimum output entropy conjecture used in the capacity theorem for the single-user thermal-noise channel was investigated. The Entropy Photon-Number Inequality, which is the quantum generalization of the classical Entropy Power Inequality, was posed and evidence supporting its validity was obtained. In other work, entanglement assistance was shown to be of no benefit in classical information transmission under a photon-number constraint unless burst-mode communication is considered.

DTIC

Channel Capacity; Data Transmission; Entropy; Quantum Theory

20080035539 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA

Method and Structure for Non-Linear Optics

Alekel, T., Inventor; Keszler, D. A., Inventor; Ye, N., Inventor; 14 Apr 05; 22 pp.; In English

Contract(s)/Grant(s): NSF-ECS-0114017

Patent Info.: Filed Filed 14 Apr 05; US-Patent-Appl-SN-11-107 367

Report No.(s): PB2008-101696; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A compound for non-linear optics for use at 350 nm and below. The compound includes a material for non-linear optics comprising $A(\text{sub } x)M(\text{sub } (1-x))Al(\text{sub } 3)B(\text{sub } 4)O(\text{sub } 12)$ x is larger than or equal to zero and smaller than or equal to 0.1, A is selected from a group consisting of Sc, Y, La, Yb, and Lu, and M is selected from a group consisting of Sc, Y, La, Yb, and Lu. The compound is free from a molybdenum bearing impurity of at least 1000 parts per million.

NTIS

Nonlinear Optics; Nonlinearity; Patent Applications

20080036016 Conley Rose, P.C., Houston, TX, USA; Baylor Coll. of Medicine, Houston, TX, USA; Rice Univ., Houston, TX USA

High Speed Microscope with Three-Dimensional Laser Beam Scanning

Saggau, P., Inventor; Reddy, D., Inventor; Iyer, V., Inventor; 6 Oct 05; 20 pp.; In English

Contract(s)/Grant(s): NSF-DBI-0130852

Patent Info.: Filed Filed 6 Oct 05; US-Patent-Appl-SN-11-245 410

Report No.(s): PB2008-102005; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system and method for independently controlling the collimation and lateral positioning of a light beam comprises at least one acousto-optic deflector and a pair of counter propagating acoustic waves with offset frequencies. While the frequency offset controls the lateral positioning of the light beam, a frequency gradient across the acousto-optic deflectors controls the collimation of the light beam.

NTIS

Acousto-Optics; Collimation; Deflectors; High Speed; Laser Beams; Light Beams; Patent Applications

20080036021 Quarles and Brady, LLP., Milwaukee, WI, USA

Versatile Substrate for SPR Detection

Wark, A. W., Inventor; Lee, H. J., Inventor; Corn, R. M., Inventor; Kodoyianni, V., Inventor; 21 Sep 05; 10 pp.; In English

Contract(s)/Grant(s): NIH-GM059622

Patent Info.: Filed Filed 21 Sep 05; US-Patent-Appl-SN-11-231 626

Report No.(s): PB2008-102012; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A substrate for testing a carrier liquid for biomolecules using SPR or other techniques provides a metallic island surrounded by a hydrophobic layer, the islands being a location for the attachment of probe molecules. The hydrophobic layer may also be a dielectric material providing improved sensitivity in SPR imaging.

NTIS

Imaging Techniques; Patent Applications; Plasmons; Substrates; Surface Plasmon Resonance

20080036083 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

CALISTO: A Cryogenic Far-Infrared/Submillimeter Observatory

Goldsmith, P. F.; Bradford, C. M.; Dragovan, M.; Khayatian, B.; Huffenberger, K.; O'Dwyer, I. J.; Gorski, K.; Yorke, H. W.; Zmuidzinas, J.; Paine, C.; Satter, C.; Lee, R.; Proceedings of the SPIE; September 2007; Volume 6687; 13 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40920>; <http://dx.doi.org/10.1117/12.731049>

We present a design for a cryogenically cooled large aperture telescope for far-infrared astronomy in the wavelength range 30 micrometers to 300 micrometers. The Cryogenic Aperture Large Infrared Space Telescope Observatory, or CALISTO, is based on an off-axis Gregorian telescope having a 4 m by 6 m primary reflector. This can be launched using an Atlas V 511, with the only optical deployment required being a simple hinged rotation of the secondary reflector. The off-axis design, which includes a cold stop, offers exceptionally good performance in terms of high efficiency and minimum coupling of radiation incident from angles far off the direction of maximum response. This means that strong astronomical sources, such as the Milky Way and zodiacal dust in the plane of the solar system, add very little to the background. The entire optical system is cooled to 4 K to make its emission less than even this low level of astronomical emission. Assuming that detector technology can be improved to the point where detector noise is less than that of the astronomical background, we anticipate unprecedented low values of system noise equivalent power, in the vicinity of $10(\text{exp } -19)$ WHz($\text{exp } -0.5$), through CALISTO's operating range. This will enable a variety of new astronomical investigations ranging from studies of objects in

the outer solar system to tracing the evolution of galaxies in the universe throughout cosmic time.

Author

Infrared Telescopes; Infrared Space Observatory (ISO); Optical Properties; Functional Design Specifications; Design Analysis

20080036094 Battelle Memorial Inst., Richland, WA, USA

Infra-Red Detector and Method of Making and Using Same

Craig, R. A., Inventor; Griffin, J. W., Inventor; 30 Sep 04; 16 pp.; In English

Contract(s)/Grant(s): DE-AC06-76RLO1830

Patent Info.: Filed Filed 30 Sep 04; US-Patent-Appl-SN-10-957 091

Report No.(s): PB2008-100693; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A low-cost infra-red detector is disclosed including a method of making and using the same. The detector employs a substrate, a filtering layer, a converting layer, and a diverter to be responsive to wavelengths up to about 1600 nm. The detector is useful for a variety of applications including spectroscopy, imaging, and defect detection.

NTIS

Infrared Detectors; Patent Applications

20080036096 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA; Naval Research Lab., Washington, DC, USA

Characterization of Mid-Infrared Single Mode Fibers as Modal Filters

Ksendzov, A.; Lay, O.; Martin, S.; Sanghera, J. S.; Busse, L. E.; Kim, W. H.; Pureza, P. C.; Nguyen, V. Q.; Aggarwal, I. D.; Applied Optics; November 9, 2007; Volume 46, No. 32, pp. 7957-7962; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40933>; <http://dx.doi.org/10.1364/AO.46.007957>

We present a technique for measuring the modal filtering ability of single mode fibers. The ideal modal filter rejects all input field components that have no overlap with the fundamental mode of the filter and does not attenuate the fundamental mode. We define the quality of a nonideal modal filter $Q(\text{sub } f)$ as the ratio of transmittance for the fundamental mode to the transmittance for an input field that has no overlap with the fundamental mode. We demonstrate the technique on a 20 cm long mid-infrared fiber that was produced by the U.S. Naval Research Laboratory. The filter quality $Q(\text{sub } f)$ for this fiber at 10.5 micron wavelength is 1000 +/- 300. The absorption and scattering losses in the fundamental mode are approximately 8 dB/m. The total transmittance for the fundamental mode, including Fresnel reflections, is 0.428 +/- 0.002. The application of interest is the search for extrasolar Earthlike planets using nulling interferometry. It requires high rejection ratios to suppress the light of a bright star, so that the faint planet becomes visible. The use of modal filters increases the rejection ratio (or, equivalently, relaxes requirements on the wavefront quality) by reducing the sensitivity to small wavefront errors. We show theoretically that, exclusive of coupling losses, the use of a modal filter leads to the improvement of the rejection ratio in a two-beam interferometer by a factor of $Q(\text{sub } f)$.

Author

Interferometry; Optical Fibers; Transmittance; Optical Filters

20080036139 Lawrence Livermore National Lab., Livermore, CA USA; California Univ., Berkeley, CA, USA

Generation of High Strength Metal Through Formation of Nanocrystalline Structure by Laser Peening

Hackel, L. A., Inventor; Syn, C. K., Inventor; Lesuer, D. R., Inventor; Sherby, O. D., Inventor; 28 Sep 04; 9 pp.; In English

Contract(s)/Grant(s): W-7405-ENG-48

Patent Info.: Filed Filed 28 Sep 04; US-Patent-Appl-SN-10-953 203

Report No.(s): PB2008-100681; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A method of processing a metal piece comprises a number of steps. One step comprises directing a laser beam onto the metal piece for laser peening the metal piece. Another step comprises causing relative movement between the laser beam and the metal piece. Another step comprises providing a tamping material between the laser beam and the metal piece. Another step comprises continuing the laser peening to induce rapid strain and substantial strain in the metal piece and inducing the formation of nanocrystalline structure in the metal piece.

NTIS

High Strength; Lasers; Patent Applications; Peening

20080036242 NASA Marshall Space Flight Center, Huntsville, AL, USA

HERO: A Hard-X-Ray Balloon-Borne Focusing Telescope

Ramsey, Brian; Stahl, H. Philip; July 07, 2008; 1 pp.; In English; ICO-21 2008 Congress 'Optics for the 21st Century' / International Commission for Optics, 7-10 Jul. 2008, Sydney, Australia; No Copyright; Avail.: Other Sources; Abstract Only

HERO, for High Energy Replicated Optics, is an evolutionary balloon payload featuring hard-X-ray grazing-incidence nickel optics. The payload provides a scientific instrument capable of high-sensitivity observations in an energy regime that is relatively unexplored at fine spatial scales, and also serves as a demonstration vehicle for in-house fabricated optics and focal plane detectors. After a proof-of-concept flight in 2001, which captured the first focused hard-X-ray images galactic sources, HERO has been significantly expanded from just 6, 3-m-focal length mirror shells to its current complement of nearly 100, 6-m-focal length mirrors. HERO was flown in 2007, from Fort Sumner, NM, and is scheduled to fly again in September 2009, from Alice Springs, NT. Full details of the payload will be provided along with preliminary data from the previous flight and science targets for the next flight, where the galactic center region will be imaged.

Author

Balloons; Balloon-Borne Instruments; Spaceborne Telescopes; X Ray Telescopes; Payloads; Optics; X Ray Astronomy

20080036388 Delaware Univ., Newark, DE USA

Multifunctional Composites with Integrated Optical Busses for Data and Sensing Applications

Tietelbaum, M; O'Brien, D J; Wells, N D; Yarlagadda, S; Wetzel, E D; Goossen, K W; Nov 2006; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481743; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481743>

Embedded communication busses are being widely investigated for complex composite structures such as military vehicles and advanced civil structures. The major difficulty with such busses is coupling external devices to embedded optical and electrical cables at ingress/egress points because physical connectors are awkward and prone to mechanical failure. In this work we present several techniques for normal incidence free-space optical data porting. These techniques are used to develop and demonstrate an integrated structural optical communication bus.

DTIC

Composite Structures; Data Processing; Detection; Optical Communication

20080036390 Army Research Lab., Aberdeen Proving Ground, MD USA

Evaluation of Hot Isostatic Pressing Parameters on the Optical and Ballistic Properties of Spinel for Transparent Armor

Gilde, Gary; Patel, Parimal; Sands, James; Patterson, Philip; Blodgett, David; Duncan, Donald; Hahn, Daniel; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481745; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481745>

The effect of different hot pressing and hot isostatic pressing temperatures and pressures on the optical properties of spinel was studied. Extinction coefficients of spinel samples were estimated by comparing the measured transmittance with the theoretical transmittance as calculated via a Sellmeier model. Results showed that the relative size of the scattering sites was large compared to the wavelengths of light. Overall, increasing HIP temperature and pressure resulted in decreasing the optical extinction. The lower of two hot pressing temperatures prior to HIPing resulted in lower scatter coefficients after HIPing; this effect was most significant in the infrared. The single shot and multi-shot ballistic properties of spinel based armor system have been evaluated. Compared to single crystal sapphire and polycrystalline ALON, spinel has superior ballistic properties to that of sapphire and is comparable to ALON. Initial testing indicates that the multi-hit ballistic performance of sapphire is comparable to spinel.

DTIC

Armor; Ballistics; Hot Isostatic Pressing; Hot Pressing; Independent Variables; Isostatic Pressure; Optical Properties; Spinel; Transparency

20080036410 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA

Modeling Fog Oil Obscurant Smoke Penetration into Simulated Tortoise Burrows

Guelta, M A; Balbach, H E; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): P622720-A896

Report No.(s): AD-A481783; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481783>

The gopher tortoise (*Gopherus polyphemus*), found on many military installations, is threatened in its westernmost distribution and at risk everywhere else. On installations where troop readiness training is conducted, an important component of realistic troop readiness training is the generation of obscurant material and the conduct of maneuvers under obscurant cover. Fog oil has long been deployed for visual obscurant training, and the effect of such obscurants on this species is unknown. As a preliminary step prior to instituting toxicological studies, a laboratory simulation was performed of the capability of the fog oil smoke to penetrate the burrow of the gopher tortoise. The fog oil smoke did not enter the simulated tortoise burrow in significant concentrations. This suggests that tortoise burrows do not need to be studied in situ, and that tortoises may be considered protected while in the burrow.

DTIC

Fog; Occultation; Oils; Penetration; Smoke; Toxicology; Turtles

20080036452 Georgia Inst. of Tech., Atlanta, GA USA

Locally-Constrained Region-Based Methods for DW-MRI Segmentation

Melonakos, John; Kubicki, Marek; Niethammer, Marc; Miller, James V; Mohan, Vandana; Tannenbaum, Allen; Jan 2007; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481866; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481866>

In this paper, we describe a method for segmenting fiber bundles from diffusion-weighted magnetic resonance images using a locally-constrained region based approach. From a pre-computed optimal path, the algorithm propagates outward capturing only those voxels which are locally connected to the fiber bundle. Rather than attempting to find large numbers of open curves or single fibers, which individually have questionable meaning, this method segments the full fiber bundle region. The strengths of this approach include its ease-of-use, computational speed, and applicability to a wide range of fiber bundles. In this work, we show results for segmenting the cingulum bundle. Finally, we explain how this approach and extensions thereto overcome a major problem that typical region-based flows experience when attempting to segment neural fiber bundles.

DTIC

Fiber Optics; Segments

20080036494 Kansas State Univ., Manhattan, KS USA

Novel Wavelength Standards in the Near IR

Corwin, Kristan L; Apr 15, 2008; 54 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-05-1-0304

Report No.(s): AD-A481973; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481973>

The goal of this work is to develop a new class of portable optical frequency references based on sub-Doppler spectroscopy inside gas-filled hollow-core photonic bandgap optical fiber. This research has three major components, consisting of spectroscopy in hollow fiber, the development of a near-IR optical frequency comb with which to characterize the transitions inside the fiber, and efforts to seal these fibers filled with molecular gases to create portable frequency references. Sub-Doppler spectra were observed for the first time in such fibers, and the dependence of the feature width on fiber core diameter was established. A mode-locked chromium-doped forsterite laser based on prism pair dispersion compensation was stabilized as an optical frequency comb for the first time, and unique noise properties were identified. Dramatic narrowing of the carrier-envelope offset frequency (f_{sub0}) was observed when a knife-edge was inserted in the optical cavity. Finally, new fusion splicing techniques for hollow-core photonic bandgap optical fiber were developed.

