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STAR

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WHAT'S INSIDE

NASA STI Program ... in Profile

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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

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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.

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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 Divisions/Categories

Document citations are grouped by division and then by category, according to the *NASA Scope and Subject Category Guide.*

Aeronautics

Astronautics

Chemistry and Materials

Engineering

Geosciences

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Mathematical and Computer Sciences

Physics

Social and Information Sciences

Space Sciences

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for linking to the corresponding document citation from *NASA Thesaurus* terms and personal author names.

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.

20090005013 William J. Hughes Technical Center, Atlantic City, NJ, USA
Video Landing Parameter Survey, London Heathrow Airport
DeFiore, T.; Micklos, R.; Nov. 2007; 220 pp.; In English
Contract(s)/Grant(s): DTFACT-06-C-00021
Report No.(s): PB2008-106523; No Copyright; Avail.: National Technical Information Service (NTIS)

Researchers from the Federal Aviation Administration (FAA) William J. Hughes Technical Center have been conducting a series of video landing parameter surveys at high-activity commercial airports to acquire a better understanding of typical landing contact conditions for a wide variety of aircraft and airports as they relate to current aircraft design criteria and practices. This is the sixth of a series of landing parameter surveys. This report documents the results from a survey at London Heathrow Airport (LHR) performed in July 2001. Previous surveys were conducted first at John F. Kennedy International Airport (JFK) in June 1994 and later at Washington National Airport (DCA) performed in June 1995. Additional surveys were performed at Honolulu International (HNL), April 1996, London City Airport in July 1997, and Philadelphia International Airport in July 1999. At LHR, six video cameras were temporarily installed along the north side of runway 27R. Video images of 495 wide-body and 468 narrow-body transports were captured and analyzed, and the results are presented herein. Landing parameters presented include sink rate; approach speed; touchdown pitch, roll, and yaw angles and rates; off-center distance; and the touchdown distance from the runway threshold. Wind and weather conditions were also recorded, and landing weights were available for most landings. Since this program is only concerned with overall statistical usage information, all data were processed and are presented without regard to the airline or flight number.
NTIS
Airports; Surveys; Airline Operations

20090005196 Federal Aviation Administration, Washington, DC, USA
Balloon Flying Handbook
January 2001; 106 pp.; In English
Report No.(s): PB2008-106037; FAA-H-8083-11; No Copyright; Avail.: CASI: A06, Hardcopy

This Balloon Flying Handbook introduces the basic pilot knowledge and skills that are essential for piloting balloons. It introduces pilots to the broad spectrum of knowledge that will be needed as they progress in their pilot training. This handbook is for student pilots, as well as those pursuing more advanced pilot certificates. Student pilots learning to fly balloons, certificated pilots preparing for additional balloon ratings or who desire to improve their flying proficiency and aeronautical knowledge, and commercial balloon pilots teaching balloon students how to fly should find this handbook helpful. This book introduces the prospective pilot to the realm of balloon flight and provides information and guidance to all balloon pilots in the performance of various balloon maneuvers and procedures. This handbook conforms to pilot training and certification concepts established by the Federal Aviation Administration (FAA). There are different ways of teaching, as well as performing flight procedures and maneuvers, and many variations in the explanations of aerodynamic theories and principles. This handbook adopts a selective method and concept to flying balloons. The discussions and explanations reflect the most commonly used practices and principles.
NTIS
Handbooks; Balloon Flight; Pilot Training; Range (Extremes); Aerodynamics

20090005248 NASA Dryden Flight Research Center, Edwards, CA, USA

Ikhana: A NASA Unmanned Aerial System Supporting Long-Duration Earth Science Missions

Cobleigh, Brent R.; June 25, 2007; 15 pp.; In English; 32nd International Symposium on Remote Sensing of Environment, 25-29 Jun. 2007, San Jose, Costa Rica; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005248

This viewgraph presentation reviews Ikhana's project goals: (1) Develop an airborne platform to conduct Earth observation and atmospheric sampling science missions both nationally and internationally, (2) develop and demonstrate technologies that improve the capability of UAVs to conduct science collection missions, (3) develop technologies that improve manned and unmanned aircraft systems, and (4) support important national UAV development activities. The criteria that guided the selection of the aircraft are listed. The payload areas on Ikhana are shown and the network that connects the systems are also reviewed. The data recorder is shown. Also the diagram of the Airborne Research Test System (ARTS) is reviewed. The Mobile Ground Control Station and the Mobile Ku SatCom Antenna are also shown and described.

CASI

Flying Platforms; Unmanned Aircraft Systems; Pilotless Aircraft; Reconnaissance Aircraft; Airborne Equipment

20090006036 Rohn and Monsanto, Gross Pointe, MI, USA

Adaptive Compliant Wing and Rotor System

Kota, S., Inventor; Hetrick, J. A., Inventor; 3 Mar 04; 33 pp.; In English

Contract(s)/Grant(s): SBIR-F33615-01-C-3100

Patent Info.: Filed Filed 3 Mar 04; US-Patent-Appl-SN-10-548 053

Report No.(s): PB2008-106121; No Copyright; Avail.: CASI: A03, Hardcopy

Variation in the contours of first and second compliant surfaces is produced by a compliant frame having a first resiliently variable frame element having a corresponding first outer surface and a first inner surface, and a second resiliently variable frame element having a corresponding second outer surface and a second inner surface. The first and second outer surfaces communicate with respective ones of the first and second compliant surfaces. A linkage element having a predetermined resilience characteristic is coupled at a first end thereof to the first inner surface and at a second end thereof to the second inner surface. A frame coupler couples the first resiliently variable frame element to a support element. An actuator applies a force to the second resiliently variable frame element with respect to the support element, resulting in a corresponding variation in the contour of the first and second compliant surfaces.

NTIS

Adaptation; Elastic Properties; Patent Applications; Rotary Wings; Rotors; Wings

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.

20090005167 NASA Dryden Flight Research Center, Edwards, CA, USA

X-48B Flight Research Progress Overview

Risch, Tim; Cosentino, Gary; Regan, Chris; Kisska, Michael; Princen, Norman; January 05, 2009; 28 pp.; In English; 47th AIAA Aerospace Sciences Meeting, 5-8 Jan. 2009, Orlando, FL., USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Program Objectives; I. Assess stability & control characteristics of a BWB class vehicle in free-flight conditions: a) Assess dynamic interaction of control surfaces; b) Assess control requirements to accommodate asymmetric thrust; c) Assess stability and controllability about each axis at a range of flight conditions II. Assess flight control algorithms designed to provide desired flight characteristics: a) Assess control surface allocation and blending; b) Assess edge of envelope protection schemes; c) Assess takeoff and landing characteristics; d) Test experimental control laws and control design methods. III. Evaluate prediction and test methods for BWB class vehicles: a) Correlate flight measurements with ground-based predictions and measurements.

Author

Aerodynamic Characteristics; Blended-Wing-Body Configurations; Control Theory; In-Flight Monitoring; Prediction Analysis Techniques; Flight Control

20090005181 NASA Dryden Flight Research Center, Edwards, CA, USA

Ground/Flight Correlation of Aerodynamic Loads with Structural Response

Mangalam, Arun S.; Davis, Mark C.; January 05, 2009; 16 pp.; In English; 47th AIAA Aerospace Sciences Meeting and Exhibit, 5-8 Jan. 2009, Orlando, FL, USA; Original contains color illustrations

Report No.(s): DFRC-835; Copyright; Avail.: CASI: A03, Hardcopy

Ground and flight tests provide a basis and methodology for in-flight characterization of the aerodynamic and structural performance through the monitoring of the fluid-structure interaction. The NF-15B flight tests of the Intelligent Flight Control System program provided a unique opportunity to test the correlation of aerodynamic loads with points of flow attaching and detaching from the surface, which are also known as flow bifurcation points, as observed in a previous wind tunnel test performed at the U.S. Air Force Academy (Colorado Springs, Colorado). Moreover, flight tests, along with the subsequent unsteady aerodynamic tests in the NASA Transonic Dynamics Tunnel (TDT), provide a basis using surface flow sensors as means of assessing the aeroelastic performance of flight vehicles. For the flight tests, the NF-15B tail was instrumented with hot-film sensors and strain gages for measuring root-bending strains. This data were gathered via selected sideslip maneuvers performed at level flight and subsonic speeds. The aerodynamic loads generated by the sideslip maneuver resulted in a structural response, which were then compared with the hot-film sensor signals. The hot-film sensor signals near the stagnation region were found to be highly correlated with the root-bending strains. For the TDT tests, a flexible wing section developed under the U.S. Air Force Research Lab SensorCraft program was instrumented with strain gages, accelerometers, and hot-film sensors at two span stations. The TDT tests confirmed the correlation between flow bifurcation points and the wing structural response to tunnel-generated gusts. Furthermore, as the wings structural modes were excited by the gusts, a gradual phase change between the flow bifurcation point and the structural mode occurred during a resonant condition.

Author

Aerodynamic Loads; Flight Tests; Ground Tests; Unsteady Aerodynamics; Strain Gages

20090006059 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Extending CFD Modeling to Near-Continuum Flows Using Enhanced Thermophysical Modeling

Claycomb, Abram E; Mar 2008; 118 pp.; In English; Original contains color illustrations

Report No.(s): AD-A490691; AFIT/GAE/ENY/08-M04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490691

The constitutive relations found in traditional Navier-Stokes-based computational fluid dynamics solvers are known to be limited in altitude. The presence of nonequilibrium phenomena beyond what these methods are able to predict becomes more prevalent at higher altitudes, or increasing Knudsen number. The bulk viscosity, normally assumed to be zero in most computational fluid dynamics applications, is examined as a means of increasing the range of applicability of computational fluid dynamics. The bulk viscosity model used was from recent calculations available in the literature, from a new anisotropic potential energy surface, and is restricted to temperatures below 2000 K. The normal shock problem was solved for Mach numbers up to ten, using the bulk viscosity model. The bulk viscosity provided improvement in the agreement with observations of normal shock thickness for Mach numbers up to ten. Two axisymmetric, experimentally observed flows were solved with and without the bulk viscosity, and compared to DSMC solutions of a previous work. Improvement of surface heat transfer agreement with observation was found for a hollow-cylinder are axisymmetric body. Improvement of separation point prediction was found for an axisymmetric double cone.

DTIC

Computational Fluid Dynamics; Continuums; Hypersonic Flight

20090006209 Army Research Lab., Aberdeen Proving Ground, MD USA

Navier-Stokes Predictions of Dynamic Stability Derivatives: Evaluation of Steady-State Methods

DeSpirito, James; Silton, Sidra I; Weinacht, Paul; Sep 2008; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-AH80

Report No.(s): AD-A491475; ARL-TR-4605; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The prediction of the dynamic stability derivatives-roll-damping, Magnus, and pitch-damping moments-were evaluated for three spin-stabilized projectiles using steady-state computational fluid dynamic (CFD) calculations. Roll-damping CFD predictions were found to be very good across the Mach number range investigated. Magnus moment predictions were very good in the supersonic flight regime; however, the accuracy varied in the subsonic and transonic flight regime. The best Magnus moment prediction in the subsonic flight regime was for the square-base projectile that did not exhibit highly nonlinear Magnus moments. A primary contribution of this report is the demonstration that the pitch-damping moment can

be adequately predicted via steady-state methods rather than resorting to unsteady techniques. The predicted pitch-damping moment compared very well to experimental data for the three projectiles investigated. For one configuration, the pitch-damping moment was predicted by several CFD codes, two different steady-state methods, and a time-accurate planar pitching motion method. All methods compared very well to each other and to the experimental data.
DTIC
Aerodynamics; Computational Fluid Dynamics; Damping; Dynamic Stability; Navier-Stokes Equation; Stability; Steady State

03
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.

20090005094 William J. Hughes Technical Center, Atlantic City, NJ, USA
Evaluation of Runway Guard Light Configurations at North Las Vegas Airport
Patterson, J. W.; Jan. 2007; 33 pp.; In English
Report No.(s): PB2008-104490; No Copyright; Avail.: CASI: A03, Hardcopy

Runway guard lights (RGL) both in pavement and elevated, when used in conjunction with Federal Aviation Administration-approved illuminated signs and painted hold position markings, have successfully reduced runway incursions at major air carrier airports. RGLs have not yet been recommended for use at general aviation (GA) airports. Typically, in pavement RGLs are installed in sets of eight parallel to the hold position marking. This research effort also evaluated the effectiveness of adding additional lights perpendicular to the hold position marking, creating a T-configuration. The purpose of this research effort was to determine if RGLs in the in-pavement, elevated, or T-configurations could offer the same safety enhancement to GA airports as they do for air carrier airports, even though GA airports are smaller in size, are far less complex in design, and have less separation between runways and taxiways. Eight test locations were selected for evaluation at the North Las Vegas Airport. Subject pilots were asked to navigate a vehicle on the airport surface to indicate the distances at which selected lights, signs, and markings became visible, and to clearly indicate the point at which the pilot must stop until clearance to enter or cross an active runway is received for air traffic control. The evaluations showed that the standard illuminated sign performed the best during daylight conditions, and the elevated RGLs were most effective during dusk, dawn and nighttime conditions. The proposed alert zone lighting configuration did not offer any significant enhancement, especially when approached from a 90-degree angle. Of the pilots polled, 60% ranked the elevated RGL as the most effective visual aid for identifying the taxiway hold position.
NTIS
Airports; Lighting Equipment; Runway Lights; Runways

20090006128 Marine Corps Development and Education Command, Quantico, VA USA
From Nicaragua to the 21st Century: Marine Corps Aviation's Role in Counterinsurgency Operations
Finneran, Robert B; Jan 2008; 33 pp.; In English
Report No.(s): AD-A491119; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491119

The Marines of the Second Nicaraguan Campaign rapidly adapted the role of aviation in order to support the ground commander's requirements to defeat an insurgency. Marine Corps aviators of the 21st century must maintain the same flexible support for the ground commander that was demonstrated by the Marines in Nicaragua since ultimately, ground forces will be the deciding factor in the success or failure of COIN operations.
DTIC
Military Aviation; Nicaragua

20090006187 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (July-September 1999)
Peake, James B; Lynch, Larry D; De Lorenzo, Robert A; Kim, Myung H; Coppola, M N; Whelen, A C; Carroll, Terry; Benge, Timothy; Fowler, Edward B; Austerman, Wayne R; Sep 1999; 49 pp.; In English
Report No.(s): AD-A491294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Several articles in this issue focus on MEDEVAC and reflect its importance in the overall AMEDD mission. 'Maximizing

Medical Evacuation' provides an operational perspective on forward support MEDEVAC teams in the theater of operation. The author draws on valuable lessons from the Combat Maneuver Training Center at Hohenfels, Germany. 'Army Aeromedical Crash Rates' is a retrospective study of helicopter crash rates in the U.S. Army. The findings support the continued commendable safety record of both Army general and MEDEVAC-specific aviation. This impressive safety record can serve as a model for all personnel in the AMEDD. 'Disease and Nonbattle Injury Forecasting' describes a quantitative model for predicting casualties during operational deployments. Accurate forecasting is critical to assuring that the right quantity and mix of medical and evacuation assets are deployed with the force. 'Malaria Surveillance in Operation New Horizon-Peru' outlines the Southern Command's efforts to identify and control endemic malaria in the Amazon Basin of Peru. 'The Evolution of Misbehavior in Insurance and Worker's Compensation' provides an insightful historical review of insurance fraud. Given the multi-billion dollar costs associated with fraud, all managers and administrators need to maintain awareness of the issue. 'Acute Myocardial Infarction' is a concise and easy-to-read synopsis of a very important disease. Coronary artery disease and myocardial infarction (heart attacks) remain a leading cause of mortality and morbidity in soldiers and civilians alike. 'Restructuring the Medical Service Corps: The 7OZ Proposal' outlines a proposal to consolidate several Medical Service Corps areas of concentration into one. A smaller, leaner AMEDD needs personnel with maximum skill and flexibility. This proposal addresses some of these issues. 'Surgical Management of Stillman's Clefts: A Case Report' describes the operative management of a unique form of gingival (gum) recession.
DTIC
Air Transportation; Crashes; Evacuating (Transportation); Forecasting; Helicopters; Injuries; Medical Services; Myocardial Infarction; Parasitic Diseases