DTIC

Fiber Optics; Near Infrared Radiation

20080036531 NASA Marshall Space Flight Center, Huntsville, AL, USA

Technology Development for Nickel X-Ray Optics Enhancement

Bubarev, Mikhail; Ramsey, Brian; Engelhaupt, Darell; June 21, 2008; 1 pp.; In English; SPIE Conference on Astronomical Telescopes and Instrumentation, 21-29 Jun. 2008, Marseille, France; Copyright; Avail.: Other Sources; Abstract Only

We are developing grazing-incidence x-ray optics for high-energy astrophysics using the electroform-nickel replication process. In this process, mirror shells are fabricated by replication off super-polished cylindrical mandrels. The mirrors fabricated using this process have a demonstrated optical performance at the level of 11-12 arc seconds resolution (HPD) for 30 keV x rays. Future missions demand ever higher angular resolutions and this places stringent requirements on the quality of the mandrels, the precision of the metrology, and the mounting and alignment of the mirror shells in their housings. A progress report on recent technology developments in all these areas will be presented along with a discussion on possible post fabrication, in-situ improvement of the x-ray mirrors quality.

Author

Nickel; X Ray Optics; Grazing Incidence; Astrophysics; Mirrors; Angular Resolution; Precision

20080036567 Naval Undersea Warfare Center, Newport, RI USA

Recoverable Optical Fiber Tethered Buoy Assembly

Amidon, Charles P, Inventor; May 14, 2008; 13 pp.; In English
Report No.(s): AD-D020367; No Copyright; Avail.: Other Sources
ONLINE: <http://hdl.handle.net/100.2/ADD020367>

The invention as disclosed is a recoverable tethered optical fiber buoy and winch assembly that is mounted to the back of the sail or the back of an aft non-moving surface of an underwater vehicle and housed in a configuration to provide very little additional drag to the underwater vehicle when the assembly is not deployed. The invention provides a capability to connect ocean surface visual or radio frequency sensors to an underwater mobile platform with a very high data rate link that is retrievable.

DTIC

Buoys; Fiber Optics; Optical Fibers; Tethering; Underwater Vehicles

20080036610 Humansystems, Inc., Guelph, Ontario Canada

Review of Fusion Systems and Contributing Technologies for SIHS-TD (Examen des Systemes de Fusion et des Technologies d'Appui pour la DT SIHS)

Angel, Harry H; Ste-Croix, Chris; Kittel, Elizabeth; Mar 31, 2007; 112 pp.; In English
Report No.(s): AD-A482098; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The major objectives of the report were to identify and review the field of image fusion and contributing technologies and to recommend systems, algorithms and metrics for the proposed SIHS TD Vision SST fusion test bed. A search of the relevant literature was conducted using the relevant databases and approximately 150 papers of primary utility were identified for review. The report provides an in depth introduction to fusion hardware and software technologies and evaluation metrics. The effort focused on identifying promising sensing fusion technologies that could be utilized by the Soldier's Integrated Helmet System Technology Demonstrator (SIHS TD). The SIHS TD Vision Sub System Team plans to develop a fusion test bed in the near term to quantify dismounted soldier performance. The systems examined in this project were projected to be mature and compatible with man packed applications by the year 2007. The literature review identified considerable technological advancements in sensor size reduction, power demand reductions, and increases in resolution. The report analyzed select sensor systems for their suitability in the fusion test bed based on sensor form factors, detector resolution, and real time performance. Recommendations on what sensors to include in the fusion test bed are included. The report provides an in depth introduction into image fusion approaches. A list of potential fusion algorithms were identified and reviewed. Recommendations on what fusion algorithms should be examined in the fusion test bed are provided. A number of subjective and objective fusion evaluation approaches and metrics were proposed in the literature to quantify and qualify image fusion performance. Recommendations on what valid fusion metrics should be utilized in the fusion test bed are provided. Improvements to fusion subjective evaluation approaches are also detailed. Finally, summary suggestions for the Vision SST fusion test bed are provided.

DTIC

Helmets; Multisensor Fusion; Portable Equipment; Proving; Systems Integration; Test Stands

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 *Geophysics*. For space plasmas see 90 *Astrophysics*.

20080034757 Government Accountability Office, Washington, DC, USA

Fusion Energy: Definitive Cost Estimates for U.S. Contributions to an International Experimental Reactor and Better Coordinated DOE Research are Needed

Oct. 2007; 38 pp.; In English

Report No.(s): PB2008-101534; GAO-08-30; No Copyright; Avail.: CASI: [A03](#), Hardcopy

The USA is pursuing two paths to fusion energy--magnetic and inertial. On November 21, 2006, the USA signed an agreement with five countries and the European Union to build and operate the International Thermonuclear Experimental Reactor (ITER) in Cadarache, France, to demonstrate the feasibility of magnetic fusion energy. The USA also built and operates facilities to pursue inertial fusion energy research. This report discusses (1) U.S. contributions to ITER and the challenges, if any, in managing this international fusion program and (2) the Department of Energy's (DOE) management of alternative fusion research activities, including National Nuclear Security Administration (NNSA) initiatives. In performing this work, GAO analyzed budget documents, briefings, and reports that focused on research and funding priorities for the fusion program. GAO also met with officials from DOE, NNSA, and the ITER Organization in France. Over 9 years, DOE estimates it will spend \$1.12 billion to help build ITER, but this is only a preliminary estimate and may not fully reflect the costs of U.S. participation.

NTIS

Cost Estimates; Fusion Reactors; International Cooperation; Thermonuclear Reactions; Tokamak Devices

20080034988 DeWitt Ross and Stevens, Madison, WI, USA

Plasma Treatment within Dielectric Fluids

Denes, F. S., Inventor; Manolache, S. O., Inventor; 4 Sep 03; 7 pp.; In English

Contract(s)/Grant(s): 02-CHRF-0-6055

Patent Info.: Filed 4 Sep 03; US-Patent-Appl-SN-10-526 798

Report No.(s): PB2008-101246; No Copyright; Avail.: CASI: [A02](#), Hardcopy

A dielectric liquid having entrained bubbles of gas or vapor is subjected to an electric field applied between spaced electrodes (112, 116) which generates microdischarges (and thus plasma) within the bubbles, allowing modification of the properties of the dielectric liquid. The invention is particularly useful for treating hydrocarbon liquids such as gasolines and other liquid hydrocarbon fuels, which have extremely low dielectric constants. Generating microdischarges within bubbles in such fuels can create compounds useful for higher combustion efficiency and/or lower emissions in internal combustion engines. The invention may be directly implemented in an engine's fuel line upstream from the combustion chamber (e.g., immediately prior to a fuel injector), thereby allowing the invention to be usefully implemented for fuel treatment prior to combustion.

NTIS

Capacitors; Dielectrics; Electric Energy Storage; Patent Applications; Plasmas (Physics)

20080035094 Orrick, Herrington and Sutcliffe, LLP, Irvine, CA, USA; California Univ., Berkeley, CA, USA

Magnetic and Electrostatic Confinement of Plasma with Tuning of Electrostatic Field

Rostoker, N., Inventor; Binderbauer, M., Inventor; Qerushi, A., Inventor; Tahsiri, H., Inventor; 19 May 05; 39 pp.; In English

Contract(s)/Grant(s): N00014-99-1-0857

Patent Info.: Filed 19 May 05; US-Patent-Appl-SN-11-133 807

Report No.(s): PB2008-102131; No Copyright; Avail.: CASI: [A03](#), Hardcopy

A system and method for containing plasma and forming a Field Reversed Configuration (FRC) magnetic topology are described in which plasma ions are contained magnetically in stable, non-adiabatic orbits in the FRC. Further, the electrons are contained electrostatically in a deep energy well, created by tuning an externally applied magnetic field. The simultaneous electrostatic confinement of electrons and magnetic confinement of ions avoids anomalous transport and facilitates classical containment of both electrons and ions. In this configuration, ions and electrons may have adequate density and temperature so that upon collisions they are fused together by nuclear force, thus releasing fusion energy. Moreover, the fusion fuel plasmas

that can be used with the present confinement system and method are not limited to neutronic fuels only, but also advantageously include advanced fuels.

NTIS

Confinement; Electric Fields; Electrostatics; Patent Applications; Plasma Control; Plasmas (Physics); Tuning

76

SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 *Electronics and Electrical Engineering*; and 36 *Lasers and Masers*.

20080034714 Fermi National Accelerator Lab., Batavia, IL, USA; Texas Univ., Austin, TX, USA

Geometrical Interpretation of Nonlinearities from a Cylindrical Pick-Up

Miyamoto, R.; Kopp, S. E.; Jansson, A.; Syphers, M. J.; Jun. 01, 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-07CH11359

Report No.(s): DE2007-915124; FERMILAB-CONF-07-337-AD-APC; No Copyright; Avail.: Department of Energy Information Bridge

In many accelerators, cylindrical pick-ups are used to measure transverse beam positions. Theoretically, signals from these pick-ups are related to infinite power series of the beam position but, in practice, only finite number of terms are considered and the position measurements degrade when a beam is far from the center of a pick-up. This paper shows there is actually a simple geometrical relation between a beam position and induced signals. With help of the geometrical relation, the beam position can be written in a compact function of signals. The paper is concluded with numerical simulations and a test to show this geometry based expression can calculate a beam position better than the conventional methods.

NTIS

Cylindrical Bodies; Electron Beams; Particle Accelerators

20080034715 Fermi National Accelerator Lab., Batavia, IL, USA; Texas Univ., Austin, TX, USA

Tevatron AC Dipole System

Miyamoto, R.; Kopp, S. E.; Jansson, A.; Syphers, J. J.; Jun. 01, 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76CH03000

Report No.(s): DE2007-915123; FERMILAB-CONF-07-338-AD-APC; No Copyright; Avail.: Department of Energy Information Bridge

The AC dipole is an oscillating dipole magnet which can induce large amplitude oscillations without the emittance growth and decoherence. These properties make it a good tool to measure optics of a hadron synchrotron. The vertical AC dipole for the Tevatron is powered by an inexpensive high power audio amplifier since its operating frequency is approximately 20 kHz. The magnet is incorporated into a parallel resonant system to maximize the current. The use of a vertical pinger magnet which has been installed in the Tevatron made the cost relatively inexpensive. Recently, the initial system was upgraded with a more powerful amplifier and oscillation amplitudes up to 2-3 were achieved with the 980 GeV proton beam. This paper discusses details of the Tevatron AC dipole system and also shows its test results.

NTIS

Alternating Current; Particle Accelerators

20080034722 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA

FEL-Accelerator Related Diagnostics

Jordan, K.; Benson, S. V.; Douglas, D.; Evtushenko, P.; Aug. 02, 2007; 8 pp.; In English

Contract(s)/Grant(s): DE-AC05-06OR23177

Report No.(s): DE2007-914719; JLAB-FEL-07-724; DOE/OR/23177-0140; No Copyright; Avail.: Department of Energy Information Bridge

Free Electron Lasers (FEL) present a unique set of beam parameters to the diagnostics suite. The FEL requires characterization of the full six dimensional phase space of the electron beam at the wiggler and accurate alignment of the electron beam to the optical mode of the laser. In addition to the FEL requirements on the diagnostics suite, the Jefferson Lab FEL is operated as an Energy Recovered Linac (ERL) which imposes additional requirements on the diagnostics. The ERL aspect of the Jefferson Lab FEL requires that diagnostics operate over a unique dynamic range and operate with simultaneous

transport of the accelerated and energy recovered beams. This talk will present how these challenges are addressed at the Jefferson Lab FEL.

NTIS

Diagnosis; Free Electron Lasers

20080034724 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Michigan State Univ., East Lansing, MI, USA; Fermi National Accelerator Lab., Batavia, IL, USA

Single Crystal and Large Grain Niobium Research at Michigan State University

Compton, C.; Aizaz, A.; Baars, D.; Bieler, T.; Bierwagen, J.; Sep. 01, 2007; 8 pp.; In English

Report No.(s): DE2007-914638; JLAB-ACO-07-710; DOE/ER/40150-4324; No Copyright; Avail.: Department of Energy Information Bridge

As Superconducting Radio Frequency (SRF) technology is used in more accelerator designs, research has focused on increasing the efficiency of these accelerators by pushing gradients and investigating cost reduction options. Today, most SRF structures are fabricated from high purity niobium. Over years of research, a material specification has been derived that defines a uniaxial, fine grain structure for SRF cavity fabrication. Most recently a push has been made to investigate the merits of using single or large grain niobium as a possible alternative to fine grain niobium. Michigan State University (MSU), in collaboration with Fermi National Accelerator Laboratory (FNAL) and Thomas Jefferson National Accelerator Facility (JLAB), is researching large grain niobium via cavity fabrication processes and testing, as well as exploring materials science issues associated with recrystallization and heat transfer. Single-cell 1.3 GHz (Beta=0.081) cavities made from both fine and large grain niobium were compared both in terms of fabrication procedures and performance. Two 7-cell cavities are currently being fabricated.

NTIS

Niobium; Radio Frequencies; Single Crystals; Superconductivity; Thermal Conductivity

20080035095 Fulbright and Jaworski, LLP, Austin, TX, USA; Southwest Research Inst., Houston, TX, USA

Systems and Methods for Detection of Dielectric Change in Material and Structure

Martinez, R. E., Inventor; Cerwin, S. A., Inventor; Goyen, T. H., Inventor; 11 Aug 05; 15 pp.; In English

Contract(s)/Grant(s): MDA904-01-C-2133

Patent Info.: Filed 11 Aug 05; US-Patent-Appl-SN-11-201 753

Report No.(s): PB2008-102132; No Copyright; Avail.: CASI: [A03](#), Hardcopy

Methods and systems are described for efficiently detecting an object. The system includes at least one electrode for measuring a displacement current. The at least one electrode is coupled to a floating ground configuration provided by an op-amp, where the inverting node of the op-amp is coupled to electrode and the non-inverting node is coupled to a signal generator. The system may include a single capacitance sensor for detecting an object. Systems may include a plurality of capacitance sensors in an array configuration for detecting an object.

NTIS

Dielectrics; Patent Applications; Detection

20080035259 Wisconsin Univ., Madison, WI USA

Nonlinear Microwave Properties of Atomic Layer Controlled HTS Multilayers

Eom, Chang-Beom; Apr 14, 2008; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-06-1-0415

Report No.(s): AD-A481177; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481177>

We have studied the nonlinear microwave response of epitaxial HTS multilayers and single layers thick films in collaboration with Dr. Dan Oates at MIT Lincoln Lab. In order to make highest quality control we have used multi-YBCO target PLD with in situ high pressure RHEED. The nonlinearity of YBCO thick films improves, as increasing the films thickness, and approaches the lowest values ever reported.

DTIC

Atoms; Microwaves; Nonlinearity; Superconductors (Materials)

20080035331 Army Research Lab., Aberdeen Proving Ground, MD USA

A Multiscale Modeling Method for Deformations on Atomic Lattice Defects and Application to Plasticity

Chung, Peter W; Clayton, John D; Nov 2006; 27 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481240; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Computing the displacements of atoms undergoing deformation in a perfect lattice requires the use of the so-called Cauchy-Born approximation. Near defects such as at vacancies or dislocations, this approximation does not hold and a computationally costly energy minimization over a large number of atoms is unavoidable. Presented is a self-consistent multiscale methodology enabling an approximation to the displacements near defects without requiring full energy minimization over successive load increments. It enables description of the fundamental mechanical behavior of crystalline materials at the length scale of a macroscopic continuum (i.e., millimeter resolution) given discrete atomic interactions at the nanoscale (i.e., angstrom resolution). The basic formulation is derived from mathematical homogenization which requires the definition of a representative crystalline volume element containing periodic defects. Numerical simulations demonstrate the utility of the framework for the particular case of tungsten. Elastic stiffness and energetic properties of periodic unit cells containing vacancies, screw dislocations, and low-angle twist boundaries are computed followed by demonstrative calculations of the extension to atomistic plastic flow.

DTIC

Atoms; Crystal Defects; Deformation; Plastic Deformation; Plastic Properties

20080035362 Army Research Lab., Aberdeen Proving Ground, MD USA

Exploring the High-Pressure Behavior of PETN: A Combined Quantum Mechanical and Experimental Study

Ciezak, Jennifer A; Byrd, Edward F; Rice, Betsy M; Nov 2006; 20 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481324; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In an effort to increase the efficiency of the developmental cycle for future munitions and propellants, integration of standard atomistic simulation methods into the research and development process is being aggressively pursued. In many cases, this approach is not feasible due to the neglect of important crystalline forces in the formulations of the simulation methods. However, within high-pressure regimes it has been shown the predictions are in much closer agreement with experiment. This paper describes a combined theoretical/experimental study to elucidate the highpressure behavior of Pentaerythritol Tetranitrate (PETN). The pressure-induced alterations in the Raman frequencies were studied in a compression sequence up to 25 GPa and subsequent decompression to ambient conditions. The observed changes indicated a nonreversible phase transition at ~ 8.0 GPa. High-pressure xray diffraction experiments corroborate the Raman results. Quantum mechanical calculations were performed in an attempt to elucidate the structure of this new material.

DTIC

High Pressure; PETN; Phase Transformations

20080036401 Johns Hopkins Univ., Bethesda, MD USA

MEANS 2: Microstructure-and Micromechanism-Sensitive Property Models for Advanced Turbine Disk and Blade Systems

Hemker, Kevin J; Apr 24, 2008; 8 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0102

Report No.(s): AD-A481762; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481762>

The overall coordinated research effort involved activities in the following areas: (1) Creep and Deformation Structure Characterization Studies of Disk Alloy Rene 104 (ME3), (2) Calculation of Activation Barriers Using Phase Field Dislocation Dynamics, (3) Adaptive computational model of crystal plasticity involving micro-twinning, (4) 3D Atom Probe Analysis of Phase Microstructures. Descriptions of all activities can be found in the annual and final reports submitted and to be submitted by the overall PI, Mike Mills.

DTIC

Crystals; Micromechanics; Microstructure; Sensitivity; Turbine Blades

20080036694 Naval Research Lab., Washington, DC USA

The Contribution of Antimonide Surface Reconstructions to Heterostructure Interface Roughness

Bracker, A S; Barvosa-Carter, W; Culbertson, J C; Nosh, B Z; Whitman, L J; Shanabrook, B V; Bennett, B R; Yang, M J; Aug 1999; 4 pp.; In English

Report No.(s): AD-A482272; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using RHEED and STM, we have studied surface reconstructions and formation of islands and interfaces for the 6.1

Angstrom family of compound semiconductors (InAs, GaSb, AlSb). The structure and stoichiometry of MBE-grown antimonide surfaces lead to growth and roughening mechanisms that are distinctly different from other III-V materials. When a new material is grown on an antimonide surface, some blurring of the resulting heterointerface must occur in the form of monolayer islands or atomic-scale intermixing.

DTIC

Antimonides; Semiconductors (Materials); Surface Roughness

77

PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 *Atomic and Molecular Physics*, 73 *Nuclear Physics*, and 25 *Inorganic, Organic and Physical Chemistry*.

20080034742 Fermi National Accelerator Lab., Batavia, IL, USA; Wisconsin Univ., Madison, WI, USA

Further Study of High Energy Neutrino Interactions at NAL (May 31, 1974)

Benvenuti, A.; Cline, D.; Entenberg, A.; Ford, W. T.; Imlay, R.; May 31, 1974; 106 pp.; In English

Report No.(s): PB2008-100978; FERMILAB-PROPOSAL-310; No Copyright; Avail.: CASI: [A06](#), Hardcopy

As a result of recent neutrino experiments and related technological progress in the past few years, it is possible to formulate a proposal for a neutrino detector to be used at NAL, which we believe will be capable of exploring the richness of that field better than present detectors. The complexity of high energy inelastic neutrino events--with and without final state muons--demands increased detector sophistication to unravel the full content of each event.

NTIS

High Energy Interactions; Neutrinos; Detectors

20080035413 California Univ., Berkeley, CA USA

Slow Light in Semi-Conductor Quantum Well Waveguides

Chang-Hasnain, Constance; Wang, Hailin; Chuang, Shun-Lien; Hemmer, Philip; Feb 14, 2008; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA9550-04-1-0196

Report No.(s): AD-A481456; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The main objective of the program is to investigate various physical phenomena and device structures that can lead to potential applications to all optical storage and processing. The physical effects include electro-magnetic ally induced transparency (EIT), coherent population oscillation (CPO) in semiconductor quantum wells (QW) or dots. We carried out experimental implementation of EIT from electron spin coherence in a GaAs quantum well waveguide for the first time. We designed and fabricated the waveguide structure. We also designed and fabricated a miniature waveguide coupler attached to a cold finger in an optical cryostat. The EIT experiment using double-V energy configuration was carried out for the first time on a (110) QW waveguide. An absorption dip of tilde 10% indicates a slow down factor of 1000 was obtained with a spectral width 1GHz at 4K. From the spectral width, the spin coherence lifetime can be inferred to be tilde 1 ns at 4K. We carried out frequency-resolved measurements of electron spin coherence lifetime from the measured EIT spectral linewidth. An asymmetry in the resonance lineshape was observed. All results will be critical for understanding the physical properties of (110) QW waveguide and implementation of optical delay lines for signal processing.

DTIC

Quantum Wells; Semiconductors (Materials); Waveguides

20080036612 Naval Research Lab., Bay Saint Louis, MS USA

Multi-Sensor Improved Sea Surface Temperature (MISST) for GODAE

Gentemann, Chelle L; Wick, Gary A; Cummings, James; Bayler, Eric; Jan 2004; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A482103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Multi-sensor Improved Sea Surface Temperatures (MISST) for the Global Ocean Data Assimilation Experiment (GODAE) project intends to produce an improved, high-resolution, global, near-real-time (NRT), sea surface temperature analysis through the combination of satellite observations from complementary infrared (IR) and microwave (MW) sensors and to then demonstrate the impact of these improved sea surface temperatures (SSTs) on operational ocean models, numerical weather prediction, and tropical cyclone intensity forecasting. SST is one of the most important variables related to the global

ocean-atmosphere system. It is a key indicator for climate change and is widely applied to studies of upper ocean processes, to air-sea heat exchange, and as a boundary condition for numerical weather prediction. The importance of SST to accurate weather forecasting of both severe events and daily weather has been increasingly recognized over the past several years. Despite the importance and wide usage of operational SST analyses, significant weaknesses remain in the existing operational products. The improved sensors on the Terra, Aqua, and EnviSAT-1 satellites, in conjunction with previously existing sensors on several other US Navy, NASA, and NOAA satellites, provide the opportunity for notable advances in SST measurement. In addition to more frequent coverage for increased temporal resolution, these sensors permit the combination of highly complementary IR and MW retrievals. While clouds, aerosols, and atmospheric water vapor affect IR retrievals, these phenomena have little impact on MW retrievals. Characteristically, IR SST provides high spatial resolution (~1 km at nadir) but poorer coverage with the presence of clouds.

DTIC

Forecasting; Multisensor Applications; Sea Surface Temperature; Sea Water; Surface Temperature

20080036693 Aerospace Corp., El Segundo, CA USA

Thermal Conductivity and Speed of Sound Measurements of Liquid Hydrazine (N₂H₄) at 293.15K and 0.101 MPa to 2.068 MPa

DeSain, John D; Brady, Brian B; Apr 25, 2008; 23 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8802-04-C-0001

Report No.(s): AD-A482266; TR-2008(8565)-5; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The thermal conductivity of liquid hydrazine was measured by the steady-state hot-wire method at 293.15K and 0.101 MPa. Eight pure organic liquids were used as reference liquids to calibrate the experimental apparatus. The current measurement is in agreement with one recent measurement. However, the current measurement disagrees with the most recent measurement, as well as several previous measurements and estimation methods. The thermal conductivity was determined to change very little over the pressure range of 0.101-2.068 MPa. The current observed pressure dependence is in agreement with one previous pressure dependence measurement. The speed of sound in liquid hydrazine was measured to be 2092 ± 12 m s⁻¹, in agreement with previous measurements. There are large inaccuracies obtained when estimating the thermal conductivity of hydrazine by using standard estimation methods that utilize speed of sound data.

DTIC

Acoustic Measurement; Acoustic Velocity; Hydrazines; Thermal Conductivity; Velocity

81

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20080036051 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Soesterberg, Netherlands

Job Oriented Training: Foundation and Empirical Support

vanderHulst, A. H.; Muller, T. J.; July 2008; 28 pp.; In Dutch

Contract(s)/Grant(s): V406; TNO Proj. 032.13117

Report No.(s): TD2008-0076; TNO-DV-2008-A194; Copyright; Avail.: Other Sources

A long needed educational paradigm shift is steadily finding its way in the Dutch military organization, namely that of Job Oriented Training (Stehouwer 2005, 2006). When training the JOT way, from day one, military students are confronted with increasingly complex real 'job' challenges to be solved in virtual environments. Along that road, we don't take prisoners; mistake means virtual death. Neither do we supply theory in advance, theoretical insights are acquired while solving realistic issues. Frequent and thorough reflecting makes the insights stick. In this report, we will explain the underlying educational theory, its basic principles and the empirical evidence supporting those principles. In addition we describe the lessons learned of the application of JOT within 7 different military curricula.

Author

Education; Occupation; Training Simulators

DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer program documentation see *61 Computer Programming and Software*.

20080034858 Bureau of Justice Statistics, Washington, DC, USA

Improving Criminal History Records in Indian Country, 2004-2006

Perry, S. W.; Jul. 2007; 4 pp.; In English

Report No.(s): PB2008-101799; NCJ-218913; No Copyright; Avail.: CASI: [A01](#), Hardcopy

Between FY 2004 and 2006, the Bureau of Justice Statistics (BJS) made 17 awards totaling nearly \$2.8 million to tribal justice agencies through the Tribal Criminal History Records Improvement Program (T-CHRIP). The main goal of the program is to improve the completeness, quality, and accessibility of tribal criminal history records. Federally recognized tribes located in New Mexico and Arizona received more than half of the T-CHRIP funds awarded.

NTIS

Quality Control; Records Management; Crime

20080034865 Northeastern Research Station, Newtown Square, PA, USA

Proceedings of the Northeastern Recreation Research Symposium, 2006. Held in Bolton Landing, New York on April 9-11, 2006

Burns, R.; Robinson, K.; Dec. 2006; 624 pp.; In English; Northeastern Recreation Research Symposium, 2006., April 9 - 11, 2006, Bolton Landing, New York

Report No.(s): PB2008-102364; FSGTR-NRS-P-14; No Copyright; Avail.: CASI: [A99](#), Hardcopy

Sport tourism events are used by destinations to enhance their image. The components of an events brand image, however, have not been well studied. Keller (1993) suggested that brand image consists of brand associations featuring attributes, benefits, and attitudes toward the product. Understanding these brand associations will help determine those elements that constitute a sport tourism events image. This study aimed to measure a sport tourism events brand image associations from the participants perspective. The sport tourism event utilized in this research was an annual bicycling event in the state of Michigan. To explore the brand image associations bicyclists have about sport tourism events, two focus groups were used. The results revealed the image of a sport tourism event consists of mental imageries related to organization, environment, physical activity, socialization, fulfillment and emotions. Implications for both event and destination marketers are discussed.

NTIS

Conferences; Recreation; Tourism

20080035115 Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, The Hague, Netherlands

Geospatial Intelligence and New Areas of Operation

Dekker, R. J.; vandenBroek, A. C.; Smith, A. J. E.; November 2007; 74 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): TNO Proj. 015.35417

Report No.(s): TNO-DV 2007 B479; TD2007-0210; Copyright; Avail.: Other Sources

Within the framework of the research programme Validated Intelligence (V513) the improvement of Geospatial Intelligence (GEOINT) and the application in new areas of operation were studied. The following subjects were investigated: (1) integration of GEOINT and open source information, (2) monitoring and security of critical infrastructures, (3) extraction of road networks from satellite imagery, (4) monitoring of activities in urban areas, (5) monitoring of geospatial features and activities in tropical forest, and (6) information products of the coastal zone and hinterland for amphibious operations. Case studies have shown that GEOINT can be improved by combining information from different sources including satellite images and open source intelligence. In these studies different information extraction techniques are applied.

Author

Geographic Information Systems; Remote Sensing; Satellite Imagery

20080035188 National Defense Univ., Washington, DC USA

Intelligence and Technology. Joint Force Quarterly, Issue 46, 3rd Quarter 2007

Gurney, David H; Jan 2007; 145 pp.; In English

Report No.(s): AD-A480991; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA480991>

Partial contents: JFQ DIALOGUE -- Joint Doctrine Update; Strategic Communication and National Security, by James

G. Stavridis; 'Deconfusing' Lethal and Kinetic Terms, by Karl E. Wingenbach and Donald G. Lisenbee, Jr.; FORUM -- Executive Summary of this issue; Law Enforcement Technology, Intelligence, and the War on Terror, by M. E. Bowman; Technology, Intelligence, and Trust, by James R. Howcroft; Eyes on Target: Intelligence Support to an Effects-based Approach, by James B. Ellsworth; Applying Law Enforcement Technology to Counterinsurgency Operations, by Giles Kyser, Matt Keegan, and Samuel A. Musa; China's ASAT Test: Motivations and Implications, by Phillip C. Saunders and Charles D. Lutes. SPECIAL FEATURE -- An Interview with James E. 'Hoss' Cartwright; Global and Theater Operations Integration, by Robert J. Elder, Jr.; Joint Functional Command for Intelligence, Surveillance, and Reconnaissance, by James L. Denton; Warfighting in Cyberspace, by Keith B. Alexander; Space Operations, by William L. Shelton; Integrated Missile Defense, by Kevin T. Campbell; A New Era in Combating WMD, by James A. Tegnalia; Guarding Cyberspace: Global Network Operations, by Charles E. Croom, Jr.; Contesting the Information Battlespace, by John C. Koziol; The Global Innovation and Strategy Center, by Kevin Williams. COMMENTARY -- The George C. Marshall European Center: Proven Model or Irrelevant Prototype? by Timothy C. Shea; American Military Culture and Strategy, by Phillip S. Meilinger; On the Nature of Strategic Communications, by Carnes Lord. FEATURES -- Effects-based Operations and the Problem of Causality: Simple and Complex, by Zoltan Jobbagy; Military Officer Attitudes toward UAV Adoption: Exploring Institutional Impediments to Innovation, by James R. FitzSimonds and Thomas G. Mahnken; Shaping the Nuclear Landscape, by Paul I. Bernstein, et al.; A JTF Training Dilemma: Component Rigor versus Joint Realism, by Thomas E. Ward II.