20090006380 Marine Corps Development and Education Command, Quantico, VA USA
Is the Short Takeoff and Vertical Landing Aircraft the Sole Tactical Air Solution for the Marine Corps
Funderburke,; Juenger, M A; Feb 4, 2002; 11 pp.; In English
Report No.(s): AD-A491887; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Since the beginning of Marine Corps aviation, the Marines have had several fixed wing platforms to support the Marine Air Ground Task Eorce (MACTE) . With the present combination of the E/A-18 Hornet, AV-8B Harrier and EA-EB Prowler aircraft, the MACTE air command element is capable of accomplishing a multitude of missions under almost any condition. However, the traditional way in which Marine tactical air carries out its role is about to change with the plan to phase out the three existing fet aircraft and replace them with one aircraft, the Short Takeoff and Vertical Landing (STOVL) Joint Strike Eighter (JSE) . Unfortunately, the JSE's debatable record of reliability, compounded by the prospect of dependence on one aircraft, may compromise the Marine Corps' ability to meet its commitment to the country and to the other branches of the military.
DTIC
Military Aviation; Short Takeoff Aircraft; STOVL Aircraft; Vertical Takeoff Aircraft

20090006382 Marine Corps Development and Education Command, Quantico, VA USA
Future Carrier vs. Super Carrier: New Issues and Technologies
Higgins, Sean P; Jan 2004; 45 pp.; In English
Report No.(s): AD-A491892; USMC/CSC-2004; No Copyright; Avail.: Defense Technical Information Center (DTIC)
New technologies and emerging issues such as the Joint Strike Fighter and the shift to a littoral navy threaten the future of the super carrier. Since the carrier's inception, heated arguments have been waged as to the size and capabilities of future carriers. This paper explores whether the era of the super carrier--a large aircraft carrier that is superior in size, capability and status--is coming to a close by examining the USA' need for large carriers. An examination of the development of the carrier, threats, costs, emerging technology and capabilities will show that future carriers will remain large despite affordability. The carrier has evolved to support the air wing. Aircraft have provided the major source for change to the carrier. Successful development of Short Takeoff and Vertical Landing (STOVL) aircraft will expand the capabilities of the air wing and require new capabilities from the carrier. Conventional Takeoff and Landing (CTOL) aircraft have perpetuated the legacy of the super carrier. Integrated air wings of STOVL and CTOL aircraft will allow interoperability between Joint forces and coalition forces. Emerging technologies such as electro mechanical aircraft launching system (EMALS), unmanned aerial vehicles (UAV) and unmanned combat aerial vehicles (UCAV) will enable cost reductions in manpower and modify hull design. Measuring the total operating costs (TOC) will make estimating budgets for the new carriers more efficient and help achieve long-term goals

by making it easier to remain on budget avoiding cost overruns. While other naval powers operate with smaller carriers, the U.S. is the only naval power that has the capacity and resources to operate super carriers. The capability of the carrier and its air wing are the key issues that must be addressed when discussing the next super carrier.
DTIC
Aircraft Carriers; Fighter Aircraft; Interoperability; Organizations

20090006391 Marine Corps Development and Education Command, Quantico, VA USA
Arming Navy Helicopters for the 21st Century
Brunett, Christopher W; Jan 2004; 47 pp.; In English
Report No.(s): AD-A491960; USMC-CSC-2004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Throughout the history of naval rotary wing aviation, aircrews have had to adapt to expanding missions and changing threats. As our Navy transforms to meet the challenges of 21st century, helicopters will continue to play a critical warfighting role. Despite the obvious requirement, few Navy helicopters are equipped to execute the missions they are tasked to accomplish. By arming less than a quarter of the fleet, the Helicopter Concept of Operations (CONOPS) does little to resolve this shortfall. It is time Navy leadership break the paradigm, envision the Navy helicopter as a combat platform and equip it appropriately. We must arm all Navy helicopters with robust and flexible weapon systems so they can respond to the demands of 21st century warfare.
DTIC
Aircraft Equipment; Helicopters; Military Aircraft; Military Aviation; Navy; Weapon Systems

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications, Spacecraft Communications, Command and Tracking; and 32 Communications and Radar.

20090005211 NASA, Washington, DC USA
Guidance and control for an autonomous soaring UAV
Allen, Michael J., Inventor; October 7, 2008; 11 pp.; In English
Patent Info.: Filed March 23, 2006; US-Patent-7,431,243; US-Patent-Appl-SN-11/277,325; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005211

The present invention provides a practical method for UAVs to take advantage of thermals in a manner similar to piloted aircrafts and soaring birds. In general, the invention is a method for a UAV to autonomously locate a thermal and be guided to the thermal to greatly improve range and endurance of the aircraft.
Official Gazette of the U.S. Patent and Trademark Office
Autonomy; Soaring; Aircraft Guidance; Pilotless Aircraft; Unmanned Aircraft Systems; Air Currents

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.

20090005010 Dayton Univ. Research Inst., OH, USA
Statistical Loads Data for the Embraer-145XR Aircraft in Commercial Operations
Jones, T.; Rustenburg, J. W.; Skinn, D. A.; Tipps, D. O.; Nov. 2007; 102 pp.; In English
Report No.(s): PB2008-106525; No Copyright; Avail.: National Technical Information Service (NTIS)

The University of Dayton Research Institute (UDRI) supports the Federal Aviation Administration (FAA) in conducting research on the structural integrity requirements for the U.S. commercial transport airplane fleet. The primary objective of this task was to support the FAA Operational Loads Measurement Program by developing new and improved methods and criteria

for processing and presenting commercial transport aircraft flight and ground loads usage data. The scope of activities included: (1) defining the service-related factors that affect the operational life of commercial aircraft; (2) designing an efficient software system to reduce, store, and process large quantities of optical quick access recorder data; and (3) reducing, analyzing, and providing processed data in statistical formats for the FAA to reassess existing certification criteria. Equally important, these new data will also enable the FAA, the aircraft manufacturers, and the airlines to better understand and control those factors that influence the structural integrity of commercial transport aircraft. Presented herein are Embraer-145XR aircraft operational usage data collected from 47,273 flights, representing 88,305 flight hours, recorded by a single U.S. operator. These data will provide the user with statistical information on aircraft usage, ground and flight loads occurrences, and systems operational usage based on routine ERJ-145XR commercial service.
NTIS
Loads (Forces); Airline Operations; Commercial Aircraft; Aerodynamic Loads

20090005012 William J. Hughes Technical Center, Atlantic City, NJ, USA; Maryland Univ., College Park, MD, USA
Flammability Properties of Aircraft Carbon-Fiber Structural Composite
Quintiere, J. G.; Walters, R. N.; Crowley, S.; Oct. 2007; 43 pp.; In English
Report No.(s): PB2008-106524; No Copyright; Avail.: CASI: A03, Hardcopy

This study investigated the flammability of a carbon-fiber composite material for use in aircraft structures. In particular, it considered a composite material manufactured by Toray Composites (America) to Boeing Material Specification 8-276. The objective was to establish a complete set of properties pertaining to the heating and burning characteristics of these materials in fires. Several apparatuses were used, including the cone calorimeter, microscale combustion calorimeter, thermogravimetric analyzer, differential scanning calorimeter, and a flame spread rig to promote spread with preheating by radiation. An attempt was made to measure the thermal conductivity of the composite over a range of temperatures through its decomposition, but the heat losses from the apparatus likely caused an overestimate in the measurement. Data from standard tests were also reported for the Ohio State University calorimeter and the smoke density chamber. The material burns in a manner similar to a charring material, in that the carbon fibers comprise most of its mass. The composite burns primarily from the vaporization of its resin. It can ignite with a pilot flame after preheating at a low heat flux. When it burns, the resin vapor is forced out of the fiber pores, and pressure causes the material to swell to over twice its volume. In most all cases studied, the composite maintained its rigidity, but its structural strength was not examined after degradation. The material appears to maintain homogeneity in swelling. The fibers create an insulating, char-like structure that causes a reduction in the internal heating, and consequently, the burning rate drops in time. As the burning rate drops, extinction can naturally occur due to insufficient heating. As is common of charring materials, external heat flux is required to sustain burning and flame spread. It should be noted that the carbon fiber can also oxidize under high-temperature conditions, and this was observed even at low heat fluxes.
NTIS
Carbon Fibers; Composite Materials; Flammability

20090005014 Mississippi State Univ., Mississippi State, MS, USA
Development and Validation of Crack Growth Models and Life Enhancement Methods for Rotorcraft Damage Tolerance
Daniewicz, S. R.; Newman, J. C.; Nov. 2007; 90 pp.; In English
Contract(s)/Grant(s): DTFA03-02-C-00043
Report No.(s): PB2008-106522; No Copyright; Avail.: National Technical Information Service (NTIS)

Fatigue crack growth from a hole with a pre-existing compressive residual stress is simulated using two-dimensional elastic-plastic finite element analyses. The analyses allow a determination of the crack-opening stress as the crack propogates through the residual stress, from which the effective stress-intensity factor range (AeltaK(sub eff)) and the fatigue crack growth is predicted. Results from these simulations are compared with experimental data and to predictions made using a conventional superposition of the elastic stress-intensity factor. The crack closure-based methodology resulted in predictions that compared well with the experimental data, while the results using superposition were nonconservative. Predictions from the closure-based method are highly dependent on the da/dN = f(AeltaK(sub eff)) constituitive relationship used, highlighting the need for experimental methods to reliably measure this correlation.
NTIS
Augmentation; Crack Propagation; Damage; Models; Rotary Wing Aircraft; Tolerances (Mechanics)

20090005015 Mississippi State Univ., Mississippi State, MS, USA

Analysis of Fatigue Crack Growth Databses for Use in a Damage Tolerance Approach for Aircraft Propellers and Rotorcraft

Newman, J. C.; Nov. 2007; 93 pp.; In English

Contract(s)/Grant(s): 01-C-AW-MSU

Report No.(s): PB2008-106521; No Copyright; Avail.: National Technical Information Service (NTIS)

A large portion of the fatigue crack growth threshold data in this report is inappropriate due to the load reduction test procedure that was used to generate these data. The author, in collaboration with National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) personnel, is developing new test procedures to generate threshold data under steady-state constant-amplitude loading conditions without any load history effects. The new test method involves using compression precracking to generate a crack at a V-notch and then to test the specimen under constant-amplitude loading. A large test program on the development of these fatigue crack growth databases, for use in damage-tolerant analyses for aircraft propellers and rotorcraft components, was conducted at NASA LaRC under a Memorandum of Agreement with the Federal Aviation Administration (FAA). Some materials tested and analyzed herein were 7050-T7451 and 7075-T7351 aluminum alloys and D6AC and 4340 steels. Only the steels were tested as part of the FAA program. The 7075 alloy was tested at the NASA Johnson Space Center, and the 7050 and 7075 alloys were tested at NASA LaRC. This test program was conducted to generate more accurate representations of fatigue crack growth rate behavior in the near-threshold regime and approaching fracture under a wide range of constant stress ratio. The objective of the proposed research grant was to analyze the test data on selected propeller and rotorcraft materials to develop the effective stress-intensity factor range against crack growth rate relationship for use in damage tolerance analyses.

NTIS

Crack Propagation; Cracking (Fracturing); Damage; Fatigue (Materials); Fatigue Tests; Propellers; Rotary Wing Aircraft; Tolerances (Mechanics)

20090005016 National Inst. for Aviation Research, Wichita, KS, USA

Summary and Comparison Report on Teardown Evaluation of Cessna 402A and Cessna 402C Airplanes

Laubach, M.; Montgomery, M.; Cope, D.; Jun. 2007; 76 pp.; In English

Contract(s)/Grant(s): 01-C-AW-WISU

Report No.(s): PB2008-106519; No Copyright; Avail.: CASI: A05, Hardcopy

To determine if potential continuing airworthiness problems exist for the small airplane fleet as a function of the aging process, the Federal Aviation Administration (FAA) established a research program to conduct a destructive evaluation of two aged airplanes (both Cessna 402 models) used in the commuter service. The intent of the program is to provide insight into the condition of a typical aged airplane and to see if a correlation exists between its maintenance history and current condition from a safety of flight perspective. This report provides a summary and comparison of the findings from the teardown examination of a 1969 Cessna 402A and a 1979 Cessna 402C model airplane in support of the research program. The results provide information for use in future investigations into the aged small airplane fleet and may determine if additional research is required to address specific problems observed (if any). The destructive evaluations of the commuter-class airplanes were separated into three main tasks: (1) inspection of the airframe and airplane systems, (2) teardown examination of the airframe and airplane systems, and (3) assessment of the airplane wiring.

NTIS

Cessna Aircraft; Evaluation; Flight Safety

20090005017 California Univ., Berkeley, CA USA

Small-Scale Ballistic Impact Tests to Optimize Transport Airplane Rotor Burst Fragment Fabric Shielding Designs

May, C. A.; Oct. 2007; 48 pp.; In English

Contract(s)/Grant(s): 01-C-AW-UCB

Report No.(s): PB2008-106520; No Copyright; Avail.: National Technical Information Service (NTIS)

Under the Federal Aviation Administration Airworthiness Assurance Center of Excellence and the Aircraft Catastrophic Failure Prevention Program, the University of California at Berkeley (UCB) teamed with The Boeing Company to investigate lightweight ballistic protection of commercial aircraft from engine fragments. UCBs role was to perform small-scale impact tests of barriers made from single and multilayer Zylon fabric to assess different fabric shield concepts prior to full-scale aircraft fuselage demonstration. It should be noted that at the time of this study, Zylon fabric was found to have long-term environmental deterioration issues. However, for the purpose of this study, Zylon was used to leverage previous testing and

analysis on this fabric. This report describes the test results, including the energy absorbed and postimpact condition of the fabric barriers.
NTIS
Fabrics; Fragments; Gas Turbines; Impact; Impact Tests; Rotors; Shielding; Terminal Ballistics; Transport Aircraft

20090005018 National Inst. for Aviation Research, Wichita, KS, USA
Teardown Evaluation of a 1979 Cessna 402C Model Airplane
Laubach, M.; Cope, D.; May 2007; 253 pp.; In English
Contract(s)/Grant(s): 01-C-AW-WISU
Report No.(s): PB2008-106518; No Copyright; Avail.: National Technical Information Service (NTIS)

The Federal Aviation Administration established a research program to conduct a destructive evaluation of two aged airplanes (both Cessna 402 models) used in commuter service. The intent of the program was to provide insight into the condition of a typical aged airplane by determining if a correlation exists between the airplane's maintenance history and current condition from a safety of flight perspective. This document supports this research program by providing the findings of a teardown evaluation of a 1979 Cessna 402C model airplane. The results in this report will provide information for use in future investigations into the aged small airplane fleet and help determine if additional research is required to address any problems observed. The destructive evaluation of the commuter-class airplane was separated into three main tasks: (1) inspection of the airframe and airplane systems, (2) teardown examination of the airframe and airplane systems, and (3) assessment of the airplane wiring.
NTIS
Aircraft Models; Cessna Aircraft

20090005116 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Development and Flight Test of a Robust Optical-Inertial Navigation System Using Low-Cost Sensors
Nielsen, Michael B; Mar 2008; 295 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487988; AFIT/GE/ENG/08-19; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487988

This report develops and tests a precision navigation algorithm fusing optical and inertial measurements. This algorithm provides an alternative to the Global Positioning System (GPS) as a precision navigation source, enabling navigation in GPS denied environments, using low-cost sensors and equipment. A rigorous study of the fundamental nature of optical/inertial navigation is accomplished through the examination of the observability grammian of the underlying measurement equations. Through this analysis, a set of principles of design are proposed guiding the development of a navigation algorithm. An algorithm titled the Simultaneous Location Aiding And Mapping Recursively (SLAAMR) is thus described incorporating these principles of design, an extended Kalman Filter (EKF) and a Simultaneous Location And Mapping (SLAM) process. The SLAAMR algorithm is designed to provide robust navigation performance in realistic, full scale environments at a low cost. The principles of design and the SLAAMR algorithm are tested and evaluated using data collected at the USA Air Force Test Pilot School (USAF TPS). A full-scale aircraft flying operationally representative parameters and profiles was used to collect the data, and was correlated with highly precise Time Space Position Information (TSPI) truth data for validation and evaluation purposes. The flight test data supports the principles of design and highlights the challenges faced by any opticallybased navigation system. The resultant performance of the SLAAMR algorithm provides a robust, practical navigation solution to Air Force aircraft.
DTIC
Detectors; Flight Tests; Inertial Navigation; Low Cost