DTIC

Intelligence; Law (Jurisprudence); Military Operations; Warfare

20080035209 General Accounting Office, Washington, DC USA

Federal Real Property: Corps of Engineers Needs to Improve the Reliability of Its Real Property Disposal Data

May 2008; 39 pp.; In English

Report No.(s): AD-A481046; GAO-08-349; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481046>

Unreliable real property data has been a long-standing problem for federal landholding agencies. Under the President's real property initiative, agencies are being held accountable for, among other things, improving accuracy of their real property inventory and disposing of unneeded property. The U.S. Army Corps of Engineers (Corps), the fourth largest landholding agency, uses the Real Estate Management Information System (REMIS) for recording its civil works inventory. GAO was asked to determine whether REMIS could provide reliable information on the Corps' civil works land disposals from fiscal years 1996 through 2006. GAO's work involved comparison analyses of REMIS disposal data and other Corps reported disposal data, reviews of Corps' real property policies and guidance, and interviews with Corps officials at headquarters, three divisions, four districts, and the Real Estate Systems National Center (RESNC), which manages REMIS.

DTIC

Engineers; Information Systems; Reliability

20080035278 MAK Technologies, Inc., Cambridge, MA USA

GIS Enabled Modeling and Simulation (GEMS)

Stanzione, Thomas; Johnson, Kevin; Jun 2007; 40 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W9132V-06-C-0018

Report No.(s): AD-A481213; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481213>

Current C4ISR and simulation systems use different tools and formats for generating and storing geospatial information. C4ISR systems tend to use geographic information systems 'GIS', such as C/JMTK, for this information, while simulation systems use proprietary terrain database formats that are generated from a number of different terrain database generation tools. This leads to problems sharing geospatial information between systems, making mission planning or embedded training difficult, as well as problems maintaining geospatial information as it is updated. A common geospatial database that can be generated with a single set of tools and shared across applications would eliminate these problems and allow higher integration of diverse military systems. Under a contract with the US Army Topographic Engineering Center, M K Technologies, along with ESRI, is developing a prototype framework for accessing geospatial data from federated geospatial databases directly into M&S applications, utilizing the ESRI ArcGIS family of products. This paper will discuss our work to date and future plans.

DTIC

Command and Control; Computers; Information Systems; Simulation; Topography

20080035322 Military Academy, West Point, NY USA

A Methodology for Simulating Net-Centric Technologies: An Operations Research Approach

Lospinoso, Joshua; Jun 2007; 21 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481226; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Captured enemy documents, also known as 'CED', are vitally important to today's Army. With the capability to fill vital intelligence requirements, CED help Army units accomplish their missions and corroborate enemy prisoner of war interrogations. The language instant screening tool 'LIST' technology being produced at the USA Military Academy provides a net-centric solution to expedite Army doctrine as outlined in FM 34-52. When modeling CED reporting procedures from FM 34-52, this study finds that LIST technologies could facilitate a net-centric enabled intelligence and information structure that is able to reduce dissemination times to a level that were previously unobtainable. The intent of this paper is to provide a methodology whereby further operations research may be conducted to support a net-centric tool suite that will ultimately benefit today's Army.

DTIC

Operations Research; Semantics; Simulation

20080035349 Naval Postgraduate School, Monterey, CA USA

Hypothesis Testing of Edge Organizations: Laboratory Experimentation Using the ELICIT Multiplayer Intelligence Game

Leweling, Tara A; Nissen, Mark E; Jun 2007; 54 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481271; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Edge is a relative newcomer to organizational design--one that appears especially appropriate for contemporary military operations, but also raises issues regarding comparative performance of the Edge to alternate organizational designs, including more traditional hierarchical configurations. These issues suggest that laboratory experimentation, with coherently structured controls and manipulations and an appropriate data collection strategy, can offer substantive insights about the internal workings of the Edge organization with high levels of reliability and internal validity. Building upon prior command and control (C2) research, we report the preliminary results of our extension of our campaign of computational experimentation to series of laboratory experiments using the ELICIT multiplayer intelligence game. Our experiments confirm the results of earlier and companion computational experimentation - chiefly, that Edge organizations outperform Hierarchy organizations in certain task and environmental contexts, and in terms of certain performance measures. Our experiments also serve to inform future computational experimentation through noting: 1) Edge and Hierarchy organizations learn at the same rate, but with higher volatility within Edge configurations; 2) transforming from Hierarchy to Edge configurations results in either similar or improved performance on subsequent tasks; and 3) transforming from Edge to Hierarchy organizations results in degraded performance initially, with subsequent recovery to previous levels.

DTIC

Hypotheses; Information Management; Intelligence; Organizations

20080035360 Military Academy, West Point, NY USA

Knowledge Sharing Mechanism: Enabling C2 to Adapt to Changing Environments

Harvie, David P; Jun 2007; 57 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481307; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The environments of software engineering and command and control (C2) are very similar because they are both instances of complex problem solving. The common nemesis to successfully developing solutions in these environments is change. The challenge of any complex problem solving process is the balance of adapting to multiple changes while keeping focused on the overall desired solution. The Knowledge Sharing Mechanism (KSM) is proposed as framework to achieve this balance. The KSM is an iterative method for understanding a complex problem, developing a framework for solving that problem, developing partial solutions for the problem, and then reassessing those partial solutions and overall framework until the complete solution has been fully developed. The KSM is based on the integration of Christopher Alexander's unfolding and differentiation processes with the image theory of C2. In image theory, there are two perspectives in developing a solution: topsight and insight. These two perspectives must be balanced in order to achieve success. Alexander's unfolding process is the basis for understanding, as an observer, the complex interactions in both software engineering and C2. The KSM uses Alexander's differentiation process, as an actor, achieving the correct balance of topsight and insight.

DTIC

Information Management; Knowledge Based Systems

20080035363 Army Construction Engineering Research Lab., Champaign, IL USA

Classifying Infrastructure in an Urban Battlespace Using Thermal IR Signatures

McInerney, Michael; Trovillion, Jonathan; Abdallah, Tarek; Majumdar, Arjun; Lozar, Robert; Nov 1, 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481325; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this study was to determine whether hyperspectral (thermal/IR) data could be used to characterize infrastructure in the urban battlespace. The Future Force needs to dominate the urban battlespace to the same degree that the current force dominates open terrain. This can be accomplished by enabling greater Urban Battlespace Environment (U-BE) awareness through the decision phases of USECT (Understand, Shape, Engage, Consolidate, Transition). The Future Force needs tools that use automated prediction, pattern recognition, and reasoning decision support to understand the battlespace environment in a collaborative network-centric environment. Infrastructure classification using hyperspectral IR data from remote sensors will help fill this need.

DTIC

Cities; Data Acquisition; Infrared Signatures; Remote Sensors

20080035495 National Inst. of Standards and Technology, Gaithersburg, MD USA

General Buildings Information Handover Guide: Principles, Methodology and Case Studies. An Industry Sector Guide of the Information Handover Guide Series

Fallon, K. K.; Palmer, M. E.; Aug. 2007; 99 pp.; In English

Report No.(s): PB2008-101856; NISTIR-7417; No Copyright; Avail.: National Technical Information Service (NTIS)

The purpose of this guide is to assist users and developers of building information and information systems in the general buildings industry in making good use of advanced technology and avoiding the pitfalls, particularly those encountered in information handovers between parties. To this end, the guide discusses the general buildings industrys need for such assistance, offers background information on the industrys traditional and emerging business processes, provides a primer on the technology concepts and terminology and presents six case studies of the use of advanced design and construction technologies and the attendant information handovers. The guide then elucidates a methodology, developed in its companion publication, the Capital Facilities Information Handover Guide (CFIHG) Part 1, for achieving successful and cost-effective information handovers in a heterogeneous environment. It suggests a hybrid approach combining data exchanges in proprietary and standard formats to meet the different requirements of enterprises. The final section offers analysis of the state of the technology and recommendations for the next steps.

NTIS

Buildings; Industries; Information Systems

20080035497 Defence Research and Development Canada, Dartmouth, Nova Scotia Canada

SeaSpider: Automated Information Gathering on Vessel Movements in Support of Maritime Domain Awareness

Tatar, Serhan; Chapman, David M; Dec 2007; 44 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481033; DRDC-A-TM-2007-294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481033>

SeaSpider is an R&D tool to investigate the development of a software agent that would aid an operator in gathering information about marine vessels from public sources on the internet. This information would supplement sensor information used for Intelligence, Surveillance, and Reconnaissance (ISR) to enhance Maritime Domain Awareness (MDA) and to complete the Recognized Maritime Picture (RMP). Specifically, SeaSpider is fine tuned to search for, organize, and display information about locations (ports), dates and times, and activities (arrival, in berth, departure). One module manages the Google searches and retrieves the html pages; another module extracts relevant ship movement information and populates a database; a third module retrieves information from the database in response to user generated queries. In this memorandum, the SeaSpider concept is introduced, the design details of the prototype are presented, and performance is analysed, with a view to future enhancements.

DTIC

Data Processing; Industries; Internets

20080036029 Shumaker and Sieffert, P.A., Saint Paul, MN, USA

Consumer Information Kiosk

Palmquist, R. D., Inventor; 7 Sep 05; 9 pp.; In English

Contract(s)/Grant(s): N00014-02-C-01222

Patent Info.: Filed 7 Sep 05; US-Patent-Appl-SN-11-221 402
Report No.(s): PB2008-100690; No Copyright; Avail.: CASI: A02, Hardcopy

The invention is directed to a kiosk for a retail establishment or other similar environment where customers may seek information. The customer can input a product identification or product description to the kiosk, e.g., by speaking to the kiosk or typing the product identification or description at the kiosk. The kiosk parses the user's input to identify a store location associated with the product. The kiosk outputs the location to the user, e.g., in the form of verbal or printed directions to a location of the product, or a printed map of the store with a conspicuous identification of the location associated with the product. The user can use the output of the kiosk to quickly locate the product of interest. In other embodiments, the kiosk may receive verbal requests from a user and respond accordingly.

NTIS

Consumers; Patent Applications

20080036268 Army Engineer Research and Development Center, Vicksburg, MS USA

Watershed Similarity Analysis for Military Applications Using Supervised-Unsupervised Artificial Neural Networks

Hsieh, B B; Jourdan, M R; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481523; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481523>

Incorporation of Geographic Information Systems (GIS) into Unsupervised-Supervised Artificial Neural Networks (ANNs) was applied to quantify the similarity of watershed characteristics. The goal of this approach is to find the best match watershed from a large knowledge base of over one thousand quantifying watersheds and to determine the reliability of transplant watershed information during the clustering and classification stages. The prediction stage of the study compares the hydrographs between this unknown watershed and the best-selected watershed to verify the similarity performance. Three examples demonstrate use of random selection, average size, and median size watersheds to test the reliability of developing procedures. It is shown that the basin area ratio provides a reasonable conversion factor for adjusting the magnitude of the predictive hydrograph. While the monthly hydrographs comparison receives very satisfactory agreement, the daily hydrographs comparison also obtains reasonable results when a high degree of similarity is found in the knowledge base.

DTIC

Analogs; Hydrography; Information Systems; Military Technology; Neural Nets; Watersheds

20080036315 Cornell Lab. of Ornithology, Ithaca, NY USA

An Annotated and Federated Digital Library of Marine Animal Sounds

Bradbury, Jack W; Clark, Christopher; Mellinger, David K; Moore, Sue E; Jan 2006; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0663; N00014-02-1-0467

Report No.(s): AD-A481605; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481605>

One specific objective of this project is to design software that will permit remote experts to annotate the content of long recordings archived at the Macaulay Library through their web browsers. Annotations will permit subsequent searches of the archive database to retrieve not only suitable recordings, but also those parts of a recording meeting the search criteria. A second main objective is to define and extract a set of acoustic features from all archived marine recordings that can be used in subsequent search and retrieval tasks. A third task is to refine the geographical location data for each recording in preparation for collaborative linking with OBIS-SEAMAP. The combined capabilities will be unique to this sound collection, and will greatly enhance the accessibility and the utility of the archive to scientists, students, educators, military personnel, the media, and the general public.

DTIC

Animals; Annotations; Information Retrieval; Libraries; Marine Biology; Underwater Acoustics

20080036332 North Carolina Agricultural and Technical State Univ., Greensboro, NC USA

Adaptive Information Fusion in Asymmetric Sensemaking Environment

Munya, Paul; Ntuen, Celestine; Jun 2007; 45 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W911NF-04-2-0052

Report No.(s): AD-A481629; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481629>

The existing sensemaking models for traditional force-on-force battlefield information management rarely survive the

kinds of information in asymmetric battlespace environments. By combining the abduction process and Bayesian probability network formalisms, we propose a Bayesian Abduction Models (BAM) to support in the sensemaking process of evaluating multiple hypotheses in the context of changing information. This paper describes a Bayesian network that captures abduction logic primitives from a kernel of disparate information sources. We use a genetic learning algorithm to solve BAM information fusion problems. We show how the model can be used in prospective and retrospective sensemaking conditions to simulate the ways commanders and the battle staffs process information.

DTIC

Asymmetry

20080036333 Army Combined Arms Center, Fort Leavenworth, KS USA

Clausewitz's Theory of War and Information Operations

Darley, William M; Jan 2006; 8 pp.; In English

Report No.(s): AD-A481639; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481639>

The debate over information operations (IO) grows more confused because IO continues to be wrongly understood in its relationship to the so-called kinetic elements of military operations. Contrary to entrenched perceptions, IO is not merely a family of related skill sets or capabilities that in all cases augment 'kinetic operations.' Collectively, they are properly understood as a specific purpose and emphasis within an overall plan of action that under some circumstances might be the main effort. The most essential factor for employing IO is therefore the commander's intent with regard to the political objective of a given operation. Viewing IO in any other way precludes recognition of the relationship the 'IO purpose' inherently has with other activities of war within the universe of political conflict, and consequently distorts thinking with regard to full incorporation and appropriate employment of all tools that might generate a desired information effect. Thus, operational planning that regards IO as mere augmentation to operations by application of five narrowly defined 'pillars,' currently revised and identified as operations security, psychological operations (PSYOP), deception, computer network operations, and electronic warfare, is fatally flawed. Information operations, unlike other battlefield effects, focus on influencing perceptions or attitudes as opposed to destroying things or seizing terrain. Part of the difficulty in distinguishing information operations from kinetic operations has resulted from a failure to understand IO within any kind of general theory on the relationship of the dynamics of war. Application of a theory is thus essential to highlight the distinguishing qualities of IO and their relationship to kinetic operations. This article examines IO in the context of Clausewitzian theory and proposes a model that shows the role of IO across the spectrum of conflict.

DTIC

Military Operations; Warfare

20080036367 DSO National Labs., Singapore, Singapore

Systematic Data Farming - An Application to a Military Scenario

Seng, Choo C; Chong, Ng E; Kiat, Ang C; Lian, Chua C; Nov 2006; 9 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481695; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481695>

This paper highlights the challenges of conducting simulation based experiments and describes how we seek to overcome these challenges through our implementation of a meta-technique known as Systematic Data Farming (SDF). We also describe its application on a military (Army) scenario to illustrate how the SDF capability can be used from the design phase, to the conduct phase and to the analysis phase. Through this application, we demonstrated the importance and value that the SDF capability can bring to simulation experiments. The paper will provide a detailed description of the process as well as the findings from the military scenario.

DTIC

Information Retrieval; Simulation

20080036457 General Accounting Office, Washington, DC USA

Department of Defense Pilot Authority for Acquiring Information Technology Services Under OMB Circular A-76

May 29, 2008; 8 pp.; In English

Report No.(s): AD-A481875; GAO-08-753R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: <http://hdl.handle.net/100.2/ADA481875>

Section 336 of the National Defense Authorization Act for Fiscal Year 2004, Pub L. No 108-136, authorized the

Department of Defense (DOD) to conduct a pilot program to use best value source selection criteria in public-private competitions for information technology (IT) services under Office of Management and Budget (OMB) Circular A-76. This authority is scheduled to expire on September 30, 2008. Section 336 also directed us to review the pilot program to determine whether it is effective and equitable. Officials from DOD's Office of Housing and Competitive Sourcing, which has overall responsibility for addressing A-76 issues within DOD, told us that the section 336 pilot authority has not been used. Consequently, there is no basis for us to judge the effectiveness or equity of the program. Our objectives, therefore, were to determine (1) the reasons why the section 336 authority has not been used, and (2) given the scheduled expiration of the authority, whether DOD officials believe the authority should be extended.