20090005180 NASA Dryden Flight Research Center, Edwards, CA, USA
Tests and Techniques for Characterizing and Modeling X-43A Electromechanical Actuators
Lin, Yohan; Baumann, Ethan; Bose, David M.; Beck, Roger; Jenney, Gavin; December 2008; 89 pp.; In English; Original contains color and black and white illustrations
Report No.(s): NASA/TM-2008-214637; H-2819; DFRC-434; Copyright; Avail.: CASI: A05, Hardcopy

A series of tests were conducted on the electromechanical actuators of the X-43A research vehicle in preparation for the Mach 7 and 10 hypersonic flights. The tests were required to help validate the actuator models in the simulation and acquire

a better understanding of the installed system characteristics. Static and dynamic threshold, multichannel crosstalk, command-to-surface timing, free play, voltage regeneration, calibration, frequency response, compliance, hysteretic damping, and aircraft-in-the-loop tests were performed as part of this effort. This report describes the objectives, configurations, and methods for those tests, as well as the techniques used for developing second-order actuator models from the test results. When the first flight attempt failed because of actuator problems with the launch vehicle, further analysis and model enhancements were performed as part of the return-to-flight activities. High-fidelity models are described, along with the modifications that were required to match measurements taken from the research vehicle. Problems involving the implementation of these models into the X-43A simulation are also discussed. This report emphasizes lessons learned from the actuator testing, simulation modeling, and integration efforts for the X-43A hypersonic research vehicle.
Author
Actuators; Frequency Response; Hypersonic Vehicles; X-45 Aircraft; Research Vehicles; Electromechanical Devices; Proving

20090005197 Federal Aviation Administration, Washington, DC, USA
Private Pilot Practical Test Standards for Lighter-Than-Air Balloon Airship
Jun. 1996; 68 pp.; In English
Report No.(s): PB2008-106038; FAA-S-8081-17; No Copyright; Avail.: CASI: A04, Hardcopy

The Private Pilot Lighter-Than-Air (Ballon and Airship) Practical Test Standards (PTS) book has been published by the Federal Aviation Administration (FAA) to establish the standards for private pilot certification practical tests for the lighter-than-air category, balloon and airship classes. FAA inspectors and designated pilot examiners shall conduct practical tests in compliance with these standards. Flight instructors and applicants should find these standards helpful during training and when preparing for the practical test.
NTIS
Airships; Balloon Flight

20090005230 Black Lowe and Graham, PLLC, Seattle, WA, USA
Apparatus and Methods for Structurally-Integrated Conductive Conduits for Rotor Blades
Kennedy, Dennis K., Inventor; Straub, Friedrich K., Inventor; Murrill, Robert J., Inventor; 9 Mar. 2006; 12 pp.; In English
Contract(s)/Grant(s): NAS2-01064
Patent Info.: Filed Filed 31 Aug. 04; US-Patent-Appl-SN-10-930 478; US 2006/0049302
Report No.(s): PB2008-100780; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005230

Structurally-integrated conductive conduits for rotor blades are disclosed. In one embodiment, an elongated rotor blade includes a body having a root portion and a distal portion spaced apart from the root portion, a device coupled to the body, and a conduit assembly disposed within the body and extending between the root portion and the device. The conduit assembly includes a main body assembly having at least one of a conductive lead, a fluid line, and an optical fiber disposed within a matrix material, the conduit assembly extending from the root portion to the device. In alternate embodiments, the device may comprise an actuator, a smart actuator, a piezoelectric material, an electromagnetic device, an electromechanical device, a hydraulic actuator, a pneumatic actuator, a light, and a sensor.
Author
Pipes (Tubes); Rotary Wings; Rotor Blades; Noise Reduction; Active Control

20090005935 Military Academy, West Point, NY USA
Swarming Unmanned Aircraft Systems
Teague, Edward; Kewley, Jr, Robert H; Sep 2008; 28 pp.; In English; Original contains color illustrations
Report No.(s): AD-A489366; DSE-TR-0808; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489366

Unmanned Aerial Systems (UAS) are entrenched as an integral part of strategic and tactical operations throughout the Department of Defense and other government agencies. In this time of emerging doctrine and rapid advances in technology, the breadth of mission profiles continues to expand. One way to increase efficiency of unmanned systems is to reduce the workload of its operators during missions. Like the swarms of some insects, semi autonomous UAVs can collaborate using

simple rule sets. These rule sets, when dynamically joined with mission specific tasks, provide the foundation for a self-organizing set of UAVs that all soldiers, not just 15Ws, can use. Mission tasks can be driven directly by the unit or personnel requiring UAS support for a particular mission. This limits 'losses in translation' and provides a shorter implementation time more directly empowering those that are supported. A system design to achieve this functionality is presented. It addresses the UAS architecture and rule set issues. Recommended rule sets are validated through simulation and analysis.
DTIC
Drone Vehicles; Self Organizing Systems; Swarming; Unmanned Aircraft Systems

20090005939 NASA Dryden Flight Research Center, Edwards, CA, USA
X-48B Flight Test Progress Overview
Risch, Timoth K.; Cosentino, Gary B.; Regan, Christopher D.; Kisska, Michael; Princen, Norman; January 05, 2009; 17 pp.; In English; 47th AIAA Aerospace Sciences Meeting, 5-8 Jan. 2009, Orlando, Fl, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The results of a series of 39 flight tests of the X-48B Low Speed Vehicle (LSV) performed at the NASA Dryden Flight Research Center from July 2007 through December 2008 are reported here. The goal of these tests is to evaluate the aerodynamic and controls and dynamics performance of the subscale LSV aircraft, eventually leading to the development of a control system for a full-scale vehicle. The X-48B LSV is an 8.5%-scale aircraft of a potential, full-scale Blended Wing Body (BWB) type aircraft and is flown remotely from a ground control station using a computerized flight control system located onboard the aircraft. The flight tests were the first two phases of a planned three-phase research program aimed at ascertaining the flying characteristics of this type of aircraft. The two test phases reported here are: 1) envelope expansion, during which the basic flying characteristics of the airplane were examined, and 2) parameter identification, stalls, and engine-out testing, during which further information on the aircraft performance was obtained and the airplane was tested to the limits of controlled flight. The third phase, departure limiter assaults, has yet to be performed. Flight tests in two different wing leading edge configurations (slats extended and slats retracted) as well as three weight and three center of gravity positions were conducted during each phase. Data gathered in the test program included measured airplane performance parameters such as speed, acceleration, and control surface deflections along with qualitative flying evaluations obtained from pilot and crew observations. Flight tests performed to-date indicate the aircraft exhibits good handling qualities and performance, consistent with pre-flight simulations.
Author
Blended-Wing-Body Configurations; Flight Tests; General Overviews; Full Scale Tests; Subsonic Aircraft

20090005982 Army Research Inst. for the Behavioral and Social Sciences, Fort Rucker, AL USA
U.S. Army Initial Entry Rotary-Wing Transfer of Training Research
Stewart, II, John E; Dohme, John A; Nullmeyer, Robert T; Jan 2000; 18 pp.; In English
Contract(s)/Grant(s): Proj-1123
Report No.(s): AD-A488061; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Early fixed-wing research demonstrated that potential cost and training benefits could be derived from simulation-augmented primary flight training. More recent research in this area has been the exception, not the rule. This is especially true for rotary-wing aircrew training research. Currently, the U.S. Army does not use simulation in the primary 'contact' phase of initial entry rotary-wing 'IERW' training. Research performed by the Army Research Institute showed that a combination of synthetic flight simulation and criterion-based training during the primary phase of IERW had the potential for saving training time and costs in the aircraft. This research was performed using a low-cost simulator based upon the UH-1 helicopter. In the 4 quasi-experiments reported, positive transfer effectiveness ratios 'TERs' were observed for most flight maneuvers pretrained in the simulator; student pilots in the simulator group required fewer iterations than control participants to reach proficiency on most flight maneuvers in the UH-1 training aircraft. As the visual display and flight modeling systems were upgraded, greater TERs were observed, and differences among groups tended to become significant.
DTIC
Flight Training; Rotary Wing Aircraft; Rotary Wings; Transfer of Training

20090006058 Air Force Research Lab., Wright-Patterson AFB, OH USA

Multi-Aircraft Video - Human/Automation Target Recognition Studies: Video Display Size in Unaided Target Acquisition Involving Multiple Videos

Plantz, Sarah E; Warfield, Lamar; Carretta, Thomas R; Gonzalez-Garcia, Airam; Patzek, Michael J; Lintern, Gavan; Hughes, Thomas; Apr 2008; 46 pp.; In English

Contract(s)/Grant(s): Proj-7184

Report No.(s): AD-A490660; AFRL-RH-WP-TR-2008-0074; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490660

As more unmanned aerial systems are incorporated into everyday military operations and as their roles become more demanding, efforts are underway to advance operator interface technology to improve human performance, system capability, and overall mission effectiveness. The System Control Interfaces Branch of the Air Force Research Laboratory is exploring multi-UAV, single-operator concepts for conducting reconnaissance, surveillance, and target acquisition (RSTA) missions. The multi-UAV research includes investigating advanced operator-vehicle interface technology and human performance associated with both mission and sensor management.

DTIC

Display Devices; Drone Vehicles; Surveillance; Target Acquisition; Target Recognition

20090006104 NASA, Washington, DC USA

Re-entry vehicle shape for enhanced performance

Brown, James L., Inventor; Garcia, Joseph A., Inventor; Prabhu, Dinesh K., Inventor; October 7, 2008; 13 pp.; In English Patent Info.: Filed November 1, 2005; US-Patent-7,431,242; NASA-Case-ARC-15606-1; US-Patent-Appl-SN-11/265,324; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006104

A convex shell structure for enhanced aerodynamic performance and/or reduced heat transfer requirements for a space vehicle that re-enters an atmosphere. The structure has a fore-body, an aft-body, a longitudinal axis and a transverse cross sectional shape, projected on a plane containing the longitudinal axis, that includes: first and second linear segments, smoothly joined at a first end of each the first and second linear segments to an end of a third linear segment by respective first and second curvilinear segments; and a fourth linear segment, joined to a second end of each of the first and second segments by curvilinear segments, including first and second ellipses having unequal ellipse parameters. The cross sectional shape is non-symmetric about the longitudinal axis. The fourth linear segment can be replaced by a sum of one or more polynomials, trigonometric functions or other functions satisfying certain constraints.

Official Gazette of the U.S. Patent and Trademark Office

Reentry Vehicles; Aerodynamic Characteristics; Afterbodies; Aircraft Performance

20090006139 Marine Corps Development and Education Command, Quantico, VA USA

'Back to the Future:' The UH-1Y Utility Helicopter; A Multi-Role Solution for a Changing Security Environment

Smith, Tres C; Jan 2008; 49 pp.; In English

Report No.(s): AD-A491167; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491167

Due to the capability shortfalls associated with the transformation of the Marine Corps aviation force structure and the challenges associated with a changing security environment, the role of the utility helicopter must evolve to achieve a true multi-mission capability. Through a change in paradigm, the Marine Corps must properly equip the UH-lY to meet these challenges. Conclusion: The current composition of the Marine Corps aviation force structure will remain constant for the next 25 years. The transition of upgraded type model series aircraft within the existing force structure coupled with the constraints of a bureaucratic acquisitions process and the security challenges associated with irregular warfare, security cooperation initiatives and the long war have generated significant capabilities gaps within its operational requirements. The solution will therefore require a timely and fiscally responsible alternative that will involve a paradigm change within existing helicopter doctrine and employment. That solution is the evolution of the utility helicopter into a true multi-role aircraft that possesses the capability, equipment, and versatility to meet the challenges of a changing security environment.

DTIC

Helicopters; Security

20090006193 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Nondestructive Evaluation of Aircraft Composites Using Terahertz Time Domain Spectroscopy

Stoik, Christopher D; Dec 10, 2008; 161 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491327; AFIT/DS/ENP/09-D02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Terahertz (THz) time domain spectroscopy (TDS) was assessed as a nondestructive evaluation technique for aircraft composites. Material properties of glass fiber composite were measured using both transmission and reflection configuration. The interaction of THz with a glass fiber composite was then analyzed, including the effects of scattering, absorption, and the index of refraction, as well as effective medium approximations. THz TDS, in both transmission and reflection configuration, was used to study composite damage, including voids, delaminations, mechanical damage, and heat damage. Measurement of the material properties on samples with localized heat damage showed that burning did not change the refractive index or absorption coefficient noticeably; however, material blistering was detected. Voids were located by THz TDS transmission and reflection imaging using amplitude and phase techniques. The depth of delaminations was measured via the timing of Fabry-Perot reflections after the mail pulse. Evidence of bending stress damage and simulated hidden cracks was also detected with terahertz imaging.

DTIC

Composite Materials; Nondestructive Tests; Spectroscopy

20090006225 Florida Atlantic Univ., Boca Raton, FL USA

A Theoretical Study of Leading Edge Noise

Glegg, Stewart; May 2008; 41 pp.; In English

Contract(s)/Grant(s): N00014-05-1-0463

Report No.(s): AD-A491573; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The report describes a theoretical procedure for calculating leading edge noise which addresses the differences found between current theoretical calculations and wind tunnel measurements of unsteady lift on airfoils in turbulent flow. The results have been compared with experiments carried at in a companion study at Virginia Tech by Dr. William Devenport. It was concluded that the effect of angle of attack on the radiated noise is relatively weak but the effect of thickness is to reduce the radiated sound levels at high frequencies.

DTIC

Airfoils; Leading Edges; Turbulent Flow

20090006240 Marine Corps Development and Education Command, Quantico, VA USA

AH-1Z: A Snake Without Fangs?

Lipiec, B L; Mar 1, 2002; 15 pp.; In English

Report No.(s): AD-A491658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In 2OO6, the first AH-1Z attack helicopters will begin entering service to replace the current AH-1W Super Cobras. The new aircraft will carry 2.V5- and 5-inch rockets, air-to-air missiles, a 2Omm gun, but only one type of precision guided missile (PGM). Joint Vision 2020 states that the USA 'must be prepared to ′win' across the full range of military operations in any part of the world...' Yet, armed only with Hellfire missiles, the AH-1Z's lethality and effectiveness on the modern asymmetric battlefield will be degraded without versatile PGMs capable of destroying a multi-faceted enemy.

DTIC

Attack Aircraft; Military Helicopters; Missiles; Snakes

20090006265 York Univ., UK

Safety Cases for Advanced Control Software: Safety Case Patterns

Alexander, Robert; Kelly, Tim P; Kurd, Zeshan; McDermid, John A; Oct 15, 2007; 29 pp.; In English

Contract(s)/Grant(s): FA8655-07-1-3025

Report No.(s): AD-A491299; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491299

This report results from a contract tasking University of York. The project will undertake one activity: Produce a unified (generic) approach to developing safety cases for adaptive avionics and software and identifying a 'way ahead' to develop and validate the approach, based on the outline produced in the preceding NASA project. As with the previous report, the authors' focus in addressing safety cases for 'advanced' control systems is to concentrate on the class of adaptive systems. A system can be considered adaptive if its behavior cannot be predicted solely from knowledge of its initial software design and state.