DTIC

Competition; Costs; Defense Program; Information Systems

20080036578 Library of Congress, Washington, DC USA

Improvised Explosive Devices: Booklet of Related Readings 25

MacLean, French; May 20, 2008; 61 pp.; In English

Report No.(s): AD-A481998; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This booklet represents the 25th in a series of compilations of print and electronic articles that are relevant to the defeat of improvised explosive devices (IEDs) that insurgent and terrorist operatives use to kill and injure U.S. military forces and civilian populations. The section contains abstracts of the articles included in the booklet in alphabetical order. The articles are as follows: 'Acquiring Women's Rights in Saudi Arabia: Between Gradualism and Haste,' by Raghida Dergham (Al-Hayat); 'Al-Ashaikh Urges Imams to Tackle Terror, Extremism' (Arab News); 'Centre Points at 'Neighbouring' Country for Jaipur Blasts (The Hindu); 'Gamers Teach Search Engines How to See,' by Colin Barras (New Scientist); 'Highlighting al-Qaeda's Bankrupt Ideology,' by Matthew Levitt, Michael Jacobson (The Washington Institute for Near East Policy); 'India braces for surge in terror,' by Sudha Ramachandran (Asia Times); 'Israel Startup Uses Behavioral Science to Identify Terrorists,' by Guy Grimland (Haaretz.com); 'Jaipur Blasts: Woman Suicide Bomber Suspected' (The Times of India); 'Flies' Eyes Could Enhance Robot Vision' (Physorg.com); 'Kafir Dreams,' by Jamie Glazov (FrontPageMag.com); 'My Daughter, the Terrorist,' by Tarjei Kidd Olsen (Asia Times); 'New Material May Be Step Towards 3D Invisibility Cloak,' by Jeff Hecht (New Scientist); 'Sharp Rise in Suicide Attacks by Women in Iraq Likely: US Expert,' by Karin Zeitvogel (Yahoo! News); 'SPARK Programs Robots with Insect Perception' (Gizmag); 'Strategy of Somalia's Islamists Survives Death of Militant Leader' (The Jamestown Foundation); 'Terror 'Wannabes' Canada's Biggest Threat,' by Colin Freeze (Globe and Mail); 'Those Who Go to Fight in Iraq 'Are Preachers of Evil',' by Mariam Al Hakeem (Gulf News); 'US Trains Pakistani Killing Machine,' by Syed Saleem Shahzad (Asia Times); 'World: RFE/RL Study Explores How Al-Qaeda Exploits Internet' (Radio Free Europe/Radio Liberty).

DTIC

Explosive Devices; Explosives; Terrorism

20080036581 Library of Congress, Washington, DC USA

Fusion Centers: Issues and Options for Congress

Rollins, John; Jan 18, 2008; 100 pp.; In English

Report No.(s): AD-A482006; CRS-RL34070; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Fusion centers are state-created entities largely financed and staffed by the states, and there is no one 'model' for how a center should be structured. State and local law enforcement and criminal intelligence seem to be at the core of many of the centers. Although many of the centers initially had purely counterterrorism goals, for numerous reasons, they have increasingly gravitated toward an all-crimes and even broader all-hazards approach. While many of the centers have prevention of attacks as a high priority, little 'true fusion,' or analysis of disparate data sources, identification of intelligence gaps, and pro-active collection of intelligence against those gaps which could contribute to prevention is occurring. Some centers are collocated with local offices of federal entities, yet in the absence of a functioning intelligence cycle process, collocation alone does not constitute fusion. The federal role in supporting fusion centers consists largely of providing financial assistance, the majority of which has flowed through the Homeland Security Grant Program; sponsoring security clearances; providing human resources; producing some fusion center guidance and training; and providing congressional authorization and appropriation of national foreign intelligence program resources, as well as oversight hearings. This report includes over 30 options for congressional consideration to clarify and potentially enhance the federal government's relationship with fusion centers. One of the central options is the potential drafting of a formal national fusion center strategy that would outline, among other elements, the federal government's clear expectations of fusion centers, its position on

sustainment funding, metrics for assessing fusion center performance, and definition of what constitutes a 'mature' fusion center. This report will be updated.

DTIC

Intelligence; Law (Jurisprudence); Security

20080036601 Georgia Inst. for Research, Atlanta, GA USA

Lethality and Autonomous Systems: The Robotist Demographic

Moshkina, Lilia V; Arkin, Ronald C; Jan 2008; 10 pp.; In English

Contract(s)/Grant(s): W911NF-06-1-0252

Report No.(s): AD-A482066; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper reports the methods and results of an on-line survey addressing the issues surrounding lethality and autonomous systems that was conducted as part of a research project for the U.S. Army Research Office. The robotics researcher demographic, one of several targeted in this survey that includes policy makers, the military, and the general public, provides the data for this report. The design and administration of this survey and an analysis and discussion of the survey results are provided.

DTIC

Autonomy; Lethality; Robotics; Surveys

20080036616 Desert Research Inst., Reno, NV USA

Alternative Future Scenarios: Development of a Modeling Information System

Cablk, Mary E; Langford, William; Panorska, Anna; Apr 22, 2003; 77 pp.; In English

Contract(s)/Grant(s): DACA72-01-P-0045

Report No.(s): AD-A482110; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Military installations face challenges that may impact mission readiness and daily operations. Of these challenges, civilian urban development on lands adjacent to installations is among the most pressing, primarily due to the number and variety of unintended consequences associated with urban expansion. The consequences include safety risks; noise; impacts to plants, animals, and cultural resources; dust emissions and other air and water pollution; and installation specific issues. The Department of Defense (DoD) has investigated the use of alternative future scenario modeling (AFSM) to predict and remediate potential impacts of civilian development on military bases. The application of AFSM to military installations throughout the US has produced many predictions, or futures, that suggest how landscapes that surround selected installations may change during the next few decades. While the success of AFSM in increasing DoD's understanding of the vulnerabilities associated with regional land use changes is well documented (Cablk, et al, 1999; Gonzalez et al., 2000; Gunter et al., 2000; Steinitz et al., 1996), transfer of the AFSM process to the military has yet to occur. This is primarily due to the complexity of this process, which requires expertise in remote sensing, demography, geographic information systems (GIS), computer programming, and statistics.

DTIC

Information Systems; Land Use

20080036638 Joint Chiefs of Staff, Washington, DC USA

Tsunami! Information Sharing in the Wake of Destruction

Dorsett, David J; Jan 2005; 8 pp.; In English

Report No.(s): AD-A482159; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On December 26, 2004, an earthquake of 9.0 magnitude jolted the Banda Aceh region on Indonesia's Sumatra Island. The quake generated a tsunami that exploded across the Indian Ocean at 500 miles per hour. The tidal surge brought death and destruction to Banda Aceh and India's Nicobar Islands 16 minutes after the quake. Within 90 minutes, the tsunami engulfed Sri Lanka's coastal areas, and within 7 hours its waves crashed into the far shores of Somalia. The ensuing catastrophe seized the attention of the world. Over 295,000 people died and 5 million were left homeless. U.S. Pacific Command (PACOM) rapidly responded to this humanitarian disaster by initiating Operation Unified Assistance. The command deployed 25 ships, 45 fixed-wing aircraft, 57 helicopters, and 16,000 personnel to assist stricken countries. This force delivered over 16 million pounds of supplies and flew helicopter operations totaling over 4,000 hours. Within days, it became apparent that a traditional military command structure was not optimal for this nontraditional mission. The ensuing operation involved over 90 nongovernmental organizations (NGOs) and military forces from 18 nations. The PACOM mission during Unified Assistance was to support the U.S. Agency for International Development (USAID) Office of Foreign Disaster Assistance, other national

forces, and international organizations in providing disaster relief to the governments of Indonesia, Sri Lanka, Thailand, and other affected nations to minimize loss of life and human suffering. This article examines the need to embed national agency representatives within theater intelligence commands to facilitate passing of timely and accurate information from the agencies to the operating forces. Although it focuses on information-sharing, which was critical to the overall operation, the article presents a successful model of transforming U.S. forces to become more agile, adaptable, and responsive to emerging crises.
DTIC

Destruction; Disasters; Military Operations; Tsunami Waves; Wakes

20080036669 Cornell Lab. of Ornithology, Ithaca, NY USA

An Annotated and Federal Digital Library of Marine Animal Sounds

Bradbury, Jack W; Clark, Christopher; Fristrup, Kurt; Mellinger, David K; Moore, Sue E; Jan 2005; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-04-1-0663

Report No.(s): AD-A482206; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Macaulay Library is the world's largest archive of animal sounds and has been selected by the Office of Naval Research as a major repository for the deposition, digital archival, review, and retrieval of the many recordings of marine animals made over the last half-century. Archived marine recordings pose challenging retrieval problems given the typically long intervals of silence between animal sounds and the multiplicity of species detectable in any given recording. One goal of this project is to design software that will permit remote experts to annotate the content of long recordings archived at the Macaulay Library through their web browsers. Annotations will permit subsequent searches of the archive database to retrieve not only suitable recordings, but also those parts of a recording meeting the search criteria. The project also seeks to define and extract a set of acoustic features from all archived marine recordings that can be used in subsequent search and retrieval tasks. Both capabilities will be unique to this sound collection, and will greatly enhance the accessibility and the utility of the archive to scientists, students, educators, military personnel, and the media.

DTIC

Annotations; Computer Programs; Data Bases; Information Retrieval; Libraries; Marine Biology

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SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20080036072 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Predicting the Earth encounters of (99942) Apophis

Giorgini, Jon D.; Benner, Lance A. M.; Ostro, Steven J.; Nolan, Michael C.; Busch, Michael W.; Icarus; September 5, 2007; Volume 193, Issue 1, pp. 1-19; In English; Original contains color and black and white illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40936>; <http://dx.doi.org/10.1016/j.icarus.2007.09.012>

Arecibo delay-Doppler measurements of (99942) Apophis in 2005 and 2006 resulted in a five standard-deviation trajectory correction to the optically predicted close approach distance to Earth in 2029. The radar measurements reduced the volume of the statistical uncertainty region entering the encounter to 7.3% of the pre-radar solution, but increased the trajectory uncertainty growth rate across the encounter by 800% due to the closer predicted approach to the Earth. A small estimated Earth impact probability remained for 2036. With standard-deviation plane-of-sky position uncertainties for 2007-2010 already less than 0.2 arcsec, the best near-term ground-based optical astrometry can only weakly affect the trajectory estimate. While the potential for impact in 2036 will likely be excluded in 2013 (if not 2011) using ground-based optical measurements, approximations within the Standard Dynamical Model (SDM) used to estimate and predict the trajectory from the current era are sufficient to obscure the difference between a predicted impact and a miss in 2036 by altering the dynamics leading into the 2029 encounter. Normal impact probability assessments based on the SDM become problematic without knowledge of the object's physical properties; impact could be excluded while the actual dynamics still permit it. Calibrated position uncertainty intervals are developed to compensate for this by characterizing the minimum and maximum effect of physical parameters on the trajectory. Uncertainty in accelerations related to solar radiation can cause between 82 and 4720 Earth-radii of trajectory change relative to the SDM by 2036. If an actionable hazard exists, alteration by 2-10% of Apophis' total absorption of solar radiation in 2018 could be sufficient to produce a six standard-deviation

trajectory change by 2036 given physical characterization; even a 0.5% change could produce a trajectory shift of one Earth-radius by 2036 for all possible spin-poles and likely masses. Planetary ephemeris uncertainties are the next greatest source of systematic error, causing up to 23 Earth-radii of uncertainty. The SDM Earth point-mass assumption introduces an additional 2.9 Earth-radii of prediction error by 2036. Unmodeled asteroid perturbations produce as much as 2.3 Earth-radii of error. We find no future small-body encounters likely to yield an Apophis mass determination prior to 2029. However, asteroid (144898) 2004 VD17, itself having a statistical Earth impact in 2102, will probably encounter Apophis at 6.7 lunar distances in 2034, their uncertainty regions coming as close as 1.6 lunar distances near the center of both SDM probability distributions.

Author

Asteroids; Impact Prediction; Trajectories; Asteroid Collisions; Astrometry

20080036103 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

CAWSES November 7-8, 2004, Superstorm: Complex Solar and Interplanetary Features in the Post-Solar Maximum Phase

Tsurutani, Bruce T.; Echer, Ezequiel; Guarnieri, Fernando L.; Kozyra, J. U.; Geophysical Research Letters; February 2008; Volume 36; 6 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40898>; <http://dx.doi.org/10.1029/2007GL031473>

The complex interplanetary structures during 7 to 8 Nov 2004 are analyzed to identify their properties as well as resultant geomagnetic effects and the solar origins. Three fast forward shocks, three directional discontinuities and two reverse waves were detected and analyzed in detail. The three fast forward shocks ‘pump’ up the interplanetary magnetic field from a value of approx.4 nT to ~44 nT. However, the fields after the shocks were northward, and magnetic storms did not result. The three ram pressure increases were associated with major sudden impulses (SI + s) at Earth. A magnetic cloud followed the third forward shock and the southward Bz associated with the latter was responsible for the superstorm. Two reverse waves were detected, one at the edge and one near the center of the magnetic cloud (MC). It is suspected that these ‘waves’ were once reverse shocks which were becoming evanescent when they propagated into the low plasma beta MC. The second reverse wave caused a decrease in the southward component of the IMF and initiated the storm recovery phase. It is determined that flares located at large longitudinal distances from the subsolar point were the most likely causes of the first two shocks without associated magnetic clouds. It is thus unlikely that the shocks were ‘blast waves’ or that magnetic reconnection eroded away the two associated MCs. This interplanetary/solar event is an example of the extremely complex magnetic storms which can occur in the post-solar maximum phase.

Author

Solar Activity Effects; Magnetic Storms; Interplanetary Magnetic Fields; Evanescence; Plasmas (Physics); Discontinuity; Magnetic Clouds

89

ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20080034758 Government Accountability Office, Washington, DC, USA

Geostationary Operational Environmental Satellites: Progress Has Been Made, but Improvements Are Needed to Effectively Manage Risks

Oct. 2007; 42 pp.; In English

Report No.(s): PB2008-101510; GAO-08-18; No Copyright; Avail.: National Technical Information Service (NTIS)

The Department of Commerce’s National Oceanic and Atmospheric Administration (NOAA), with the aid of the National Aeronautics and Space Administration (NASA), plans to procure the next generation of geostationary operational environmental satellites, called the Geostationary Operational Environmental Satellites-R series (GOES-R). This series is considered critical to the USA’ ability to maintain the continuity of data required for weather forecasting through the year 2028. GAO was asked to (1) assess the status and plans for GOES-R, and (2) evaluate whether NOAA is adequately mitigating key technical and programmatic risks. To do so, GAO analyzed contractor and program data and interviewed officials from NOAA and NASA. NOAA has made progress in planning its GOES-R procurement--which is estimated to cost \$7 billion and scheduled to have the first satellite ready for launch in 2014--but cost and schedules are likely to grow. Specifically, the agency completed preliminary design studies of GOES-R and recently decided to separate the space and ground elements of the

program into two separate development contracts. However, this change in the GOES-R acquisition strategy has delayed a decision to proceed with the acquisition. Further, independent estimates are higher than the program's current cost estimate and convey a low level of confidence in the program's schedule. Independent studies show that the estimated program could cost about \$2 billion more, and the first satellite launch could be delayed by 2 years. As NOAA works to reconcile the independent estimate with its own program office estimate, costs are likely to grow and schedules are likely to be delayed. To address cost, schedule, and technical risks, the GOES-R program has established a risk management program and has taken steps to mitigate selected risks. For example, as of July 2007, the program office identified the lack of an integrated master schedule to be its highest priority risk and established plans to bring this risk to closure. However, more remains to be done to fully address GOES-R risks. Specifically, the program has multiple risk watchlists that are not always consistent and key risks are missing from the watchlists, including risks associated with unfilled executive positions, limitations in NOAA's insight into NASA's deliverables, and insufficient funds for unexpected costs--called management reserves. As a result, the GOES-R program is at risk that problems will not be identified or mitigated in a timely manner and could lead to program cost overruns and schedule delays.