The behavior of an adaptive system is the product of its initial state and the adaptations (state changes) that have taken place according to the stimuli it has encountered. Adaptive systems can be introduced to improve safety (e.g., to continue to control an aircraft safely in the event of losing a control surface), or to improve other system characteristics (e.g., to improve the fuel consumption of an aero-engine). The motivation for introducing an adaptive capability has a significant impact on the nature of the required safety argument. Where improved safety is the goal of the adaptation, the safety argument must justify that the adaptive system is capable of reducing some of the risks associated with hazards already present with the equipment under control. At the same, it is necessary to ensure that the introduction of the adaptive capability does not introduce new, or increase existing, risks. Where adaptation is being introduced for reasons other than safety, safety can be viewed as a constraint. The principal concern is that the adaptive capability doesn't introduce new, or increase existing, risks.
DTIC
Adaptation; Aircraft Safety; Avionics; Computer Programming; Control; Flight Safety; Program Verification (Computers); Risk; Safety; Software Engineering

20090006266 Marine Corps Development and Education Command, Quantico, VA USA
Unguided Rocket Employment: Why We Must Update Marine Corps Rotary Wing Attack Training
Joyce, Richard D; Mar 2008; 115 pp.; In English
Report No.(s): AD-A491463; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491463

The success of the AH-1W helicopter rests primarily on its versatility and that of its pilots. The ability to adapt to enemy threats throughout the spectrum of conflict and provide MAGTF commanders with quick, responsive, and effective fire support has been the hallmark of the community for years. One aspect of versatility inherent with the AH-1W is its variety of weapons capabilities. Complimentary weapons, such as precision guided munitions (PGMs) and unguided munitions, allow pilots to adapt to an ever-changing environment. Versatility does not, however, rest solely with the weapons. Air crews must remain proficient in effectively and accurately employing those weapons. That versatility, however, may be degrading. An analysis of the limited data available reveals a significant lack of proficiency in rocket delivery accuracy. Analyzing data from the last 15 Weapons and Tactics Instructor (WTI) Courses shows a student average miss distance in excess of 59 meters from the intended target. Unfortunately, no consistent performance standards exist in the current Training and Readiness Manual (T&R) by which to judge proficiency in this skill. Equally disconcerting are the observations by community subject matter experts that many pilots are content to rely solely on precision guided munitions for increased accuracy; this is a tenuous proposition considering technology can fail and external factors can affect PGM accuracy. The current T&R Manual Program of Instruction, consisting of only eight training events dedicated to unguided weapons employment, does not provide enough focused training to effectively develop that skill set. Although other weapons employment training opportunities exist, the focus during those events does not center on developing the fundamentals of accurate weapons employment. Additionally, the T&R Manual lacks needed performance standards required to effectively assess and evaluate individual pilot skill proficiency.
DTIC
Abilities; AH-1W Helicopter; Attack Aircraft; Education; Military Helicopters; Pilots; Rotary Wings; System Effectiveness; Weapon Systems; Weapons Delivery

20090006278 Marine Corps Development and Education Command, Quantico, VA USA
The Marine Light Attack Helicopter Paradigm: Upgrade, Replace or Invest in the Future?
Jan 1996; 22 pp.; In English
Report No.(s): AD-A491771; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491771

If defense budget cuts continue their present trend, the Marine Light Attack Helicopter (HMLA) community will support the Corps of the 21st century with 1980 technology because of improper funding and wait-and-see strategies. Trapped in a decreasing Defense budget crunch, the aging fleet of HMLA helicopters will enter the 21st century without the technological enhancements desperately needed to support the Commandant's operational maneuver from the sea (OMFTS). The HMLA community continues to choose an upgrade vice replacement strategy. HMLA funding has historically fallen to the back of the line concerning congressional funding and military priorities. The UH-1N needs to be replaced, not upgraded. Money spent on the HML-60 and dollars invested now into tilt rotor technology will keep the HMLA community viable beyond the first quarter of the 21st century.
DTIC
Attack Aircraft; Light Helicopters; Military Aircraft; Military Helicopters; Procurement; Replacing

20090006377 Marine Corps Development and Education Command, Quantico, VA USA

Time to Stand Down: Justification for the Decommissioning of USMC Reserve F/A-18 Squadrons

Jakubowski, E S; Hobbs, T K; Feb 20, 2004; 13 pp.; In English

Report No.(s): AD-A491882; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In an uncertain world, the Marine Corps must learn to stretch every dollar available to maximize its war fighting capability. Escalating operation and maintenance costs, budgetary constraints, and increased deployment tempos all emphasize this point. Unfortunately, by continuing to cling to the excess infrastructure of reserve F/A-18 Hornet squadrons, the Marine Corps is spreading its resources too thin and risking not sufficiently equipping its active duty forces with the tools required to succeed in combat. Although maintaining reserve squadrons may have been justified in the past, the elimination of the four remaining reserve E/A-18 squadrons would greatly benefit the Marine Corps. These improvements include decreased operational costs, better personnel management, and increased aircraft availability.

DTIC

Attack Aircraft; Decommissioning; Fighter Aircraft; Jet Aircraft; Military Aviation; Reserves

20090006379 Marine Corps Development and Education Command, Quantico, VA USA

Planning To Fail: Building Aircraft Dependent Upon LASER

Moore, J L; Montgomery, B; Feb 20, 2004; 12 pp.; In English

Report No.(s): AD-A491886; No Copyright; Avail.: Defense Technical Information Center (DTIC)

After serving Marine Corps aviation faithfully for 18 years, it's time for the Cobra to get a facelift. 280 AH-1W airframes will be remanufactured to theoretically new 0-hour aircraft with significant upgrades. The replacement--the AH-1Z (Zulu) model--will use a newer, smarter missile rack capable of launching both Hellfire II missiles and the Joint Common Missile (JCM) . Although still under development, the JCM will be capable of targeting using imaging infrared, semi-active laser, and millimeter wave (MMW) radar. The JOM will provide great methods of targeting on an open battlefield, but in the urban environment the JCM will have serious shortfalls. Additionally, while the Zulu will achieve initial operational capability in 200E', the JCM will not be fielded until at least 20082 (assuming it arrives on schedule) . Ironically, without a direct-fire weapon that is capable of targeting in an urban environment, such as the TOW missile, the AH-1Z will be a less capable helicopter than the AH-1W.

DTIC

Air to Surface Missiles; Helicopters; Lasers; Military Aviation

20090006381 Marine Corps Development and Education Command, Quantico, VA USA

Joint Replacement Aircraft: The Case for a Single Multi-Mission HMLA Platform

McGowan, S R; Jan 1999; 62 pp.; In English

Report No.(s): AD-A491890; USMC/CSC-1999; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The proposed introduction of the Joint Replacement Aircraft, as a follow-on for the UH-1Y/AH-1Z program, is an ideal opportunity to build a single platform that performs both the rotary-wing attack and utility missions for the Marine Corps. Historically, the Marine Light/Attack Helicopter missions have been flown by two different aircraft. The AH-1 Cobra performs the attack mission, while the UH-1 Huey handles various 'utility' tasks. Originally assigned in equal numbers, each squadron is now equipped with 18 AH-1W Cobras and 9 UH-1N Hueys. The two-to-one ratio is indicative of a trend. Over the years, the UH-1N's performance has been eroded by the increased weight of new systems. This reduced capability has left many questioning the worth of a 'utility' platform. The poor capability of the UH-1N is mistakenly viewed as a reflection on the poor value of multi-purpose helicopters in general. Although the Huey and Cobra are both Bell products that originally shared many components, the Cobra has received extensive upgrades since its introduction. As a result, the two helicopters now share very few parts and require specialized maintenance training. In an effort to correct these deficiencies, the four bladed UH-1Y/AH-1Z program was initiated to improve performance and dramatically increase commonality. When these new helicopters begin arriving in 2003, they will share 85% in common components. While the UH-1Y/AH-lZ program an important step in the right direction, an opportunity for even greater benefits lies ahead. An undeveloped concept program, the Joint Replacement Aircraft, is slated for introduction in the 2015 to 2020 time frame. Although the design is still open, many involved with the acquisition process believe that a tilt-rotor or futuristic canard rotary wing concept is favored over a conventional helicopter.

DTIC

Helicopters; Replacing

20090006383 Marine Corps Development and Education Command, Quantico, VA USA
USA Marine Corps' CH-53E Super Stallion Modernization: Necessary Victim of Transformation
Sichenzia, Paul G; Jan 2003; 67 pp.; In English
Report No.(s): AD-A491918; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A Service Life Extension Program (SLEP) is necessary to prolong the operational capability of the CH-53E in support of Marine Corps expeditionary capabilities. Is modernization of the CH-53E Super Stallion necessary, or should it be retired as a necessary victim of transformation? Will the current and future Marine Corps doctrine and concepts be executable without the heavy lift capability provided by the CH-53E? Specifically, if the CH-53E is a concept enabler, the Service Life Extension Program (SLEP)/Modernization needs to be defined, approved, and procured quickly in order to allow continuation of the Marine Corps as a force in readiness in support of the nation s military strategy and the Combatant Commanders. As prescribed by the 82nd Congress, the Marine Corps is to be a versatile, fast-moving, hardhitting force. Moreover, we remain the most ready when the nation generally is least ready. Current competition for new systems and programs has necessitated the reevaluation of all existing and future weapon systems by each of the armed services. Under the moniker of Transformation, new programs must provide a significant advance in technology and capability to be in line with the Secretary of Defense's guidance driving effects based operational capabilities. Those programs that do not conform to this concept face cancellation. Presently, due to recent accidents and reduced confidence in the MV-22 Osprey program and its technology, the Osprey is again required to justify its relevance, capability, and survivability. However, even if the Osprey program is approved, a significant gap in future capabilities will still exist. Specifically, the heavy lift capabilities will be deficient. Currently the increased use of the CH-53E Super Stallion has made up for the delay in the MV-22's arrival. However, increased use and aging airframes will only expedite the retirement of the CH-53E.
DTIC
Helicopters; United States

20090006405 Marine Corps Development and Education Command, Quantico, VA USA
AC-130 Employment
Hornick, Robert; Jan 2006; 14 pp.; In English
Report No.(s): AD-A492023; USMC-BWS-2006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

3 The primary missions for the AC-130 are close air support, air interdiction, and armed reconnaissance. Other missions include perimeter and point defense, escort, landing, drop and extraction zone support, forward air control, limited command and control, and combat search and rescue. During the last few years, Marines have found the AC-130H/U gunship to be the favored aircraft used for close air support. This is especially true for Operation Iraqi Freedom II, in which Marines found most of the fighting to be in urban settings. A few reasons for this favoritism include: accurate and sustained firepower, time on station, and advanced optics. AC-130s carry a lethal mix of firepower that varies slightly depending on whether it is an AC-130(H) Spectre, or AC-130(U) Spooky model. Both models are equipped with a L60 40mm Bofors cannon capable of firing up to one hundred rounds per minute as well as a M102 105mm howitzer capable of shooting six to ten rounds per minute. Spectre models are equipped with two M61 20mm GAU-4 Vulcan cannons capable of firing four or six thousand rounds per minute, where the Spooky model3 The primary missions for the AC-130 are close air support, air interdiction, and armed reconnaissance. Other missions include perimeter and point defense, escort, landing, drop and extraction zone support, forward air control, limited command and control, and combat search and rescue. During the last few years, Marines have found the AC-130H/U gunship to be the favored aircraft used for close air support. This is especially true for Operation Iraqi Freedom II, in which Marines found most of the fighting to be in urban settings. A few reasons for this favoritism include: accurate and sustained firepower, time on station, and advanced optics. AC-130s carry a lethal mix of firepower that varies slightly depending on whether it is an AC-130(H) Spectre, or AC-130(U) Spooky model.
DTIC
Alternating Current; Command and Control; Transport Aircraft

20090006417 Army War Coll., Carlisle Barracks, PA USA
Strategic Mobility: 1965-1980
Eggers, Jr, George D; Apr 22, 1966; 33 pp.; In English
Report No.(s): AD-A488167; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the past five years the Department of Defense (DoD) has placed a disproportionate emphasis on the qualitative and quantitative improvement of the national military strategic airlift capability. But no real attempt has been made to develop a modern sealift capability to complement the strategic aircraft being procured under the comprehensive airlift modernization program initiated in 1961. As a consequence, a progressive lack of balance is emerging between the quality of the strategic

airlift capacity and that of the strategic sealift fleet. To attain balance in its strategic mobility posture during the 1965-1980 period, the DoD should implement a long-range MSTS modernization program to replace the fractional effort presently programmed. In addition, a Presidential Commission should be appointed to make appropriate recommendations with respect to improving the capability of the U.S. Merchant Marine to perform its dual mission of carrying U.S. commercial cargoes and serving as an auxiliary to the MSTS fleet. If a balanced and flexible strategic mobility attitude is to be achieved, there is a requirement for an organizational structure that will plan and execute strategic deployments effectively, provide a mechanism for furnishing timely and pertinent information on strategic mobility matters to national decision-makers, and produce a competent and full-time spokesman to 'sell' appropriate strategic mobility programs to the executive and legislative branches of the government. To date, no demonstrable operational or planning defects in the existing organization have been uncovered that would justify consequential changes in the present organizational groupings. Future stresses and strains placed upon the organization for strategic mobility may disclose major deficiencies that will make it imperative that a mechanism be created for more centralized control over the strategic lift capability.
DTIC
Mobility; Military Operations

20090006554 Science Applications International Corp., Beavercreek, OH USA
Developing a Corrective Action Simulator to Support Decision Making Research and Training
Doyal, Jeffrey A; Sargent, Michael G; Overdorf, Roger L; McClure, Robert S; Haas, Michael W; May 2008; 74 pp.; In English
Contract(s)/Grant(s): FA8650-06-C-6750; Proj-2830
Report No.(s): AD-A487489; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Air Force Research Laboratory, in an effort to identify and evolve human performance modeling tools and their application to human performance research and training, developed a conceptual prototype of a corrective action simulator (CAS). Applied to an AWACS environment, this prototype CAS system employs task-network-based human performance modeling, 3-D visualization including avatars, speech recognition and synthesis, virtual workstations, and computer-based training components to create an immersive environment in which a live operator in the role of Senior Director can observe and interact with synthetic Weapons Directors. The live operator can observe the synthetic Weapons Directors performing their designated functions and issue verbal corrective action when he/she observes an error being made. The scenario represented reflects a real-world event in which corrective action was required to avoid mission failure. Such an immersive system portraying complex, real world events, provides an ideal environment for the study and training of naturalistic decision making. This report provides an overview of the prototype CAS system development process, including lessons learned, and a brief follow-on effort to create avatars tailored to resemble specific individuals.
DTIC
AWACS Aircraft; Decision Making; Education; Human Performance; Performance Prediction; Simulators

20090006556 Pennsylvania Univ., Philadelphia, PA USA
UMCE-FM: Untethered Motion Capture Evaluation for Flightline Maintenance Support
Kider, Jr , Joseph T; Stocker, Catherine R; Badler, Norman I; Jun 2008; 42 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-6546; Proj-7184
Report No.(s): AD-A487504; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this research was to explore and evaluate the utility of novel motion capture technologies within the Air Force maintenance domain. The primary objective was to determine the potential of untethered motion capture capabilities for real-time human subject motion capture and performance data collection with full-scale physical props. The second objective was to evaluate data collected during maintenance task performance validation for the purpose of instruction generation and maintenance training. The effort consisted of domain analysis, conceptual design definition, prototype development, and a performance evaluation within relevant operational maintenance scenarios. Both university laboratories and field-based research environments were used to evaluate the efficacy of untethered motion capture.
DTIC
Maintenance; Real Time Operation; Maintenance Training

20090006633 National Academy of Sciences - National Research Council, Washington, DC, USA
U.S. Supersonic Commercial Aircraft: Assessing NASA's High Speed Research Program
[1997]; 165 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NASW-4938
Report No.(s): LC-97-69127; Copyright; Avail.: Other Sources
ONLINE: http://www.nap.edu/catalog.php?record_id=5848

The legislatively mandated objectives of the National Aeronautics and Space Administration (NASA) include 'the improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles' and 'preservation of the USA' preeminent position in aeronautics and space through research and technology development related to associated manufacturing processes.' Most of NASA's activities are focused on the space-related aspects of these objectives. However, NASA also conducts important work related to aeronautics. NASA's High Speed Research (HSR) Program is a focused technology development program intended to enable the commercial development of a high speed (i.e., supersonic) civil transport (HSCT). However, the HSR Program will not design or test a commercial airplane (i.e., an HSCT); it is industry's responsibility to use the results of the HSR Program to develop an HSCT. An HSCT would be a second generation aircraft with much better performance than first generation supersonic transports (i.e., the Concorde and the Soviet Tu-144). The HSR Program is a high risk effort: success requires overcoming many challenging technical problems involving the airframe, propulsion system, and integrated aircraft. The ability to overcome all of these problems to produce an affordable HSCT is far from certain. Phase I of the HSR Program was completed in fiscal year 1995; it produced critical information about the ability of an HSCT to satisfy environmental concerns (i-e., noise and engine emissions). Phase II (the final phase according to current plans) is scheduled for completion in 2002. Areas of primary emphasis are propulsion, airframe materials and structures, flight deck systems, aerodynamic performance, and systems integration.
Author
Civil Aviation; Commercial Aircraft; Manufacturing; Supersonic Transports; Tu-144 Aircraft; NASA Programs; High Speed

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.

20090006534 Honeywell International, Inc., Morristown, NJ USA
Multiple Miniature Avionic Displays
Rye, Jeffrey M., Inventor; Dorneich, Michael C., Inventor; Gannon, Aaron J., Inventor; August 19, 2008; 7 pp.; In English
Contract(s)/Grant(s): NAS1-00107; NAS1-00107
Patent Info.: Filed April 28, 2005; US-Patent-7,414,543; US-Patent-Appl-SN-11/116,971; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006534

A display screen for displaying multiple sets of information is provided. In one embodiment, an aviation display screen includes a main window and a plurality of miniature windows. The main window is adapted to illustrate one set of information. Each miniature window is adapted to display a set of avionic information. The avionic display is further adapted to toggle a select set of avionic information in one of the miniature windows into the main window.
Official Gazette of the U.S. Patent and Trademark Office
Avionics; Display Devices; Screens; Miniaturization

07
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.

20090005064 Troutman Sanders , LLP, Atlanta, GA, USA
Stagnation Point Reverse Flow Combustor
Zinn, Ben T., Inventor; Neumeier, Yedidia, Inventor; Seitzman, Jerry M., Inventor; Jagoda, Jagoda, Inventor; Weksler, Yoav, Inventor; 15 Dec. 2005; 17 pp.; In English
Contract(s)/Grant(s): NCC3-982

Patent Info.: Filed 26 Aug. 04; US-Patent-Appl-SN-10/ 927,205; US 2005/0277074
Report No.(s): PB2007-109389; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005064

A method for combusting a combustible fuel includes providing a vessel having an opening near a proximate end and a closed distal end defining a combustion chamber. A combustible reactants mixture is presented into the combustion chamber. The combustible reactants mixture is ignited creating a flame and combustion products. The closed end of the combustion chamber is utilized for directing combustion products toward the opening of the combustion chamber creating a reverse flow of combustion products within the combustion chamber. The reverse flow of combustion products is intermixed with combustible reactants mixture to maintain the flame.
Official Gazette of the U.S. Patent and Trademark Office
Combustion Chambers; Patent Applications; Stagnation Point

20090005178 NASA Glenn Research Center, Cleveland, OH, USA
Testing of a Microwave Blade Tip Clearance Sensor at the NASA Glenn Research Center
Woike, Mark R.; Roeder, James W.; Hughes, Christopher E.; Bencic, Timothy J.; January 05, 2009; 14 pp.; In English; 47th AIAA Aerosciences Conference, 5-8 Jan. 2009, Orlando, FL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 984754.02.07.03.13.06
Report No.(s): E-16826; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005178

The development of new active tip clearance control and structural health monitoring schemes in turbine engines and other types of rotating machinery requires sensors that are highly accurate and can operate in a high temperature environment. The use of a microwave sensor to acquire blade tip clearance and tip timing measurements is being explored at the NASA Glenn Research Center. The microwave blade tip clearance sensor works on principles that are very similar to a short range radar system. The sensor sends a continuous microwave signal towards a target and measures the reflected signal. The phase difference of the reflected signal is directly proportional to the distance between the sensor and the target being measured. This type of sensor is beneficial in that it has the ability to operate at extremely high temperatures and is unaffected by contaminants that may be present in turbine engines. The use of microwave sensors for this application is a new concept. Techniques on calibrating the sensors along with installation effects are not well quantified as they are for other sensor technologies. Developing calibration techniques and evaluating installation effects are essential in using these sensors to make tip clearance and tip timing measurements. As a means of better understanding these issues, the microwave sensors were used on a bench top calibration rig, a large axial vane fan, and a turbofan. Background on the microwave tip clearance sensor, an overview of their calibration, and the results from their use on the axial vane fan and the turbofan will be presented in this paper.
Author
Blade Tips; Microwave Sensors; Turbine Engines; Clearances; Time Measurement; Contaminants; High Temperature Environments; Active Control; Calibrating

20090005226 Bachman and Lapointe, PC, New Haven, CT, USA
Bootstrap Data Methodology for Sequential Hybrid Model Building
Volponi, Allan J., Inventor; Brotherton, Thomas, Inventor; 2 Mar. 2006; 11 pp.; In English
Contract(s)/Grant(s): NAS4-02038
Patent Info.: Filed Filed 26 Aug. 04; US-Patent-Appl-SN-10-926 760; US 2006/0047487
Report No.(s): PB2008-101123; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005226

A method for modeling engine operation comprising the steps of: (1) collecting a first plurality of sensory data, (2) partitioning a flight envelope into a plurality of sub-regions, (3) assigning the first plurality of sensory data into the plurality of sub-regions, (4) generating an empirical model of at least one of the plurality of sub-regions, (5) generating a statistical summary model for at least one of the plurality of sub-regions, (6) collecting an additional plurality of sensory data, (7) partitioning the second plurality of sensory data into the plurality of sub-regions, (8) generating a plurality of pseudo-data using the empirical model, and (9) concatenating the plurality of pseudo-data and the additional plurality of sensory data to generate an updated empirical model and an updated statistical summary model for at least one of the plurality of sub-regions.
Author
Models; Gas Turbine Engines; Aircraft Engines; Computerized Simulation

20090005227 Bachman and Lapointe, PC, New Haven, CT, USA
System for Gas Turbine Health Monitoring Data Fusion
Volponi, Allan J., Inventor; Wood, C. Bruce, Inventor; 2 Mar. 2006; 6 pp.; In English
Contract(s)/Grant(s): NAS3-98005
Patent Info.: Filed Filed 26 Aug. 04; US-Patent-Appl-SN-10-926 464; US 2006/0047403
Report No.(s): PB2008-101122; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005227

An apparatus for assessing health of a device comprising a data alignment module for receiving a plurality of sensory outputs and outputting a synchronized data stream, an analysis module for receiving the synchronized data stream and outputting at least one device health feature, and a high level diagnostic feature information fusion module for receiving the at least one device health feature and outputting a device health assessment.
Author
Gas Turbine Engines; Modules; Multisensor Fusion; Systems Health Monitoring

20090006282 Royal Aircraft Establishment, Farnborough, UK
Development of Pyrotechnic Igniters for a 6 in. Ramjet
Porter, K H; Jun 1952; 37 pp.; In English
Report No.(s): AD-A491810; RAE-TN-GW-200; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491810

Tests have been made to develop a suitable pyrotechnic igniter for the Reid air blast burner 6 in. ramjet. Two types of igniter have been successfully developed, one flash typo and one long burning type. The modifications necessary to adopt standard pyrotechnic practice to fulfil the exacting requirements of ramjet ignition are described.
DTIC
Igniters; Pyrotechnics; Ramjet Engines

08
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.

20090005992 NASA Glenn Research Center, Cleveland, OH, USA
Current Methods for Modeling and Simulating Icing Effects on Aircraft Performance, Stability and Control
Ralvasky, Thomas P.; Barnhart, Billy P.; Lee, Sam; December 2008; 28 pp.; In English; Atmospheric Flight Mechanics Conference and Exhibit, 18-21 Aug. 2008, Honolulu, HI, USA; Original contains black and white illustrations
Contract(s)/Grant(s): WBS 457280.02.07.03.02
Report No.(s): NASA/TM-2008-215453; AIAA-Paper-2008-6204; E-16643; Copyright; Avail.: CASI: A03, Hardcopy

Icing alters the shape and surface characteristics of aircraft components, which results in altered aerodynamic forces and moments caused by air flow over those iced components. The typical effects of icing are increased drag, reduced stall angle of attack, and reduced maximum lift. In addition to the performance changes, icing can also affect control surface effectiveness, hinge moments, and damping. These effects result in altered aircraft stability and control and flying qualities. Over the past 80 years, methods have been developed to understand how icing affects performance, stability and control. Emphasis has been on wind tunnel testing of two-dimensional subscale airfoils with various ice shapes to understand their effect on the flow field and ultimately the aerodynamics. This research has led to wind tunnel testing of subscale complete aircraft models to identify the integrated effects of icing on the aircraft system in terms of performance, stability, and control. Data sets of this nature enable pilot in the loop simulations to be performed for pilot training, or engineering evaluation of system failure impacts or control system design.
Author
Aircraft Icing; Flight Characteristics; Simulation; Aerodynamic Forces; Aircraft Control; Angle of Attack

20090006201 Armstrong Lab., Williams AFB, AZ USA
Visual Issues in Training and Simulation: Presentation Summaries
Dec 1991; 139 pp.; In English
Contract(s)/Grant(s): Proj-1123
Report No.(s): AD-A491366; AL-TR-1991-0171; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report contains summaries of the information presented at the Interagency Technical Information Exchange meeting,

hosted by Armstrong Laboratory's Aircrew Training Research Division, Williams AFB AZ, in October 1991. The subject of the meeting was visual issues in training and simulation. Paper topics included: Display image quality; Psychophysical assessment of wide-field, variable resolution imagery; Eye measurement system for flight simulation; Eye movement behavior of pilots; Vision and visibility issued in US Navy landing craft; Use of color in flight simulators; Determinants and consequences of smooth pursuit; Infrared imagery in flight; Night flights over featureless terrains; Training system definition for a Navy visual simulator; Vision research at the FAA Civil Aeromedical Institute; Vision research at NASA Ames FLM Branch; Ongoing R&D in night vision devices; Visual limitations of night vision devices; Visual system transport delay on pilot performance; Visually induced motion sickness; Vision on manual control and spatial orientation; Flight simulator side effects; Flight simulation visual research by the US Army; Cuing and scene content requirements for low level flight; Performance effects on pilot tasks; Vision research at AL/OEDL; Grating effects following laser-produced central retinal lesions; Human spatial vision; Target acquisition simulation; Target identification requirements; Aided night vision training; and Night vision device training research at Williams AFB AZ.
DTIC
Education; Flight Simulation; Flight Simulators; Flight Training

20090006461 York Univ., Ontario Canada
Safety Cases for Advanced Control Software
Alexander, Robert; Hall-May, Martin; Kelly, Tim; McDermid, John; Jun 18, 2007; 15 pp.; In English
Contract(s)/Grant(s): FA8655-06-1-3041
Report No.(s): AD-A492296; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This report results from a contract tasking University of York as follows: The project will undertake three activities: 1. Review current rules and regulations for clearing flight control software to establish a 'baseline' for the other two activities; 2. Assess the state-of-the-art in safety cases for adaptive systems and software, including neural networks and agents; 3. Outline a generic approach to developing safety cases for adaptive avionics and software. Each activity would produce a stand-alone report for delivery to NASA.
DTIC
Computer Programming; Flight Control; Reliability; Safety; Software Engineering

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*.

20090005028 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mission Planning and Scheduling System for NASA's Lunar Reconnaissance Mission
Garcia, Gonzalo; Barnoy, Assaf; Beech, Theresa; Saylor, Rick; Cosgrove, Sager; Ritter, Sheila; [2009]; 2 pp.; In English; Ground Systems Architecture Workshop (GSAW), 23-26 Mar. 2009, Torrence, CA, USA
Contract(s)/Grant(s): NNG04DA01C; Copyright; Avail.: Other Sources; Abstract Only
In the framework of NASA's return to the Moon efforts, the Lunar Reconnaissance Orbiter (LRO) is the first step. It is an unmanned mission to create a comprehensive atlas of the Moon's features and resources necessary to design and build a lunar outpost. LRO is scheduled for launch in April, 2009. LRO carries a payload comprised of six instruments and one technology demonstration. In addition to its scientific mission LRO will use new technologies, systems and flight operations concepts to reduce risk and increase productivity of future missions. As part of the effort to achieve robust and efficient operations, the LRO Mission Operations Team (MOT) will use its Mission Planning System (MPS) to manage the operational activities of the mission during the Lunar Orbit Insertion (LOI) and operational phases of the mission. The MPS, based on GMV's flexplan tool and developed for NASA with Honeywell Technology Solutions (prime contractor), will receive activity and slew maneuver requests from multiple science operations centers (SOC), as well as from the spacecraft engineers. flexplan will apply scheduling rules to all the requests received and will generate conflict free command schedules in the form of daily stored command loads for the orbiter and a set of daily pass scripts that help automate nominal real-time operations.
Author
Mission Planning; Lunar Orbiter; Launch Dates; Lunar Exploration

20090005060 NASA Kennedy Space Center, Cocoa Beach, FL USA
KSC and Space-Related Area Attractions
Mar. 1997; 10 pp.; In English
Report No.(s): AD-A470479; KSC Release No. 92-131; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005060

This fact pamphlet lists and describes the visitor facilities on the Kennedy Space Center or nearby area that are related to space exploration. This pamphlet includes: Kennedy Space Center Visitor Facility, Astronauts Memorial Space Mirror and The Center for Space Education, U.S. Astronaut Mall of Fame, U.S. Space Camp Florida, Merrill Island National Wildlife Refuge and Cape Canaveral National Seashore, Air Force Space and Missile Museum, U.S. Space Walk of Fame, and Brevard Community College Astronaut Memorial Planetarium. The pamphlet also includes a map.
Author
Handbooks; Space Exploration; Museums; Aerospace Systems

20090005218 Townsend and Townsend and Crew, LLP, San Francisco, CA, USA; Aspen Aerogels, Inc., Northborough, MA, USA
High Performance Vacuum-Sealed Insulations
Stepanian, Christopher J., Inventor; Trifu, Roxana, Inventor; Ou, Duan Li, Inventor; 16 Feb. 2006; 21 pp.; In English
Contract(s)/Grant(s): NAS9-03022; W81XWH-04-C-0046
Patent Info.: Filed Filed 1 Sep. 05; US-Patent-Appl-SN-11-219084; US 2006/0035054
Report No.(s): PB2008-101474; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005218

An insulating structure comprising an aerogel composite fully enclosed by an envelope and sealed at a reduced pressure, said aerogel composite comprising at least one metal oxide matrix and a fibrous material incorporated therein, and where said insulating structure can bend to at least 90 degrees and a bending radius of less than 1/2 inch without any substantial fracture.
Official Gazette of the U.S. Patent and Trademark Office
High Vacuum; Insulation; Patent Applications; Thermal Insulation; Vacuum

20090005984 Naval Postgraduate School, Monterey, CA USA
Operationally Responsive Space: Creating Responsive Space for America
Anderson, Brian; Arledge, Richard; Bein, Alexander; Braszko, Alexander; Collier, Corey; Crook, Mathew; Fitzgearld, Gregory; Gleckel, Gerry; Messer, Samuel; Smith, Phillip; Jun 20, 2008; 135 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488040; NPS-SP-08-004; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Tactical space support has earned a reputation as unresponsive and the Operationally Responsive Space Office was created in 2007 to address this for the military. The intent of this course project is to use an educational research approach to develop a future architecture that will make space responsive in 2025. This paper evaluates the shortcomings that hinder quick and effective space-based support to the U.S. Military and Intelligence Community. The current space community is fragmented, preventing quick, unified decisions, and does not have the executive clout necessary to lead effectively. Our group's solution creates a Department of Space at the cabinet level. The Department of Space will unify the space community, promoting quicker decisions with one common and consistent vision. This change would enable unified plans and policies as well as allow one organization to prioritize all of the space programs. The responsive culture would facilitate other needed changes to Space Operations, Launch, and Acquisition.
DTIC
Aerospace Engineering; Aerospace Systems; Command and Control; Leadership; Space Missions; United States

20090006014 Stanford Linear Accelerator Center, Menlo Park, CA, USA
Geant4 Applications in Space
Asai, M.; Nov. 2007; 10 pp.; In English
Report No.(s): DE2007-919412; SLAC-PUB-12966; No Copyright; Avail.: Department of Energy Information Bridge