NTIS

Data Acquisition; Forecasting; Geosynchronous Orbits; Risk Management; Synchronous Platforms

20080034879 SGT, Inc., Greenbelt, MD, USA

The Effects of Clumping on Wind Line Variability

Prinja, R. K.; Massa, D.; Fullerton, A. W.; [2008]; 4 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG05GJ54G; Copyright; Avail.: Other Sources

We review the effects of clumping on the profiles of resonance doublets. By allowing the ratio of the doublet oscillator strengths to be a free parameter, we demonstrate that doublet profiles contain more information than is normally utilized. In clumped (or porous) winds, this ratio can lie between unity and the ratio of the f-values, and can change as a function of velocity and time, depending on the fraction of the stellar disk that is covered by material moving at a particular velocity at a given moment. Using these insights, we present the results of SEI modeling of a sample of B supergiants, sigma Pup and a time series for a star whose terminal velocity is low enough to make the components of its Si VI lambda lambda 1400 independent. These results are interpreted within the framework of the Oskinova et al. (2007) model, and demonstrate how the doublet profiles can be used to extract information about wind structure.

Author

Variability; Mathematical Models; Wind (Meteorology); Hot Stars; Active Galactic Nuclei; Stellar Winds

20080034880 University Coll., London, UK

Quantitative Studies of the Optical and UV Spectra of Galactic Early B Supergiants

Searle, S. C.; Prinja, R. K.; Massa, D.; Ryans, R.; *Astronomy and Astrophysics (An International Weekly Journal)*; [2008]; Volume 481, pp. 777-798; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG05GJ54G; Copyright; Avail.: Other Sources
ONLINE: <http://dx.doi.org/10.1051/0004-6361:20077125>

We undertake an optical and ultraviolet spectroscopic analysis of a sample of 20 Galactic B0-B5 supergiants of luminosity classes Ia, Ib, Iab, and II. Fundamental stellar parameters are obtained from optical diagnostics and a critical comparison of the model predictions to observed UV spectral features is made. Methods. Fundamental parameters (e.g., $T(\text{sub eff})$, $\log L(\text{sub } *)$, mass-loss rates and CNO abundances) are derived for individual stars using CMFGEN, a nLTE, line-blanketed model atmosphere code. The impact of these newly derived parameters on the Galactic B supergiant Ten scale, mass discrepancy, and wind-momentum luminosity relation is examined. Results. The B supergiant temperature scale derived here shows a reduction of about 1000-3000 K compared to previous results using unblanketed codes. Mass-loss rate estimates are in good agreement with predicted theoretical values, and all of the 20 B0-B5 supergiants analysed show evidence of CNO processing. A mass discrepancy still exists between spectroscopic and evolutionary masses, with the largest discrepancy occurring at $\log(L/(solar)L)$ approx. 5.4. The observed WLR values calculated for B0-B0.7 supergiants are higher than predicted values, whereas the reverse is true for B1-B5 supergiants. This means that the discrepancy between observed and theoretical values cannot be resolved by adopting clumped (i.e., lower) mass-loss rates as for O stars. The most surprising result is that, although CMFGEN succeeds in reproducing the optical stellar spectrum accurately, it fails to precisely reproduce key UV diagnostics, such as the N v and C IV P Cygni profiles. This problem arises because the models are not ionised enough and fail to reproduce the full extent of the observed absorption trough of the P Cygni profiles. Conclusions. Newly-derived fundamental parameters for early B supergiants are in good agreement with similar work in the field. The most significant discovery, however, is the failure of CMFGEN to predict the correct ionisation fraction for some ions. Such findings add further support to revising the

current standard model of massive star winds, as our understanding of these winds is incomplete without a precise knowledge of the ionisation structure and distribution of clumping in the wind. Key words. techniques: spectroscopic - stars: mass-loss - stars: supergiants - stars: abundances - stars: atmospheres - stars: fundamental parameters

Author

Spectroscopic Analysis; Stellar Spectra; Supergiant Stars; Massive Stars; Abundance; Luminosity; O Stars; B Stars

20080035371 Fermi National Accelerator Lab., Batavia, IL USA

The Sixth Data Release of the Sloan Digital Sky Survey

Adelman-McCarthy, Jennifer K; Agueros, Marcel A; Allam, Sahar S; Prieto, Carlos A; Anderson, Kurt S; Anderson, Scott F; Annis, James; Bahcall, Neta A; Bailer-Jones, C A; Baldry, Ivan K; Apr 2008; 18 pp.; In English; Original contains color illustrations

Report No.(s): AD-A481348; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper describes the Sixth Data Release of the Sloan Digital Sky Survey. With this data release, the imaging of the northern Galactic cap is now complete. The survey contains images and parameters of roughly 287 million objects over 9583 deg², including scans over a large range of Galactic latitudes and longitudes. The survey also includes 1.27 million spectra of stars, galaxies, quasars, and blank sky (for sky subtraction) selected over 7425 deg². This release includes much more stellar spectroscopy than was available in previous data releases and also includes detailed estimates of stellar temperatures, gravities, and metallicities. The results of improved photometric calibration are now available, with uncertainties of roughly 1% in g, r, i, and z, and 2% in u, substantially better than the uncertainties in previous data releases. The spectra in this data release have improved wavelength and flux calibration, especially in the extreme blue and extreme red, leading to the qualitatively better determination of stellar types and radial velocities. The spectrophotometric fluxes are now tied to point-spread function magnitudes of stars rather than fiber magnitudes. This gives more robust results in the presence of seeing variations, but also implies a change in the spectrophotometric scale, which is now brighter by roughly 0.35 mag. Systematic errors in the velocity dispersions of galaxies have been fixed, and the results of two independent codes for determining spectral classifications and redshifts are made available. Additional spectral outputs are made available, including calibrated spectra from individual 15 minute exposures and the sky spectrum subtracted from each exposure. We also quantify a recently recognized underestimation of the brightnesses of galaxies of large angular extent due to poor sky subtraction; the bias can exceed 0.2 mag for galaxies brighter than $r = 14$ mag.

DTIC

Sky Surveys (Astronomy); Spectroscopy; Surveys

20080036073 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Taking the Measure of the Universe : Precision Astrometry with SIM PlanetQuest

Unwin, Stephen C.; Shao, Michael; Tanner, Angelle M.; Allen, Ronald J.; Beichman, Charles A.; Boboltz, David; Catanzarite, Joseph H.; Chaboyer, Brian C.; Ciardi, David R.; Edberg, Stephen J.; Fey, Alan L.; Fischer, Debra A.; Gelino, Christopher R.; Gould, Andrew P.; Grillmair, Carl; Henry, Todd J.; Johnston, Kathryn V.; Johnston, Kenneth J.; Jones, Dayton L.; Kulkarni, Shrinivas R.; Law, Nicholas M.; Majewski, Steven R.; Makarov, Valeri V.; Marcy, Geoffrey W.; Meier, David L., et al.; Publications of the Astronomical Society of the Pacific; January 2008; Volume 120, pp. 38-88; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40906>

Precision astrometry at microarcsecond accuracy has application to a wide range of astrophysical problems. This paper is a study of the science questions that can be addressed using an instrument with flexible scheduling that delivers parallaxes at about 4 microarcsec (microns)as on targets as faint as $V = 20$, and differential accuracy of 0.6 (microns)as on bright targets. The science topics are drawn primarily from the Team Key Projects, selected in 2000, for the Space Interferometry Mission PlanetQuest (SIM PlanetQuest). We use the capabilities of this mission to illustrate the importance of the next level of astrometric precision in modern astrophysics. SIM PlanetQuest is currently in the detailed design phase, having completed in 2005 all of the enabling technologies needed for the flight instrument. It will be the first space-based long baseline Michelson interferometer designed for precision astrometry. SIM will contribute strongly to many astronomical fields including stellar and galactic astrophysics, planetary systems around nearby stars, and the study of quasar and AGN nuclei. Using differential astrometry SIM will search for planets with masses as small as an Earth orbiting in the 'habitable zone' around the nearest stars, and could discover many dozen if Earth-like planets are common. It will characterize the multiple-planet systems that are now known to exist, and it will be able to search for terrestrial planets around all of the candidate target stars in the Terrestrial Planet Finder and Darwin mission lists. It will be capable of detecting planets around young stars, thereby providing insights into how planetary systems are born and how they evolve with time. Precision astrometry allows the measurement

of accurate dynamical masses for stars in binary systems. SIM will observe significant numbers of very high- and low-mass stars, providing stellar masses to 1%, the accuracy needed to challenge physical models. Using precision proper motion measurements, SIM will probe the Galactic mass distribution, and through studies of tidal tails, the formation and evolution of the Galactic halo. SIM will contribute to cosmology through improved accuracy of the Hubble Constant. With repeated astrometric measurements of the nuclei of active galaxies, SIM will probe the dynamics of accretion disks around supermassive black holes, and the relativistic jets that emerge from them.

Author

Astronomy; Astrometry; Spacecraft Instruments; Interferometers; Astronomical Interferometry; Spaceborne Astronomy

20080036086 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Starfish Preplanetary Nebula: IRAS 19024+0044

Sahai, Raghvendra; Sanchez Contreras, Carmen; Morris, Mark; *The Astrophysical Journal*; February 20, 2005; Volume 620, pp. 948-960; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): AS5-26555; GO-09463.01; GO-09801.01; NSF 99-81546; RTOP 399-30-61-00-00; RTOP 399-30-00-08; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40924>

Using the Hubble Space Telescope, we have imaged the OH/IR star IRAS 19024+0044 (I19024) at 0.6, 0.8, 1.1, and 1.6 micrometers, as part of our surveys of candidate preplanetary nebulae. The images show a multipolar nebula of size approximately equal to 3.7×2.3 , with at least six elongated lobes emanating from the center of the nebula. Two of the lobes show limb-brightened tips having point-symmetric structure with respect to the expected location of the central star. The central region shows two dark bands southwest and northeast of a central shallow maximum that may be either two inclined dusty toroidal structures or the dense parts of a single wide, inhomogeneous, toroid. A very faint, surface brightness-limited, diffuse halo surrounds the lobes. Long-slit/echelle optical spectroscopy obtained at the Mount Palomar and Keck observatories shows a spatially compact source of H(α) emission; the H(α) line shows a strong, narrow, central core with very broad (± 1000 km/sec), weak wings, and a narrower blueshifted absorption feature signifying the presence of an approximately 100 km/sec ($\exp -1$) outflow. The spectrum is characterized by a strong, relatively featureless, continuum and lacks the strong forbidden emission lines characteristic of planetary nebulae, confirming that IRAS 19024 is a preplanetary nebula; the spectral type for the central star, although uncertain, is most likely early G. Interferometric observations of the CO $J = 1 - 0$ line emission with the Owens Valley Radio Interferometer show a marginally resolved molecular envelope (size 5.5×4.4) with an expansion velocity of 13 km/sec ($\exp -1$), resulting from the asymptotic giant branch (AGB) progenitor's dense, slow wind. We derive a kinematic distance of 3.5 kpc to I19024, based on its radial velocity. The bolometric flux is 7.3×10^{-9} erg s ($\exp -1$) cm ($\exp -2$), and the luminosity 2850 L_{\odot} . The relatively low luminosity of I19024, in comparison with stellar evolutionary models, indicates that the initial mass of its central star was approximately 1-1.5 solar mass. The lobes, which appear to be hollow structures with dense walls, have a total mass greater than or equal to about 0.02 solar mass. The lobes, which appear to be hollow structures with dense walls, have a total mass greater than or equal to about 0.02 solar mass. The dusty tori in the center have masses of a few times 10^{-3} solar mass. The faint halo has a power-law radial surface brightness profile with an exponent of about -3 and most likely represents the remnant spherical circumstellar envelope formed as a result of constant mass loss during the AGB expansion age of less than or approximately equal to 2870 yr, giving a mass-loss rate of greater than or approximately equal to 10^{-5} solar mass yr ($\exp -1$). The far-infrared fluxes of I19024 indicate the presence of a large mass of cool dust in the nebula, from a simple model we infer the presence of 'cool' (109 K) and 'warm' (280 K) components of dust mass 5.7×10^{-4} and 1.5×10^{-7} solar mass. We discuss our results for I19024 in the light of past and current ideas for the dramatic transformation of the morphology and kinematics of mass-ejecta as AGB stars evolve into planetary nebulae.

Author

Planetary Nebulae; Infrared Astronomy

20080036087 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

SIM Planetquest Science and Technology: A Status Report

Edberg, Stephen J.; Laskin, Robert A.; Marr, James C., IV; Unwin, Stephen C.; Shao, Michael; *Proceedings, SPIE*; August 28, 2007; Volume 6693; 17 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40927>; <http://dx.doi.org/10.1117/12.732728>

Optical interferometry will open new vistas for astronomy over the next decade. The Space Interferometry Mission (SIM-PlanetQuest), operating unfettered by the Earth's atmosphere, will offer unprecedented astrometric precision that

promises the discovery of Earth-analog extra-solar planets as well as a wealth of important astrophysics. Results from SIM will permit the determination of stellar masses to accuracies of 2% or better for objects ranging from brown dwarfs through main sequence stars to evolved white dwarfs, neutron stars, and black holes. Studies of star clusters will yield age determinations and internal dynamics. Microlensing measurements will present the mass spectrum of the Milky Way internal to the Sun while proper motion surveys will show the Sun's orbital radius and speed. Studies of the Galaxy's halo component and companion dwarf galaxies permit the determination of the Milky Way's mass distribution, including its Dark Matter component and the mass distribution and Dark Matter component of the Local Group. Cosmology benefits from precision (1-2%) determination of distances to Cepheid and RR Lyrae standard candles. The emission mechanism of supermassive black holes will be investigated. Finally, radio and optical celestial reference frames will be tied together by an improvement of two orders of magnitude. Optical interferometers present severe technological challenges. The Jet Propulsion Laboratory, with the support of Lockheed Martin Advanced Technology Center (LM ATC) and Northrop Grumman Space Technology (NGST), has addressed these challenges with a technology development program that is now complete. The requirements for SIM have been satisfied, based on outside peer review, using a series of laboratory tests and appropriate computer simulations: laser metrology systems perform with 10 picometer precision; mechanical vibrations have been controlled to nanometers, demonstrating orders of magnitude disturbance rejection; and knowledge of component positions throughout the whole test assembly has been demonstrated to the required picometer level. Technology transfer to the SIM flight team is now well along.