Use of Geant4 is rapidly expanding in space application domain. I try to overview three major application areas of Geant4 in space, which are apparatus simulation for pre-launch design and post-launch analysis, planetary scale simulation for radiation spectra and surface and sub-surface explorations, and micro-dosimetry simulation for single event study and radiation-hardening of semiconductor devices. Recently, not only the mission dependent applications but also various

multi-purpose or common tools built on top of Geant4 are also widely available. I overview some of such tools as well. The Geant4 Collaboration identifies that the space applications are now one of the major driving forces of the further developments and refinements of Geant4 toolkit. Highlights of such developments are introduced.
NTIS
Aerospace Engineering; Launching; Simulation

20090006034 Thorpe North and Western, Sandy, UT, USA; Utah State Univ., Logan, UT, USA
Modular Platform System
Quincieu, J., Inventor; 16 Aug 05; 19 pp.; In English
Contract(s)/Grant(s): DOD AFRL 03-4131
Patent Info.: Filed Filed 16 Aug 05; US-Patent-Appl-SN-11-205 347
Report No.(s): PB2008-106116; No Copyright; Avail.: CASI: A03, Hardcopy

A system and methods are disclosed for a modular platform configured to carry small payloads into orbit. The system comprises a prefabricated module comprising a plurality of panels. An orthogrid pattern can be located on an inner side of one or more of the panels. The orthogrid pattern can comprise an array of orthogonal recessed areas surrounded by an orthogrid wall. The system can include a bolt pattern comprising an attachment location placed near each corner of each recessed area. A torquer coil can be integrated into one or more of the panels.
NTIS
Patent Applications; Space Platforms

20090006068 Naval Postgraduate School, Monterey, CA USA
An Operationally Responsive Space Architecture for 2025
Atkins, Rob; Bass, Aaron; Francis, Mike; Jablonski, Dave; Nelson, Jeff; Poiro, Zeke; Richardson, Craig; Jun 22, 2008; 91 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488022; NPS-SP-08-005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA488022

The distance learning team was tasked to produce an architecture that would best support future Operationally Responsive Space requirements in the 2025 timeframe. The ‘bottom line up front’ to this analysis showed that the current space architecture already provides some level of responsiveness. However, ORS will demand modifications of the current space architecture vice certain pre-conceived notions of quick launch or a separate ORS architecture altogether. The team developed a ‘baseline’ vision for deeper analysis focused on the Combatant Commander supported by analytical categories named ‘Pillars’ as follows: Improved Organizational Relationships, Asset Loss Mitigation, Availability, Flexibility, and Streamlined Acquisition Processes. These pillars allowed the solutions, material and non-material, to be organized for further analysis, relevancy, and value to the architecture. Constraints and alternative solutions were considered. Analysis was further supported by a performance versus cost process which provided a final test of solution feasibility. Relative cost was determined by comparison of existing program or like capabilities with future inflation. Differing combinations of solutions could provide ORS value by modification of the metrics. The final analysis showed an Operationally Responsive Space architecture that meets all metrics and that could support all COCOM requirements.
DTIC
Aerospace Systems; Space Missions

13
ASTRODYNAMICS

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

20090005221 Johns Hopkins Univ., Laurel, MD, USA
Method for Deploying Multiple Spacecraft
Sharer, P. J., Inventor; 26 Jan. 2006; 24 pp.; In English
Contract(s)/Grant(s): NAS5-97271
Patent Info.: Filed Filed 6 Jul. 04; US-Patent-Appl-SN-10-884 901; US 2006/0016934
Report No.(s): PB2008-100618; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005221

A method for deploying multiple spacecraft is disclosed. The method can be used in a situation where a first celestial body

is being orbited by a second celestial body. The spacecraft are loaded onto a single spaceship that contains the multiple spacecraft and the spacecraft is launched from the second celestial body towards a third celestial body. The spacecraft are separated from each other while in route to the third celestial body. Each of the spacecraft is then subjected to the gravitational field of the third celestial body and each of the spacecraft assumes a different, independent orbit about the first celestial body. In those situations where the spacecraft are launched from Earth, the Sun can act as the first celestial body, the Earth can act as the second celestial body and the Moon can act as the third celestial body.
Official Gazette of the U.S. Patent and Trademark Office
Deployment; Patent Applications; Spacecraft Launching

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*.

20090005215 Black Lowe and Graham, PLLC, Seattle, WA, USA
Methods and Systems for Advanced Spaceport Information Management
Fussell, Ronald M., Inventor; Ely, Donald W., Inventor; Meier, Gary M., Inventor; Halpin, Paul C., Inventor; Meade, Phillip T., Inventor; Jacobson, Craig A.; Blackwell-Thompson, Charlie; 23 Feb. 2006; 16 pp.; In English
Contract(s)/Grant(s): NAS10-02007; NAS10-11400
Patent Info.: Filed Filed 17 Mar. 05; US-Patent-Appl-SN-11-083420; US 2006/0038084
Report No.(s): PB2008-100967; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005215

Advanced spaceport information management methods and systems are disclosed. In one embodiment, a method includes coupling a test system to the payload and transmitting one or more test signals that emulate an anticipated condition from the test system to the payload. One or more responsive signals are received from the payload into the test system and are analyzed to determine whether one or more of the responsive signals comprises an anomalous signal. At least one of the steps of transmitting, receiving, analyzing and determining includes transmitting at least one of the test signals and the responsive signals via a communications link from a payload processing facility to a remotely located facility. In one particular embodiment, the communications link is an Internet link from a payload processing facility to a remotely located facility (e.g. a launch facility, university, etc.).
Official Gazette of the U.S. Patent and Trademark Office
Information Management; Launching Bases; Patent Applications; Space Transportation; Systems Management

20090005981 Naval Postgraduate School, Monterey, CA USA
Operationally Responsive Space (ORS) Architecture for the Year 2025
Hansen, K; Kennedy, S; Ledoux, S; Senn, M; Turner, J; Rayburn, J; Kacala, J; Hatcher, B; Widmann, M; Carson, J; Jun 15, 2008; 109 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488039; NPS-SP-08-003; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Unites States' first space systems programs were initially developed to meet the requirements of strategic users. Since the 1991 Gulf War there has been a growing dependence on the capabilities and support delivered by these programs to meet the requirements of nonstrategic users. The current National Security Space (NSS) architecture makes it rather difficult for all but critical strategic users to fully capitalize on the available assets. Timelines that were once adequate to deliver strategic capabilities are now not sufficient to allow a broader range of users to realize the benefit from using the available space systems. In addition, nonstrategic users run into challenges when they attempt to change the tasking requirements that would enable them to receive associated products and services that are useful and timely. With the identified gaps in the current NSS environment, the Integrated Product Team (IPT), consisting of 10 active duty military students, sought solutions to make space more 'Operationally Responsive' (ORS) to its customers by 2025. Due to limited time and assets, the IPT narrowed the focus of the project to the four Joint Publication (JP) 3-14 'Joint Doctrine for Space Operations' mission areas of Space Support, Space Control, Force Enhancement, and Force Application. During this project, the IPT defined ORS from its perspective, developed the requirements to meet the identified NSS gaps, selected the final alternatives to satisfy those requirements, and suggested an implementation plan. While in the architecture process, the IPT conducted an in-depth evaluation of the original alternatives based on Responsiveness, Risk, Capability, and Cost. After building a foundation for further analysis, a total of

16 alternatives were chosen for the final ORS architecture. The alternative that provided the most responsiveness was to create a Single Space Agency.
DTIC
Aerospace Engineering; Aerospace Systems; Forecasting; Intelligence; User Requirements

20090006237 Aerospace Corp., El Segundo, CA USA
Reentry Breakup and Survivability Characteristics of the Vehicle Atmospheric Survivability Project (VASP) Vehicles
Stern, Richard G; Aug 5, 2008; 26 pp.; In English
Contract(s)/Grant(s): FA8802-04-C-0001
Report No.(s): AD-A491628; TR-2008(8506)-3; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The breakup of two satellites (Vehicle Atmospheric Survivability Project) during atmospheric reentry is documented. The satellites were deboosted from orbit, and their subsequent reentries were observed by surface-based radars and optics as well as airborne optics. Numerous pieces of satellite debris were tracked, and, in some cases, their heritage identified. The breakup process substantiated the heating relationships derived from the VAST test, which is an order of magnitude less than traditional heating relationships above an altitude of 30 nmi.
DTIC
Aerodynamic Heating; Aerothermodynamics; Artificial Satellites; Atmospheric Entry; Debris; Space Debris; Spacecraft Breakup

20090006560 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Constraint Based Approach for Building Operationally Responsive Satellites
Kahraman, Mesut O; Sep 2008; 146 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487564; AFIT/GSS/ENY/08-S02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Operational Responsive Space (ORS) program requires flexible and responsive satellites to meet user's needs. Traditional satellite design methods are typically iterative processes that optimize individual components, subsystems, and ultimately the entire satellite. This study focuses on developing a new approach for creating Responsive Satellites (RS) from Plug-and-Play (PnP) components. The aim is to create an approach that quickly evaluates a wide variety of possible satellite configurations and identify the best configurations that meet the user's needs and constraints. Satellite configurations are created by matching locations on the satellite structure with PnP components. Various constraints are derived from the user's inputs at different levels of the configuration process. As the user provides more information related to PnP satellite, additional constraints can be applied to reduce the number of PnP satellite configurations resulting in manageable numbers or even zero configurations. In this research, we found that applying constraints whenever it is applicable results in eliminating invalid configurations. Each satellite configuration is saved to a database, if the user desires, a sorted list can help the user find the lowest mass and least expensive satellite that meets their requirements. Configurations can also be eliminated when respective properties are very close to each other which will reduce the number of satellite configurations from which the user can select. A goal of this research effort is to help user's access basic concept feasibility from several key aspects in a short period of time.
DTIC
Artificial Satellites; Transistors

20090006603 California Inst. of Tech., Pasadena, CA USA
Method for implementation of back-illuminated CMOS or CCD imagers
Pain, Bedabrata, Inventor; September 16, 2008; 16 pp.; In English
Patent Info.: Filed September 13, 2005; US-Patent-7,425,460; US-Patent-Appl-SN-11/226,902; No Copyright; Avail.:
CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006603

A method for implementation of back-illuminated CMOS or CCD imagers. An oxide layer buried between silicon wafer and device silicon is provided. The oxide layer forms a passivation layer in the imaging structure. A device layer and interlayer dielectric are formed, and the silicon wafer is removed to expose the oxide layer.
Official Gazette of the U.S. Patent and Trademark Office
Charge Coupled Devices; CMOS; Illuminating; Imaging Techniques; Silicon

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also *03 Air Transportation and Safety; 15 Launch Vehicles and Launch Operations*; and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

20090005185 NASA Johnson Space Center, Houston, TX, USA; United Space Alliance, Houston, TX, USA
Hubble Servicing Challenges Drive Innovation of Shuttle Rendezvous Techniques
Goodman, John L.; Walker, Stephen R.; January 31, 2009; 41 pp.; In English; 32nd Annual AAS Guidance and Control Conference, 31 Jan. - 4 Feb. 2009, Breckenridge, CO, USA; Original contains color and black and white illustrations
Report No.(s): AAS 09-013; Copyright; Avail.: CASI: A03, Hardcopy

Hubble Space Telescope (HST) servicing, performed by Space Shuttle crews, has contributed to what is arguably one of the most successful astronomy missions ever flown. Both nominal and contingency proximity operations techniques were developed to enable successful servicing, while lowering the risk of damage to HST systems, and improve crew safety. Influencing the development of these techniques were the challenges presented by plume impingement and HST performance anomalies. The design of both the HST and the Space Shuttle was completed before the potential of HST contamination and structural damage by shuttle RCS jet plume impingement was fully understood. Relative navigation during proximity operations has been challenging, as HST was not equipped with relative navigation aids. Since HST reached orbit in 1990, proximity operations design for servicing missions has evolved as insight into plume contamination and dynamic pressure has improved and new relative navigation tools have become available. Servicing missions have provided NASA with opportunities to gain insight into servicing mission design and development of nominal and contingency procedures. The HST servicing experiences and lessons learned are applicable to other programs that perform on-orbit servicing and rendezvous, both human and robotic.
Author
Hubble Space Telescope; Maintenance; Spaceborne Telescopes; Robotics; Navigation Aids; Dynamic Pressure; Spacecrews; Space Shuttles

20090005242 NASA Langley Research Center, Hampton, VA, USA
Aerodynamic Characteristics of a Proposed Personnel Launch System (PLS) Lifting-Body Configuration at Mach Numbers from 0.05 to 20.3. Supplement
Cruz, Christopher I.; Ware, George M.; Grafton, Sue B.; Woods, William C.; Young, James C.; November 1989; In English; See also 19930015333; See also NASA-TM-101641; CD contains numerical data in an R:BASE system database
Report No.(s): NASA/TM-101651; No Copyright; Avail.: CASI: C01, DVD

A wind-tunnel investigation was performed to determine the aerodynamic characteristics of a proposed lifting-body personnel launch system (PLS) configuration over a Mach range of 0.05 to 20.3. The test configuration had a low-aspect-ratio body with a flat undersurface and three fins on the upper aft body. Data are presented with a minimum of analysis. All of the experimental data were placed in a structured data base using the R:BASE system. This is the CD-ROM that is available for this report.
Author
Aerodynamic Characteristics; Data Bases; Lifting Bodies; Wind Tunnel Tests; Spacecraft Launching; Mach Number

20090005852 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Volume Averaged Height Integrated Radar Reflectivity (VAHIRR) Cost-Benefit Analysis
Bauman, William H., III; October 2008; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNK06MA70C
Report No.(s): NASA/CR-2008-214753; Copyright; Avail.: CASI: A03, Hardcopy

Lightning Launch Commit Criteria (LLCC) are designed to prevent space launch vehicles from flight through environments conducive to natural or triggered lightning and are used for all U.S. government and commercial launches at government and civilian ranges. They are maintained by a committee known as the NASA/USAF Lightning Advisory Panel (LAP). The previous LLCC for anvil cloud, meant to avoid triggered lightning, have been shown to be overly restrictive. Some of these rules have had such high safety margins that they prohibited flight under conditions that are now thought to be safe 90% of the time, leading to costly launch delays and scrubs. The LLCC for anvil clouds was upgraded in the summer of 2005 to incorporate results from the Airborne Field Mill (ABFM) experiment at the Eastern Range (ER). Numerous combinations of parameters were considered to develop the best correlation of operational weather observations to in-cloud electric fields

capable of rocket triggered lightning in anvil clouds. The Volume Averaged Height Integrated Radar Reflectivity (VAHIRR) was the best metric found. Dr. Harry Koons of Aerospace Corporation conducted a risk analysis of the VAHIRR product. The results indicated that the LLCC based on the VAHIRR product would pose a negligible risk of flying through hazardous electric fields. Based on these findings, the Kennedy Space Center Weather Office is considering seeking funding for development of an automated VAHIRR algorithm for the new ER 45th Weather Squadron (45 WS) RadTec 431250 weather radar and Weather Surveillance Radar-1988 Doppler (WSR-88D) radars. Before developing an automated algorithm, the Applied Meteorology Unit (AMU) was tasked to determine the frequency with which VAHIRR would have allowed a launch to safely proceed during weather conditions otherwise deemed 'red' by the Launch Weather Officer. To do this, the AMU manually calculated VAHIRR values based on candidate cases from past launches with known anvil cloud LLCC violations. An automated algorithm may be developed if the analyses from past launches show VAHIRR would have provided a significant cost benefit by allowing a launch to proceed. The 45 WS at the ER and 30th Weather Squadron (30 WS) at the Western Range provided the AMU with launch weather summaries from past launches that were impacted by LLCC. The 45 WS provided summaries from 14 launch attempts and the 30 WS fkom 5. The launch attempts occurred between December 2001 and June 2007. These summaries helped the AMU determine when the LLCC were 'red' due to anvil cloud. The AMU collected WSR-88D radar reflectivity, cloud-to-ground lightning strikes, soundings and satellite imagery. The AMU used step-by-step instructions for calculating VAHIRR manually as provided by the 45 WS. These instructions were used for all of the candidate cases when anvil cloud caused an LLCC violation identified in the launch weather summaries. The AMU evaluated several software programs capable of visualizing radar data so that VAHIRR could be calculated and chose GR2Analyst from Gibson Ridge Software, LLC. Data availability and lack of detail from some launch weather summaries permitted analysis of six launch attempts from the ER and none from the WR. The AMU did not take into account whether or not other weather LCC violations were occurring at the same time as the anvil cloud LLCC since the goal of this task was to determine how often VAHIRR provided relief to the anvil cloud LLCC at any time during several previous launch attempts. Therefore, in the statistics presented in this report, it is possible that even though VAHIRR provided relief to the anvil cloud LLCC, other weather LCC could have been violated not permitting the launch to proceed. The results of this cost-benefit analysis indicated VAHIRR provided relief from the anvil cloud LLCC between about 15% and 18% of the time for varying 5-minute time periods based on summaries fkom six launch attempts and would have allowed launch to proceed that were otherwise 'NO GO' due to the anvil cloud LLCC if the T-0 time occurred during the anvil cloud LLCC violations.
Derived from text

Flight Conditions; Lightning; Reflectance; Spacecraft Launching; Weather Forecasting; Meteorological Radar; Launch Windows

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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*.