Author

Spaceborne Telescopes; Astronomical Interferometry; Planet Detection; Technology Assessment; Astrometry

20080036091 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

SIM PlanetQuest Key Project Precursor Observations to Detect Gas Giant Planets Around Young Stars

Tanner, Angelle; Beichman, Charles; Akeson, Rachel; Ghez, Andrea; Grankin, Konstantin N.; Herbst, William; Hillenbrand, Lynne; Huerta, Marcos; Konopacky, Quinn; Metchev, Stanimir; Mohanty, Subhanjoy; Prato, L.; Simon, Michal; February 1, 2008; 25 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40928>

We present a review of precursor observing programs for the SIM PlanetQuest Key project devoted to detecting Jupiter mass planets around young stars. In order to ensure that the stars in the sample are free of various sources of astrometric noise that might impede the detection of planets, we have initiated programs to collect photometry, high contrast images, interferometric data and radial velocities for stars in both the Northern and Southern hemispheres. We have completed a high contrast imaging survey of target stars in Taurus and the Pleiades and found no definitive common proper motion companions within one arcsecond (140 AU) of the SIM targets. Our radial velocity surveys have shown that many of the target stars in Sco-Cen are fast rotators and a few stars in Taurus and the Pleiades may have sub-stellar companions. Interferometric data of a few stars in Taurus show no signs of stellar or sub-stellar companions with separations of <5 mas. The photometric survey suggests that approximately half of the stars initially selected for this program are variable to a degree ($1(\sigma) > 0.1$ mag) that would degrade the astrometric accuracy achievable for that star. While the precursor programs are still a work in progress, we provide a comprehensive list of all targets ranked according to their viability as a result of the observations taken to date. By far, the observable that removes the most targets from the SIM-YSO program is photometric variability.

Author

Gas Giant Planets; Astrometry; Detection; Photometry; Interferometry; Stellar Mass; Radial Velocity

20080036092 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Moderate-Resolution Spitzer Infrared Spectrograph Observations of M, L, and T Dwarfs

Mainzer, A. K.; Roellig, Thomas L.; Saumon, D.; Marley, Mark S.; Cushing, Michael C.; Sloan, G. C.; Kirkpatrick, J. Davy; Leggett, S. K.; Wilson, John C.; The Astrophysical Journal; June 20, 2007; Volume 662, pp. 1245-1253; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NASA-1407; W-7405-ENG-36; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40932>

We present 10-19 micrometers moderate-resolution spectra of 10 M dwarfs, one L dwarf, and two T dwarf systems obtained with the Infrared Spectrograph (IRS) on board the Spitzer Space Telescope. The IRS allows us to examine molecular spectroscopic features/lines at moderate spectral resolution in a heretofore untapped wavelength regime. These $R = (\lambda/\Delta\lambda)$ approximately equal to 600 spectra allow for a more detailed examination of clouds and nonequilibrium chemistry, as well as the molecular features of H₂O, NH₃, and other trace molecular species that are the hallmarks of these objects. A cloud-free model best fits our mid-infrared spectrum of the T1 dwarf (Sigma) Indi Ba, and we find that the NH₃ feature in (Sigma) Indi Bb is best explained by a nonequilibrium abundance due to vertical transport in its

atmosphere. We examined a set of objects (mostly M dwarfs) in multiple systems to look for evidence of emission features, which might indicate an atmospheric temperature inversion, as well as trace molecular species; however, we found no evidence of either.

Author

Brown Dwarf Stars; Space Infrared Telescope Facility; Infrared Spectroscopy

20080036105 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Luminosity Function of Ly(alpha)-Emitting Galaxies at Z [Approx. Equal to] 4.5(Sup 1),(Sup 2)

Dawson, Steve; Rhoads, James E.; Malhotra, Sangeeta; Stern, Daniel; Wang, JunXian; Dey, Arjun; Spinrad, Hyron; Jannuzi, Buell T.; *The Astrophysical Journal*; December 20, 2007; Volume 671, pp. 1227-1240; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF AST 01-32798; NSF AST 95-28536; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40899>

We present a catalog of 59 z [approx. equal to] 4:5 Ly(alpha)-emitting galaxies spectroscopically confirmed in a campaign of Keck DEIMOS follow-up observations to candidates selected in the Large Area (LALA) narrowband imaging survey. We targeted 97 candidates for spectroscopic follow-up; by accounting for the variety of conditions under which we performed spectroscopy, we estimate a selection reliability of approx. 76%. Together with our previous sample of Keck LRIS confirmations, the 59 sources confirmed herein bring the total catalog to 73 spectroscopically confirmed z [approx. equal to] 4:5 Ly(alpha)-emitting galaxies in the [approx. equal to] 0.7 deg(exp 2) covered by the LALA imaging. As with the Keck LRIS sample, we find that a nonnegligible fraction of the co rest-frame equivalent widths ($W(\text{sub } \lambda_{\text{rest}})$) that exceed the maximum predicted for normal stellar populations: 17%-31% (93% confidence) of the detected galaxies show ($W(\text{sub } \lambda_{\text{rest}})$) 12%-27% (90% confidence) show ($W(\text{sub } \lambda_{\text{rest}})$) > 240 Å. We construct a luminosity function of z [approx. equal to] 4.5 Ly(alpha) emission lines for comparison to Ly(alpha) luminosity function < 6.6. We find no significant evidence for Ly(alpha) luminosity function evolution from z [approx. equal to] 3 to z [approx. equal to] 6. This result supports the conclusion that the intergalactic medium largely reionized from the local universe out to z [approx. equal to] 6.5. It is somewhat at odds with the pronounced drop in the cosmic star formation rate density recently measured between z approx. 3 and z approx. 6 in continuum-selected Lyman-break galaxies, and therefore potentially sheds light on the relationship between the two populations.

Author

Luminosity; Lyman Alpha Radiation; Catalogs (Publications); Star Formation Rate; Imaging Techniques; Emission Spectra; Galaxies; Continuums

20080036244 NASA Marshall Space Flight Center, Huntsville, AL, USA

SWIFT XRT Observations of the Possible Dark Galaxy VIRGOHI 21

Bonamente, Massimiliano; Swartz, Douglas A.; Weisskopf, Martin C.; Murray, Stephen S.; [2008]; 12 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Swift XRT observations of the Hi line source VIRGOHI 21 were performed on April 22 and April 26, 2008 for a total exposure time of 9.2 ks. No X-rays were detected from the source. The non-detection of extended X-ray emission within the angular extent of the Hi source corresponds to a 99% confidence upper limit of 2.1×10^{-14} ergs/sq cm/s in the 0.3-2.0 keV band. The equivalent upper limit to the amount of diffuse hot gas associated with VIRGOHI 21 is in the range $4 \times 10^7 - 10 \times 10^8$ Solar Mass, depending on the gas temperature assumed. The nondetection also corresponds to a 99%-confidence upper limit on the flux from a point-like source of 8×10^{-15} ergs/sq cm/s in the 0.3-2.0 keV band. We discuss the constraints on the nature of VIRGOHI 21 imposed by these observations and the theoretical implications of these results.

Author

Stellar Mass; High Temperature Gases; Swift Observatory; Point Sources; Galaxies; Gas Temperature

20080036810 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

P/2006 HR30 (Siding Spring): A Low-activity Comet in Near-Earth Space

Hicks, Michael D.; Bauer, James M.; *The Astrophysical Journal Letters*, 662: L47-L50, 2007 June 10; 23 May 2007; Volume 662, pp. L47 - L50; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40934>

The low cometary activity of P/2006 HR30 (Siding Spring) allowed a unique opportunity to study the nucleus of a periodic comet while near perihelion. P/2006 HR30 was originally targeted as a potential extinct comet, and we measured

spectral reflectance and dust production using long-slit CCD spectroscopy and wide-field imaging obtained at the Palomar Mountain 200 inch telescope on 2006 August 3 and 4. The dust production $A_p = 19.7 \pm 0.4$ cm and mass-loss rate $Q(\text{dust}) = 4.1 \pm 0.1$ kg/sec of the comet were approximately 2 orders of magnitude dust less than 1P/Halley at similar heliocentric distance. The VRI colors derived from the spectral reflectance were compared to Kuiper Belt objects, Centaurs, and other cometary nuclei. We found that the spectrum of P/2006 HR30 was consistent with other comets. However, the outer solar system bodies have a color distribution statistically distinct from cometary nuclei. It is our conjecture that cometary activity, most likely the reaccretion of ejected cometary dust, tends to moderate and mute the visible colors of the surface of cometary nuclei.

Author

Comets; Near Earth Objects; Comet Nuclei; Spectral Reflectance; Color

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20080036079 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Revised Orbits of Saturn's Small Inner Satellites

Jacobson, R. A.; Spitale, J.; Porco, C. C.; Beurle, K.; Cooper, N. J.; Evans, M. W.; Murray, C. D.; *The Astronomical Journal*; December 7, 2007; Volume 135, pp. 261; In English; Original contains black and white illustrations; Copyright; Avail.:

Other Sources

ONLINE: <http://hdl.handle.net/2014/40929>

We have updated the orbits of the small inner Saturnian satellites using additional Cassini imaging observations through 2007 March. Statistically significant changes from previously published values appear in the eccentricities and inclinations of Pan and Daphnis, but only small changes have been found in the estimated orbits of the other satellites. We have also improved our knowledge of the masses of Janus and Epimetheus as a result of their close encounter observed in early 2006.

Author

Natural Satellites; Saturn (Planet); Orbits

20080036108 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Mid-Infrared Imaging Survey of Embedded Young Stellar Objects in the (ρ) Ophiuchi Cloud Core

Barsony, Mary; Ressler, Michael E.; Marsh, Kenneth A.; *The Astrophysical Journal*, 630:381-399, 2005 September 1; September 1, 2005; Volume 630, pp. 381-399; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NSF AST 00-96087; NSF AST 97-53229; NSF AST 02-06146; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40916>

Results of a comprehensive, new, ground-based mid-infrared imaging survey of the young stellar population of the (ρ) Ophiuchi cloud are presented. Data were acquired at the Palomar 5m and at the Keck 10m telescopes with the MIRLIN and LWS instruments, at 0'.5 and 0'.25 resolutions, respectively. Of 172 survey objects, 85 were detected. Among the 22 multiple systems observed, 15 were resolved and their individual component fluxes determined. A plot of the frequency distribution of the detected objects with SED spectral slope shows that YSOs spend approx. 4×10^5 yr in the flat-spectrum phase, clearing out their remnant infall envelopes. Mid-infrared variability is found among a significant fraction of the surveyed objects and is found to occur for all SED classes with optically thick disks. Large-amplitude near-infrared variability, also found for all SED classes with optically thick disks, seems to occur with somewhat higher frequency at the earlier evolutionary stages. Although a general trend of mid-infrared excess and near-infrared veiling exists progressing through SED classes, with Class I objects generally exhibiting $r(\text{sub K}) \geq 1$, flat-spectrum objects with $r(\text{sub K}) \geq 0.58$, and Class III objects with $r(\text{sub K}) = 0$, Class II objects exhibit the widest range of $r(\text{sub K})$ values, ranging from $0 \leq r(\text{sub K}) \leq 4.5$. However, the highly variable value of veiling that a single source can exhibit in any of the SED classes in which active disk accretion can take place is striking and is direct observational evidence for highly time-variable accretion activity in disks. Finally, by comparing mid-infrared versus near-infrared excesses in a subsample with well-determined effective temperatures and extinction values, disk-clearing mechanisms are explored. The results are consistent with disk clearing proceeding from the inside out.

Author

Imaging Techniques; Accretion Disks; Infrared Telescopes; Frequency Distribution; Embedding; Surveys

20080036246 NASA Marshall Space Flight Center, Huntsville, AL, USA

An Excess of Cosmic Ray Electrons Between 300 and 800 GeV

Chang, J.; Adams, J. H., Jr.; Ahn, H. S.; Bashindzhagyan, G. L.; Batkov, K. E.; Christl, M.; Fazely, A. R.; Ganel, O.; Guzik, T. G.; Isbert, J.; Kim, K. C.; Kuznetsov, E. N.; Panasyuk, M. I.; Panov, A. D.; Schmidt, W. K. H.; Seo, E. S.; Sokolskaya, N. V.; Watts, J. W.; Wefel, J. P.; Wu, J.; Zatsepin, V. I.; [2008]; 23 pp.; In English; Original contains color illustrations; Copyright; Avail.: Other Sources

The energy spectrum of cosmic ray electrons above 100 GeV is sensitive to the details of astrophysical origin of these high energy particles. High energy electrons originate from primary acceleration sites such as supernova remnants. Further, 'candidate' dark matter particles are predicted to annihilate into energy electrons and positrons. Observing the signatures from such sources superimposed on an otherwise smoothly decreasing energy spectrum requires an instrument exposure, energy resolution and background suppression better than previously available. Here we present electron spectrum results from the Advanced Thin Ionization Calorimeter (ATIC) long duration balloon experiment, with total 'effective' exposure of 3.1 sq m-sr-days. (The highest energy electron event observed was 2.3 TeV.) ATIC separates leptons from hadrons using the topology of the electromagnetic cascade induced in the fully active BGO calorimeter. With an electron energy resolution of approx.2%, the ATIC data are the best current measurements. The ATIC spectrum follows the shape expected from models for secondary cosmic ray electrons up to several hundred GeV. At higher energies an excess of electrons is observed peaking around 500-650 GeV. One possible explanation for this spectral 'feature' is a nearby source of electron acceleration, but it is very difficult to fit the feature using the characteristics of known local supernova remnants. The feature could also result from dark matter particle annihilation and while the observed intensity is consistent with an excess positron flux observed at lower energy, the annihilation cross section would need to be about a factor of 230 above the value currently predicted by theory.

Author

Cosmic Rays; High Energy Electrons; Electron Acceleration; Annihilation Reactions; Energy Spectra; Dark Matter

20080036527 NASA Marshall Space Flight Center, Huntsville, AL, USA

The Twist Limit for Bipolar Active Regions

Moore, Ron; Falconer, David; Gary, Allen; June 23, 2008; 1 pp.; In English; Solar, Heliospheric, and INterplanetary Environment (SHINE), 23-27 Jun. 2008, Midway, UT, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present new evidence that further supports the standard idea that active regions are emerged magnetic-flux-rope omega loops. When the axial magnetic twist of a cylindrical flux rope exceeds a critical amount, the flux rope becomes unstable to kinking, and the excess axial twist is converted into writhe twist by the kinking. This suggests that, if active regions are emerged omega loops, then (1) no active region should have magnetic twist much above the limit set by kinking, (2) active regions having twist near the limit should often arise from kinked omega loops, and (3) since active regions having large delta sunspots are outstandingly twisted, these arise from kinked omega loops and should have twist near the limit for kinking. From each of 36 vector magnetograms of bipolar active regions, we have measured (1) the total flux of the vertical field above 100 G, (2) the area covered by this flux, and (3) the net electric current that arches over the polarity inversion line. These three quantities yield an estimate of the axial magnetic twist in a simple model cylindrical flux rope that corresponds to the top of the active region's hypothetical omega loop prior to emergence. In all 36 cases, the estimated twist is below the critical limit for kinking. The 11 most twisted active regions (1) have estimated twist within a factor of approx.3 of the limit, and (2) include all of our 6 active regions having large delta sunspots. Thus, our observed twist limit for bipolar active regions is in good accord with active regions being emerged omega loops.