20090005079 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Estimating Orbit and Attitude Ephemerides by Means of Control Points

Badue, Gabrie Soares; [2008]; 127 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15152-TDI/1284; Copyright; Avail.: CASI: C01, CD-ROM; A07, Hardcopy

The use of images obtained by satellites is steadily increasing. Based on these advances, the need for improvement in these images quality is bigger and bigger. This work proposes a procedure to estimate the position and attitude deviation of a satellite by means of control points deviation in an image with the objective of improving the image precision obtained by satellites. The use of the estimated deviations will allow a better adjustment in the image processing. The algorithm used was the Least Squares Method with a priori information. The adopted procedure does not require the use of the measurements obtained by sensors, in the case of the attitude, or of the tracking station data, in the case of the position. A simulator has been developed generating control points to be used in the estimation. This simulator has as a model the CBERS-2 satellite, providing points as if they were coming from an image generated by a CCD camera of this satellite. Many situations were simulated considering cases with errors in position, cases with errors in attitude, cases with errors combined, among others.

The results show that the proposed procedure diminishes the distortions provoked by the attitude and orbit deviations, thus contributing for an improved geo-referencing of the images.
Author
Satellite Orbits; Attitude (Inclination); Orbital Position Estimation; Ephemerides; Control Simulation; Satellite Control; Satellite Tracking

20090005977 NASA Glenn Research Center, Cleveland, OH, USA
Space Telecommunications Radio System (STRS) Definitions and Acronyms
Briones, Janette C.; Handler, Louis M.; Johnson, Sandra K.; Nappier, Jennifer; Gnepp, Steven; Kacpura, Thomas J.; Reinhart, Richard C.; Hall, Charles S.; Mortensen, Dale; December 2008; 20 pp.; In English
Contract(s)/Grant(s): WBS 439432.04.07.01
Report No.(s): NASA/TM-2008-215445; E-16637; Copyright; Avail.: CASI: A03, Hardcopy

Software-defined radio is a relatively new technology area, and industry consensus on terminology is not always consistent. Confusion exists when the various organizations and standards bodies define different radio terms associated with the actual amount of reconfigurability of the radios. The Space Telecommunications Radio System (STRS) Definitions and Acronyms Document provides the readers of the STRS documents a common understanding of the terminology used and how they will be applied to the STRS architecture.
Author
Telecommunication; Radio Equipment; Software Engineering; Space 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*.

20090005159 NASA, Washington, DC, USA
Unmanned Spacecraft of the USA
Cortright, Edgar M.; [1964]; 21 pp.; In English; Original contains black and white illustrations
Report No.(s): NASA EP 16; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005159

In 1957 the first earth satellite ushered in the age of space flight. Since that historic event, space exploration has become a major national objective of both the USA and the Soviet Union. These two nations have attempted a total of well over 200 space flight missions. Other nations are also participating in various degrees in what will continue to grow as a cooperative world effort. In the years since 1957, man has successfully flown in earth orbit. He has initiated programs to land on the moon and return. He has made dramatic applications of earth satellites in meteorology, communications, navigation, and geodesy. A host of scientific satellites.continue to advance understanding of the earth's environment, the sun, and the stars. Automated spacecraft are being flown to the moon, deep into interplanetary space, and to the near planets, Mars and Venus. One of the most exciting technological aspects of space exploration has been the development of automated spacecraft. Most of the scientific exploration of space and the useful applications of space flight thus far have been made possible by automated spacecraft. Development of these spacecraft and their many complex subsystems is setting the pace today for many branches of science and technology. Guidance, computer, attitude control, power, telecommunication, instrumentation, and structural subsystems are being subjected to new standards of light weight, high efficiency, extreme accuracy, and unsurpassed reliability and quality. This publication reviews the automated spacecraft which have been developed and flown, or which are under active development in the USA by the National Aeronautics and Space Administration. From the facts and statistics contained herein, certain observations can be made and certain conclusions drawn.
Author
Unmanned Spacecraft; United States; NASA Programs; Space Transportation System; Spacecraft Design

20090006101

Model-based fault detection and isolation for intermittently active faults with application to motion-based thruster fault detection and isolation for spacecraft

Wilson, Edward, Inventor; November 11, 2008; 13 pp.; In English

Contract(s)/Grant(s): NAS2-00065

Patent Info.: Filed May 6, 2004; US-Patent-7,451,021; US-Patent-Appl-SN-10/841,675; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006101

The present invention is a method for detecting and isolating fault modes in a system having a model describing its behavior and regularly sampled measurements. The models are used to calculate past and present deviations from measurements that would result with no faults present, as well as with one or more potential fault modes present. Algorithms that calculate and store these deviations, along with memory of when said faults, if present, would have an effect on the said actual measurements, are used to detect when a fault is present. Related algorithms are used to exonerate false fault modes and finally to isolate the true fault mode. This invention is presented with application to detection and isolation of thruster faults for a thruster-controlled spacecraft. As a supporting aspect of the invention, a novel, effective, and efficient filtering method for estimating the derivative of a noisy signal is presented.

Official Gazette of the U.S. Patent and Trademark Office

Fault Detection; Isolation; Mathematical Models

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information see also *06 Avionics and Aircraft Instrumentation*; for spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; for spaceborne telescopes and other astronomical instruments see *89 Astronomy*.

20090006624 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Fault Detection and Diagnosis in Sensors and Actuators of the Multi-Mission Platform

Leite, Alexandre Carvalho; [2007]; 374 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15219-TDI/1313; Copyright; Avail.: CASI: C01, CD-ROM; A16, Hardcopy

This work presents methods and techniques for Fault Detection and Diagnosis on the ACS of the MMP; specifically, faults in sensors (gyros) and actuators (reaction wheels). A general overview of the MMP ACS is provided. Subsequently, some fault modes are defined (together with its fault models) as case studies. Four fault modes for each of three reaction wheels, and another four for each of three gyro. Then, Fault Detection techniques are presented as applied to the method of Residual Generation; and, among these techniques, only one is selected. The next step is to introduce Fault Diagnosis techniques reusing some Fault Detection results. All other simulations consider an environment in the presence of uncertainties, which arise robustness questions in FDD, suitably discussed in the context of this work. All these techniques permit the execution of the main case study (Fault Detection and Diagnosis in Sensors and Actuators of the MMP). This application is done by means of virtual time simulation with the MATRIXx/SystemBuild environment reusing the simulator of the nominal operation mode, developed in previous works. Finally, the application of the techniques is verified and validated by means of hardware-in-the-loop simulation, where an interesting adaptive model reference control problem arises for the emulation of the reaction wheel physical model. The results, in general, are satisfactory and provide many parts of an FDD complete development project.

Author

Actuators; Adaptive Control; Fault Detection; Detection; Sensors; Failure Analysis; Control Simulation

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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*.

20090005994 NASA Glenn Research Center, Cleveland, OH, USA

Processing and Preparation of Advanced Stirling Convertors for Extended Operation at NASA Glenn Research Center

Oriti, Salvatore M.; Cornell, Peggy A.; December 2008; 23 pp.; In English; Sixth International Energy Conversion Engineering Conference (IECEC), 28-30 Jul. 2008, Cleveland, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 138494.04.01.01

Report No.(s): NASA/TM-2008-215454; E-16645; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005994

The U.S. Department of Energy (DOE), Lockheed Martin Space Company (LMSC), Sunpower Inc., and NASA Glenn Research Center (GRC) have been developing an Advanced Stirling Radioisotope Generator (ASRG) for use as a power system on space science missions. This generator will make use of the free-piston Stirling convertors to achieve higher conversion efficiency than currently available alternatives. NASA GRC is supporting the development of the ASRG by providing extended operation of several Sunpower Inc. Advanced Stirling Convertors (ASCs). In the past year and a half, eight ASCs have operated in continuous, unattended mode in both air and thermal vacuum environments. Hardware, software, and procedures were developed to prepare each convertor for extended operation with intended durations on the order of tens of thousands of hours. Steps taken to prepare a convertor for long-term operation included geometry measurements, thermocouple instrumentation, evaluation of working fluid purity, evacuation with bakeout, and high purity charge. Actions were also taken to ensure the reliability of support systems, such as data acquisition and automated shutdown checkouts. Once a convertor completed these steps, it underwent short-term testing to gather baseline performance data before initiating extended operation. These tests included insulation thermal loss characterization, low-temperature checkout, and full-temperature and power demonstration. This paper discusses the facilities developed to support continuous, unattended operation, and the processing results of the eight ASCs currently on test.

Author

Stirling Cycle; Energy Conversion Efficiency; Degassing; Computer Programs

20090006468 Royal Aircraft Establishment, Farnborough, UK

A Comparison of Liquid and Solid Propellant Boost Rocket Motors

Broughton, L W; Frauenberger, H J; Jan 1950; 24 pp.; In English

Report No.(s): AD-A492317; RAE-TN-RPD-25; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Boost units for test vehicles and missiles have up to the present used only solid propellants. Because of the need for boost units of higher thrust and efficiency the possibility of the development of liquid propellant boost units of total impulse 43,000 and 150,000 lb-sec has been examined and their performance compared with that of the solid propellant type. The conclusion is reached that whilst liquid boost units could be developed to give a better performance (based on total impulse per unit weight) than solid boosts known at present, the development of solid boosts giving as good, or better performance is equally promising; on these grounds, therefore, there seems little justification for the development of a liquid boost. The liquid boost has the advantage, however, of greater flexiblity in installation in that the combustion chamber can be fitted at the rear of the vehicle and thus ensures a purely axial thrust; at the time the tanks can be mounted at any suitable point around the body of the vehicle so that the shift in the centre of gravity is reduced to a minimum. If, the supply of any future high performance solid propel insufficient to meet the demand, the development and use of a liquid boost motor might be justified on this account alone.

DTIC

Booster Rocket Engines; Liquid Propellant Rocket Engines; Liquid Rocket Propellants; Rocket Engines; Solid Propellant Rocket Engines; Solid Propellants

20090006567 Army Tank-Automotive Research and Development Command, Warren, MI USA
Army Invests in Testing Facilities to Support Current and Future Technologies
Bochenek, Grace M; Hitchcock, Jennifer; Dec 2007; 5 pp.; In English
Report No.(s): AD-A490349; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490349

The U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) has played a critical role in developing a hybrid electric powerpack designed to meet all anticipated Future Combat Systems (FCS) Manned Ground Vehicle power requirements. TARDEC also has been instrumental in developing the testing facilities, expertise, and processes necessary to ensure that each powerpack component, and the powerpack as an integrated whole, will answer de facto requirements for each FCS ground vehicle variant that eventually goes into production.
DTIC
Combat; Diesel Engines; Electric Propulsion; Hybrid Propulsion; Test Facilities

20090006573 National Renewable Energy Lab., Golden, CO USA
FCV Learning Demonstration: Project Midpoint Status and FAll 2007 Results. EVS 23 Sustainability: The Future of Transportation
Dec. 2007; 24 pp.; In English
Report No.(s): DE2007-920938; NREL/PR-560-42197; No Copyright; Avail.: National Technical Information Service (NTIS)

The International Electric Vehicle Symposium and Exposition (EVS) attracts business, policy, industry, and academic leaders from around the world who are interested in exploring and understanding the technical, policy and market challenges of electric transportation technologies.
NTIS
Energy Policy; Enhanced Vision; Fuel Cells; Hydrogen Fuels; Transportation

20090006594 NASA, Washington, DC USA
Dual Expander Cycle Rocket Engine with an Intermediate, Closed-cycle Heat Exchanger
Greene, William D., Inventor; September 2, 2008; 6 pp.; In English
Patent Info.: Filed June 30, 2005; US-Patent-7,418,814; NASA-Case-MFS-32214-1; US-Patent-Appl-SN-11/172,666; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006594

A dual expander cycle (DEC) rocket engine with an intermediate closed-cycle heat exchanger is provided. A conventional DEC rocket engine has a closed-cycle heat exchanger thermally coupled thereto. The heat exchanger utilizes heat extracted from the engine's fuel circuit to drive the engine's oxidizer turbomachinery.
Official Gazette of the U.S. Patent and Trademark Office
Rocket Engines; Thermodynamic Cycles; Closed Cycles; Heat Exchangers; Rocket Engine Design

23
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*.

20090005054 National Renewable Energy Lab., Golden, CO USA
Advanced Thermal Interface Materials for Power Electronics
Oral/Visual Presentation
Narumanchi, S.; Nov. 08, 2007; 14 pp.; In English
Report No.(s): DE2007-921218; NREL/PR-540-42342; No Copyright; Avail.: National Technical Information Service (NTIS)

Advancing thermal interface materials for power electronics is a critical factor in power electronics equipment. NREL aims to improve thermal interface materials for power electronics technologies.
NTIS
Automobiles; Industries; Thermal Analysis; Turbogenerators

20090005103 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
CVD-Diamond Films on Tridimensional Porous Pure Titanium Substrate: NA Electrode Application Proposal
Braga, Neila de Almeida; [2008]; 198 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15255-TDI/1340; Copyright; Avail.: CASI: C01, CD-ROM; A09, Hardcopy

A novel composite material formed from nanocrystalline and/or microcrystalline diamond films grown on pure porous titanium substrate was extensively studied taking into account their morphological, structural and electrochemical properties. The films were deposited by chemical vapor deposition technique, using a hot filament reactor, while the techniques of the powder metallurgy showed to be suitable to obtain the titanium substrate, mainly due to the required control of the compact porosity and their mechanical properties. This work is presented considering important stages to obtain and to characterize the substrates and diamond films. The titanium substrate, the diamond films as well as their interfaces were analyzed by scanning electron microscopy, X-ray diffraction, Raman scattering spectroscopy and energy dispersive X-ray spectroscopy. Particularly, these tridimensional composite electrodes, formed from boron doped microcrystalline and nanodiamond films, were also characterized by cyclic voltammetry technique. A systematic study revealed that the substrate hydrogenation was the determinant factor in the fissure formations on the titanium matrix. Therefore, the importance to control the deposition parameters, such as pressure, growth temperature, filament distance, and growth time showed to be relevant to minimize the negative effects caused in titanium matrix by atomic or molecular hydrogen present in the gas phase during the film growth. These suitable experimental parameters optimized the diamond film formation covering the entire substrate in its surface and deeper planes as well as in its pore walls. In this sense, the interface characterization, formed between the film/substrate, allowed to identify the hydride and carbide compounds formations, as the main compounds present in this interface, in addition to their strong dependence with the growth temperature and with the argon concentration in the mixture used to grow nanocrystalline films, mainly associated to the TiC(111), TiC(200) e TiH2 phase evolutions.
Author
Diamond Films; Titanium; Substrates; Porosity; Composite Materials; Electrodes

20090005115 Thermoretec Consulting Corp., Mission, KS USA
Technology Status Review In Situ Oxidation
Nov 1999; 51 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAC39-99-C-002
Report No.(s): AD-A487961; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487961