Author

Bipolarity; Cylindrical Bodies; Magnetic Flux; Magnetic Signatures; Inversions; Loops; Kinking

20080036633 Naval Research Lab., Washington, DC USA

The Role of Magnetic Reconnection in Solar Activity

Antiochos, Spiro K; DeVore, C R; Jan 1999; 19 pp.; In English

Report No.(s): AD-A482146; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We argue that magnetic reconnection plays the determining role in many of the various manifestations of solar activity. In particular, it is the trigger mechanism for the most energetic of solar events, coronal mass ejections and eruptive flares. We propose that in order to obtain explosive eruptions, magnetic reconnection in the corona must have an 'on-off' nature, and show that reconnection in a sheared multi-polar field configuration does have this property. Numerical simulation results which support this model are presented, and implications for coronal mass ejections/eruptive flare prediction are discussed.

DTIC

Energy Transfer; Magnetic Field Reconnection; Magnetic Fields; Solar Activity

20080036822 NASA Marshall Space Flight Center, Huntsville, AL, USA

Relativistic Particle-In-Cell Simulations of Particle Acceleration in Relativistic Jets

Nishikawa, K.-I.; Hardee, P.; Mizuno, Y.; Medvedev, M.; Hartmann, D. H.; Fishman, J. F.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Highly accelerated particles are observed in astrophysical systems containing relativistic jets and shocks, e.g., active galactic nuclei (AGNs), microquasars, and Gamma-Ray Bursts (GRBs). Particle-In-Cell (PIC) simulations of relativistic electron-ion and electron-positron jets injected into a stationary medium show that efficient acceleration occurs downstream in the jet. In collisionless relativistic shocks particle acceleration is due to plasma waves and their associated instabilities, e.g., the Buneman instability, other two-stream instabilities, and the Weibel (filamentation) instability. Simulations show that the Weibel instability is responsible for generating and amplifying highly non-uniform, small-scale magnetic fields. The instability depends on strength and direction of the magnetic field. Particles in relativistic jets may be accelerated in a complicated dynamics of relativistic jets with magnetic field. We present results of our recent PIC simulations.

Author

Computerized Simulation; Particle Acceleration; Relativistic Plasmas; Plasma Jets; Plasma Physics; Astrophysics

20080036823 NASA Marshall Space Flight Center, Huntsville, AL, USA

Production of Magnetic Turbulence by Cosmic Rays Drifting Upstream of Supernova Remnant Shocks

Stroman, Thomas; Niemiec, Jacek; Pohl, Martin; Nishikawa, Ken-ichi; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; Copyright; Avail.: Other Sources; Abstract Only

I will present results of our recent two- and three-dimensional Particle-In-Cell simulations of magnetic-turbulence production by cosmic-ray ions drifting upstream of supernova remnant shocks. These studies' aim is twofold: test recent predictions of strong amplification in short wavelength, non-resonant wave modes, and study the subsequent evolution of the magnetic turbulence, including its backreaction on cosmic-ray trajectories. We confirm that the drifting cosmic rays give rise to a turbulent magnetic field, but show that an oblique filamentary mode grows more rapidly than the non-resonant parallel modes found in analytical theory. The field perturbations grow more slowly than estimated using a quasi-linear analytical approach for the parallel plane-wave mode, and saturate in amplitude at $\Delta B/B$ approximately equal to 1. The backreaction of the magnetic turbulence on the particles leads to an alignment of the bulk-flow velocities of the cosmic rays and the background medium. This is an essential characteristic of cosmic ray-modified shocks: the upstream flow speed is continuously changed by the cosmic rays. The reduction of relative drift between cosmic rays and background medium accounts for the saturation of the instability at only moderate magnetic-field amplitudes. It is possible that the prolonged magnetic field growth observed in recent MHD simulations results from a cosmic-ray current assumed to be constant and thus immune to the backreaction from the turbulent field. We speculate that the parallel plane-wave mode found in analytical treatments very quickly leads to filamentation, which we observe in our PIC modeling and is also apparent in the MHD simulations.

Author

Computerized Simulation; Magnetohydrodynamic Simulation; Magnetohydrodynamic Turbulence; Magnetic Fields; Cosmic Rays; Supernova Remnants; Shock Waves

20080036824 NASA Marshall Space Flight Center, Huntsville, AL, USA

New Relativistic Particle-In-Cell Simulation Studies of Prompt and Early Afterglows from GRBs

Nishikawa, Ken-ichi; Hardee, P.; Mizuno, Y.; Zhang, B.; Medvedev, M.; Hartmann, D.; Fishman, J. F.; Preece, R.; July 13, 2008; 1 pp.; In English; 37th COSPAR Scientific Assembly, 13-20 Jul. 2008, Montreal, Canada; No Copyright; Avail.: Other Sources; Abstract Only

Nonthermal radiation observed from astrophysical systems containing relativistic jets and shocks, e.g., gamma-ray bursts (GRBs), active galactic nuclei (AGNs), and Galactic microquasar systems usually have power-law emission spectra. Recent PIC simulations of relativistic electron-ion (electron-positron) jets injected into a stationary medium show that particle acceleration occurs within the downstream jet. In the collisionless relativistic shock particle acceleration is due to plasma waves and their associated instabilities (e.g., the Buneman instability, other two-streaming instability, and the Weibel (filamentation) instability) created in the shocks are responsible for particle (electron, positron, and ion) acceleration. The simulation results show that the Weibel instability is responsible for generating and amplifying highly nonuniform, small-scale magnetic fields. These magnetic fields contribute to the electron's transverse deflection behind the jet head. The 'jitter' radiation from deflected electrons has different properties than synchrotron radiation which is calculated in a uniform magnetic

field. This jitter radiation may be important to understanding the complex time evolution and/or spectral structure in gamma-ray bursts, relativistic jets, and supernova remnants.

Author

Computerized Simulation; Afterglows; Gamma Ray Bursts; Relativistic Particles; Electron-Positron Plasmas; Plasma Jets; Particle Acceleration; Astrophysics

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

20080036081 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

A Chapman-Layers Ionspheric Model for Mars

Pi, Xiaoqing; Edwards, Charles D.; Hajj, George A.; Ao, Chi; Romans, Larry J.; Callas, John L.; Mannucci, Anthony J.; Asmar, Sami W.; Kahan, Daniel S.; August 2008; 8 pp.; In English; Original contains color illustrations

Report No.(s): JPL-Publication-08-24; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40912>

A numerical model (CLIMM) is developed that adopts functions of two Chapman layers to compute Mars ionospheric electron densities at given local solar zenith angle and height. Electron density profiles derived from Mars Global Survey (MGS)-to-Earth radio occultation measurements collected during 1998 through 2005 are used to fit the model. The present model does not include variations with solar extreme ultraviolet (EUV) radiation cycles and seasons, and may have increased errors at lower latitudes. A more sophisticated model taking into account these variations is being developed and will be available in the future.

Author

Atmospheric Models; Mars Atmosphere; Planetary Ionospheres; Ionospheric Electron Density; Mathematical Models

20080036101 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Middle UV to Near-IR Spectrum of Electron-Excited SO₂

Ajello, Joseph M.; Aguilar, Alejandro; Mangina, Rao S.; James, Geoffrey K.; Geissler, Paul; Trafton, Laurence; Journal of Geophysical Research; March 21, 2008; Volume 113; 15 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNG04G131G; Copyright; Avail.: Other Sources

ONLINE: <http://hdl.handle.net/2014/40896>; <http://dx.doi.org/10.1029/2007JE002921>

We investigated the electron impact-induced fluorescence spectrum of SO₂ to provide excitation cross sections for modeling Io's mission spectrum and analyzing Cassini Imaging Science Subsystem observations. The electron-excited middle-ultraviolet visible optical near-infrared (VOIR) emission spectrum of SO₂ gas was generated in the laboratory and studied from 2000 to 11,000 Å at a resolution of (Δλ) approximately 2.5 Å full width at half maximum (FWHM). The VOIR laboratory spectrum longward of 6000 Å consists entirely of S I, II and O I, II multiplets for electron impact energies above approximately 15 eV. Between 2000 and 6000 Å, we find previously identified molecular bands from both SO and SO₂. This work represents a significant improvement in spectral resolution over our earlier work done at 18 Å FWHM. From a measurement of the medium-resolution spectrum, we provide detailed 25- and 100-eV emission cross sections for spectral features from 2000 to 11,000 Å. On the basis of these data, we suggest future ground-based and satellite telescopic observations in the VOIR that are of promise for understanding Io's atmosphere.

Author

Io; Satellite Atmospheres; Atmospheric Composition; Sulfur Oxides

20080036217 NASA Marshall Space Flight Center, Huntsville, AL, USA

Exploration Technology Developments Program's Radiation Hardened Electronics for Space Environments (RHESE) Project Overview

Keys, Andrew S.; Adams, James H.; Darty, Ronald C.; Patrick, Marshall C.; Johnson, Michael A.; Cressler, John D.; June 2008; 24 pp.; In English; 6th International Planetary Probe Workshop, 23-26 Jun. 2008, Atlanta, GA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036217>

Primary Objective: 1) A computational tool to accurately predict electronics performance in the presence of space

radiation in support of spacecraft design: a) Total dose; b) Single Event Effects; and c) Mean Time Between Failure. (Developed as successor to CR ME96.) Secondary Objectives: 2) To provide a detailed description of the natural radiation environment in support of radiation health and instrument design: a) In deep space; b) Inside the magnetosphere; and c) Behind shielding.

Derived from text

Aerospace Environments; Performance Prediction; Extraterrestrial Radiation; Shielding; MTBF; Electronic Equipment; Radiation Hardening

20080036521 NASA Marshall Space Flight Center, Huntsville, AL, USA

Microwave Extraction of Lunar Water for Rocket Fuel

Ethridge, Edwin C.; Donahue, Benjamin; Kaukler, William; June 23, 2008; 1 pp.; In English; 2008 National Space and Missile Materials Symposium, 23-27 Jun. 2008, Henderson, NV, USA; Copyright; Avail.: Other Sources; Abstract Only

Nearly 50% of the lunar surface is oxygen, present as oxides in silicate rocks and soil. Methods for reduction of these oxides could liberate the oxygen. Remote sensing has provided evidence of significant quantities of hydrogen possibly indicating hundreds of millions of metric tons, MT, of water at the lunar poles. If the presence of lunar water is verified, water is likely to be the first in situ resource exploited for human exploration and for LOX-H₂ rocket fuel. In-Situ lunar resources offer unique advantages for space operations. Each unit of product produced on the lunar surface represents 6 units that need not to be launched into LEO. Previous studies have indicated the economic advantage of LOX for space tugs from LEO to GEO. Use of lunar derived LOX in a reusable lunar lander would greatly reduce the LEO mass required for a given payload to the moon. And Lunar LOX transported to L₂ has unique advantages for a Mars mission. Several methods exist for extraction of oxygen from the soil. But, extraction of lunar water has several significant advantages. Microwave heating of lunar permafrost has additional important advantages for water extraction. Microwaves penetrate and heat from within not just at the surface and excavation is not required. Proof of concept experiments using a moon in a bottle concept have demonstrated that microwave processing of cryogenic lunar permafrost simulant in a vacuum rapidly and efficiently extracts water by sublimation. A prototype lunar water extraction rover was built and tested for heating of simulant. Microwave power was very efficiently delivered into a simulated lunar soil. Microwave dielectric properties (complex electric permittivity and magnetic permeability) of lunar regolith simulant, JSC-1A, were measured down to cryogenic temperatures and above room temperature. The microwave penetration has been correlated with the measured dielectric properties. Since the microwave penetration depth is a function of temperature and frequency, an extraction system can be designed for water removal from different depths.

Author

Mars Missions; Hydrogen; Oxygen; Lunar Resources; Lunar Soil; Extraction; Lunar Surface

20080036590 NASA Marshall Space Flight Center, Huntsville, AL, USA; NASA Marshall Space Flight Center, Huntsville, AL, USA

Extant and Extinct Lunar Regolith Simulants: Modal Analyses of NU-LHT-1M and -2m, OB-1, JSC-1, JSC-1A and -1A,FJS-1, and MLS-1

Schrader, Christian; Rickman, Doug; McLemore, Carole; Fikes, John; Wilson, Stephen; Stoesser, Doug; Butcher, Alan; Botha, Pieter; June 02, 2008; 30 pp.; In English; Planetary and Terrestrial Mining Symposium (PTMSS)/Northern Centre for Advanced Technology, Inc. (NORCAT), 9-11 Jun. 2008, Montreal, Quebec, Canada; Original contains color illustrations; Copyright; Avail.: CASI: [A03](#), Hardcopy

This work is part of a larger effort to compile an internally consistent database on lunar regolith (Apollo samples) and lunar regolith simulants. Characterize existing lunar regolith and simulants in terms of: a) Particle type; b) Particle size distribution; c) Particle shape distribution; d) Bulk density; and e) Other compositional characteristics. Evaluate regolith simulants (Figure of Merit) by above properties by comparison to lunar regolith (Apollo sample) This presentation covers new data on lunar simulants.

Derived from text

Lunar Rocks; Regolith; Extinction; Particle Size Distribution; Data Bases; Figure of Merit

20080036821 NASA Marshall Space Flight Center, Huntsville, AL, USA

Development of Lunar Highland REgolith Simulants, NU-LHT-1M,-2M

Stoesser, D. B.; Wilson, S. A.; Fikes, J.; McLemore, C.; Rickman, Douglas; July 13, 2008; 1 pp.; In English; Goldschmidt Conference, 13-18 Jul. 2008, Vancouver, Canada; No Copyright; Avail.: CASI: [A01](#), Hardcopy

ONLINE: <http://hdl.handle.net/2060/20080036821>

As part of a collaborative agreement between the U.S. Geological Survey (USGS) and NASA's Marshall Space Flight

Center (MSFC) lunar highland simulants are being produced to support engineers and scientists in developing the technologies required to put a base on the moon by 2024. Two simulants have been produced to date: NU-LHT-1M and -2M (NASA/USGS-Lunar Highlands Type-1 & 2 Medium-grained). Using starting material chiefly collected from the Stillwater Mine, Nye, MT, blending protocols were developed based on normative mineralogy calculated from average chemistry, for the Apollo 16 regolith. New technologies using a high temperature remotely coupled plasma melter were developed to generate both high quality and agglutinitic glasses that simulate the glassy components of the regolith. Detailed chemical, mineralogical and physical properties analysis of NU-LHT-1M indicate that it is overall a good surrogate for highlands lunar regolith (our new simulant LHT-2M has not been analyzed yet). The primary difference between 1M and 2M was the inclusion of trace mineralogy (phosphates and sulfide). Plans will also be presented on the future direction of the simulant project.

Author

Lunar Rocks; Regolith; Simulation; Lunar Composition; Mineralogy; Geotechnical Engineering

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20080036809 NASA Dryden Flight Research Center, Edwards, CA, USA

Dryden Flight Research Highlights; August 2006 - July 2007

Wright, David A.; August 17, 2007; In English; Silent, Color, Two Versions; 1:17 min. and 5:35 min.; No Copyright;

Avail.: CASI: [C01](#), DVD

A DVD highlights the research activities of the Dryden Flight Research Center. The video includes coverage of space-based communication, intelligent flight controls, autonomous refueling demonstration, QuietSpike, sonic boom tests, G-III radar pod, X-48B blended wing body, Altair fire mission, Ikhana UAV, STS-117 Atlantis, and SOFIA Telescope research efforts.

CASI

Research and Development; NASA Programs; Aerospace Industry; Aerospace Sciences; Aerospace Engineering; Research Vehicles; Video Disks

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