Soil and groundwater contamination with CVOCs is a widespread problem at DOD sites. ISO has been rapidly adopted as a remediation technology for CVOCs in both soil and groundwater. However, the technology has only recently been developed, and there is little operational history. Sites contaminated with CVOCs have proven difficult and expensive to remediate, particularly when a DNAPL phase is present. On many sites these DNAPL accumulations are well below the water table, dispersed in very thin layers, difficult to find, and difficult to remove. Currently, pump and treat and excavation are the only proven technologies for treating DNAPL; however, they both have limitations. Pump and treat operations can provide adequate containment, but removal of any CVOC source is very slow. The DNAPL accumulations serve as a long-term reservoir of contaminants, requiring that the pump and treat operations be continued indefinitely. Excavation can remove CVOCs in soil, but large amounts of clean soil must be moved and excavations have to be dewatered to remove DNAPLs below the water table. Therefore, these technologies can be very slow and/or very expensive.
DTIC
Oxidation; Soil Pollution; Ground Water; Contamination

20090005229 Winstead Aechrest and Minick, Houston, TX, USA
Oriented Nanofibers Embedded in Polymer Matrix
Barrera, Enrique V., Inventor; Rodriguez-Macias, Fernando J., Inventor; Lozano, Karen, Inventor; Chibante, Luis Paulo Felipe, Inventor; Stewart, David Harris, Inventor; 2 Mar. 2006; 55 pp.; In English
Contract(s)/Grant(s): NAS9-99129; NSF DMR-9357505; NCC9-77
Patent Info.: Filed Filed 7 Dec. 00; US-Patent-Appl-SN-10-149 216; US 2006/0047052
Report No.(s): PB2008-101116; No Copyright; Avail.: CASI: A04, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005229

A method of forming a composite of embedded nanofibers in a polymer matrix is disclosed. The method includes incorporating nanofibers in a plastic matrix forming agglomerates, and uniformly distributing the nanofibers by exposing the agglomerates to hydrodynamic stresses. The hydrodynamic said stresses force the agglomerates to break apart. In combination

or additionally elongational flow is used to achieve small diameters and alignment. A nanofiber reinforced polymer composite system is disclosed. The system includes a plurality of nanofibers that are embedded in polymer matrices in micron size fibers. A method for producing nanotube continuous fibers is disclosed. Nanofibers are fibrils with diameters 100 nm, multiwall nanotubes, single wall nanotubes and their various functionalized and derivatized forms. The method includes mixing a nanofiber in a polymer; and inducing an orientation of the nanofibers that enables the nanofibers to be used to enhance mechanical, thermal and electrical properties. Orientation is induced by high shear mixing and elongational flow, singly or in combination. The polymer may be removed from said nanofibers, leaving micron size fibers of aligned nanofibers.
Author
Embedding; Polymer Matrix Composites; Nanofabrication; Fibers

20090005231 Pratt and Whitney Aircraft, East Hartford, CT, USA
Cryogenic Insulation
Sanders, Stuart Alan, Inventor; 2 Mar. 2006; 6 pp.; In English
Contract(s)/Grant(s): NAS8-36801
Patent Info.: Filed Filed 27 Aug 04; US-Patent-Appl-SN-10-927 978; US 2006/0047024
Report No.(s): PB2008-101111; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005231

Putty-like gap-filling compounds for insulation that can be utilized at temperatures from about -420 degrees F. (-250 degrees C.) up to about 500 degrees F. (260 degrees C.) are described herein. Embodiments of these compounds contain about 25-50 volume percent base material, about 50-75 volume percent microspheres, and about 0.1-0.3 volume percent catalyst. Embodiments of these compounds contain about 70-80 weight percent base material, about 20-30 weight percent microspheres, and about 0.1-0.5 weight percent catalyst.
Author
Cryogenics; Thermal Insulation; Microparticles

20090005957 Savannah River National Lab., Aiken, SC, USA
Performance Testing of Spring Energized C-Rings for Use in Radioactive Material Containing Tritium
Blanton, P. S.; Eberl, K. R.; January 2007; 9 pp.; In English
Report No.(s): DE2007-919044; No Copyright; Avail.: Department of Energy Information Bridge

This paper describes the sealing performance testing and results of silver-plated inconnel Spring Energized CRings used for tritium containment in radioactive shipping packagings. The test methodology used follows requirements of the American Society of Mechanical Engineers (ASME) summarized in ASME Pressure Vessel Code (B&PVC), Section V, Article 10, Appendix IX (Helium Mass Spectrometer Test - Hood Technique) and recommendations by the American National Standards Institute (ANSI) described in ANSI N14.5-1997. The tests parameters bound the predicted structural and thermal responses from conditions defined in the Code of Federal Regulations 10 CFR 71. The testing includes an evaluation of the effects of pressure, temperature, flange deflection, surface roughness, permeation, closure torque, torque sequencing and re-use on performance of metal C-Ring seals.
NTIS
Containment; Packaging; Performance Tests; Radioactive Materials; Radioactive Wastes; Radioactivity; Seals (Stoppers); Tritium; Waste Management

20090005995 NASA Glenn Research Center, Cleveland, OH, USA
NASA Glenn Research Center's Materials International Space Station Experiments (MISSE 1-7)
deGroh, Kim K.; Banks, Bruce a.; Dever, Joyce A.; Jaworske, Donald A.; Miller, Sharon K.; Sechkar, Edward A.; Panko, Scott R.; December 2008; 46 pp.; In English; International Symposium on SM/MPAC and SEED Experiments, 10-11 Mar. 2008, Tsukuba, Japan; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 698671.01.03.51
Report No.(s): NASA/TM-2008-215482; E-16690; Copyright; Avail.: CASI: A03, Hardcopy

NASA Glenn Research Center (Glenn) has 39 individual materials flight experiments (>540 samples) flown as part of the Materials International Space Station Experiment (MISSE) to address long duration environmental durability of spacecraft materials in low Earth orbit (LEO). MISSE is a series of materials flight experiments consisting of trays, called Passive

Experiment Carriers (PECs) that are exposed to the space environment on the exterior of the International Space Station (ISS). MISSE 1-5 have been successfully flown and retrieved and were exposed to the space environment from one to four years. MISSE 6A & 6B were deployed during the STS-123 shuttle mission in March 2008, and MISSE 7A & 7B are being prepared for launch in 2009. The Glenn MISSE experiments address atomic oxygen (AO) effects such as erosion and undercutting of polymers, AO scattering, stress effects on AO erosion, and in-situ AO fluence monitoring. Experiments also address solar radiation effects such as radiation induced polymer shrinkage, stress effects on radiation degradation of polymers, and radiation degradation of indium tin oxide (ITO) coatings and spacesuit fabrics. Additional experiments address combined AO and solar radiation effects on thermal control films, paints and cermet coatings. Experiments with Orion Crew Exploration Vehicle (CEV) seals and UltraFlex solar array materials are also being flown. Several experiments were designed to provide ground-facility to in-space calibration data thus enabling more accurate in-space performance predictions based on ground-laboratory testing. This paper provides an overview of Glenn s MISSE 1-7 flight experiments along with a summary of results from Glenn s MISSE 1 & 2 experiments.
Author
International Space Station; Solar Radiation; Radiation Effects; Aerospace Environments; Low Earth Orbits; Erosion

20090006211 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Laser Induced Millimeter Wave Fluorescence From Bio-Materials
Moon, Raphael P; Gelmont, Boris; Tripathi, Ashish; Oct 2008; 32 pp.; In English
Contract(s)/Grant(s): Proj-BA06DET084
Report No.(s): AD-A491480; ECBC-TR-652; No Copyright; Avail.: Defense Technical Information Center (DTIC)
In this report, we conduct the initial theoretical investigation of emission of radiation by DNA components upon the absorption of infrared (IR) radiation. Excitation wavelengths in 9 and 11 urn region are of interest. These transitions are related to the bond vibrations including only small groups of atoms. Hence, it is possible to analyze different fragments of DNA for identification of proper transitions. The carbon dioxide (CO2) laser was chosen as the IR radiation source. We calculated the vibrational spectra of various DNA bases: cytosine; thymine; adeninc; and guanine along with 2' deoxyadenosine 5'-monophosphate (dAMP); 2' deoxyguanosine 5'-monophosphate (dGMP); 2' deoxycytidine 5'-monophosphate (dCMP); 2' deoxythymidine 5'-monophosphate (dTMP) with HF/6-31G (d)\ and B3LYP approximation. The theoretical model considers the molecule as a system of coupled oscillators. The anharmonicity couples the oscillators and drives the energy transfer. Anharmonicity triggered transitions are analyzed. The Fermi resonances provide the most effective channels of the energy transfer. The probabilities of Fermi resonance induced transitions arc calculated for the absorption bands evaluated with the HF model. We also acquired absorption spectra of DNA components from a herring sperm DNA sample. The tunable C02 laser induced emission spectra of these bio-chemicals was also acquired.
DTIC
Laser Induced Fluorescence; Millimeter Waves

20090006366 Ingersoll (Buchanan), PC, Alexandria, VA, USA
Electrically and Thermally Conductive Carbon Nanotube or Nanofiber Array Dry Adhesive
Majumdar, Arun, Inventor; Tong, Tao, Inventor; Zhao, Yang, Inventor; Delzeit, Lance, Inventor; Kashani, Ali, Inventor; 30 Mar. 2006; 13 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NAS5-016815
Patent Info.: Filed Filed 19 May 05; US-Patent-Appl-SN-11-133780; US 2006/0068195
Report No.(s): PB2008-102045; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006366
A carbon nanostructure adhesive for adhering two surfaces together, including: an array of vertically aligned carbon nanostructures on a first surface; and a second surface positioned adjacent to the vertically aligned carbon nanostructures such that the vertically aligned carbon nanostructures adhere the first and second surfaces together by van der Waals forces.
Author
Adhesives; Carbon Nanotubes; Drying; Electrical Resistivity; Thermal Conductivity

20090006442 Explosives Research and Development Establishment, Waltham Abbey, UK

The Physical Properties of Desensitised Nitro-Glycerine

Clifford, D V; Nov 1950; 23 pp.; In English

Report No.(s): AD-A492166; ERDE-TM-7/M/50; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The specific gravity, viscosity, sensitiveness, calometric value, and refractive index of nitroglycerine, triacetin, and mixtures of these, with and without carbamite, have been determined. Details of methods and results are recorded.

DTIC

Desensitizing; Nitroglycerin

20090006473 Royal Armament Research and Development Establishment, Fort Halstead, UK

Controlled Fragmentation. 31. The Development of Rubber Liners for the Grooved-Charge Method of Controlling Fragmentation

Shepherd, W C; Gibson, J W; Jan 1952; 21 pp.; In English

Report No.(s): AD-A492389; RARDE-18/51; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Earlier work on the development and application of the grooved-charge method of obtaining controlled fragmentation has been confined to casings with cylindrical cavities into which pre-cast charges, or fluted liners, can be easily inserted. Difficulty is experienced when the cavity is not cylindrical and when it is bulbous with a narrow neck, for it is then necessary to have a flexible liner which, shaped to the cavity, can be collapsed during insertion and is elastic enough to recover its shape. A method of fabricating fluted rubber liners which meet this requirement has been developed. A metal former carrying the chosen fluted pattern and shaped to the cavity of the casing is sprayed with rubber latex under specified conditions. The liner, in the form of a bag, is peeled off the former and inserted into the casing. The process of filling with molten explosive helps in achieving a good fit of the liner to the cavity. Fragmentation results with cylindrical and barrel-shaped casings are described.

DTIC

Fragmentation; Linings; Rubber

20090006601 California Inst. of Tech., Pasadena, CA USA

Direct methanol feed fuel cell and system

Surampudi, Subbarao, Inventor; Frank, Harvey A., Inventor; Narayanan, Sekharipuram R., Inventor; Chun, William, Inventor; Jeffries-Nakamura, Barbara, Inventor; Kindler, Andrew, Inventor; Halpert, Gerald, Inventor; September 16, 2008; 27 pp.; In English

Contract(s)/Grant(s): NAS7-1407

Patent Info.: Filed September 1, 2004; US-Patent-7,425,384; US-Patent-Appl-SN-10/932,521; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006601

Improvements to non acid methanol fuel cells include new formulations for materials. The platinum and ruthenium are more exactly mixed together. Different materials are substituted for these materials. The backing material for the fuel cell electrode is specially treated to improve its characteristics. A special sputtered electrode is formed which is extremely porous.

Official Gazette of the U.S. Patent and Trademark Office

Feed Systems; Fuel Cells; Methyl Alcohol; Electrodes

20090006604 NASA, Washington, DC USA

Synthesis of asymmetric tetracarboxylic acids and corresponding dianhydrides

Chuang, Chun-Hua, Inventor; September 16, 2008; 15 pp.; In English

Patent Info.: Filed March 18, 2006; US-Patent-7,425,650; US-Patent-Appl-SN-11/378,553; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006604

This invention relates to processes for preparing asymmetrical biphenyl tetracarboxylic acids and the corresponding asymmetrical dianhydrides, namely 2,3,3',4'-biphenyl dianhydride (a-BPDA), 2,3,3',4'-benzophenone dianhydride (a-BTDA) and 3,4'-methylenediphthalic anhydride (-MDPA). By cross-coupling reactions of reactive metal substituted o-xylenes or by cross-coupling o-xylene derivatives in the presence of catalysts, this invention specifically produces asymmetrical biphenyl intermediates that are subsequently oxidized or hydrolyzed and oxidized to provide asymmetric biphenyl tetracarboxylic acids in comparatively high yields. These asymmetrical biphenyl tetracarboxylic acids are subsequently converted to the

corresponding asymmetrical dianhydrides without contamination by symmetrical biphenyl dianhydrides.
Official Gazette of the U.S. Patent and Trademark Office
Anhydrides; Asymmetry; Polyphenyls; Carboxylic Acids; Carboxyl Group

24
COMPOSITE MATERIALS

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

20090005067 NASA Langley Research Center, Hampton, VA, USA
Double Vacuum Bag Process for Resin Matrix Composite Manufacturing
Hou, Tan-Hung, Inventor; Jensen, B. J., Inventor; Jensen, Brian J., Inventor; 17 Nov. 2005; 12 pp.; In English
Patent Info.: Filed 19 Apr. 05; US-Patent-Appl-SN-11-110996; US 2005/0253309
Report No.(s): PB2007-109098; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005067

A double vacuum bag molding assembly with improved void management and laminate net shape control which provides a double vacuum environment for use in fabricating composites from prepregs containing air and/or volatiles such as reactive resin matrix composites or composites from solvent containing prepregs with non-reactive resins matrices. By using two vacuum environments during the curing process, a vacuum can be drawn during a B-stage of a two-step cycle without placing the composite under significant relative pressure. During the final cure stage, a significant pressure can be applied by releasing the vacuum in one of the two environments. Inner and outer bags are useful for creating the two vacuum environments with a perforated tool intermediate the two. The composite is placed intermediate a tool plate and a caul plate in the first environment with the inner bag and tool plate defining the first environment. The second environment is characterized by the outer bag which is placed over the inner bag and the tool plate.
Official Gazette of the U.S. Patent and Trademark Office
Manufacturing; Patent Applications; Resin Matrix Composites; Vacuum

20090005176 NASA Glenn Research Center, Cleveland, OH, USA
Statistical Models of Fracture Overview for Nonirradiated Nuclear-Graphite Components
Nemeth, Noel N.; Bratton, Robert L.; [2009]; 71 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): SAA3-824; DE-AC07-05ID14517; WBS 659877.02.03.0505.01
Report No.(s): E-16798; Copyright; Avail.: Other Sources

Next generation nuclear reactor designs call for gas cooling and use of nuclear grade (low impurity) graphite for the fuel element and moderator material. Large amounts of graphite would be required for the core of the reactor and significant loads may be experienced by the individual graphite bricks that surround the nuclear fuel. Plant specifications call for the structural integrity of the graphite elements to be maintained for 30 to 60 years. Therefore the development of accurate design and analysis tools that can assess the potential for crack formation and even complete fracture of the graphite bricks is of high interest. An important characteristic of graphite is that its strength is stochastic.an individual specimen can show a large random fluctuation in strength from a population mean. In this review relevant statistical failure models are discussed. Modeling approaches developed for series and parallel systems are described with the focus of the discussion given to strength distribution and size effect. For series systems Weibull, Batdorf, and Burchell models are included. For parallel systems, consideration is given to the predicted transition between brittle and quasi-brittle (ductile-like) behavior, particularly since nuclear grade graphite is often characterized as quasi-brittle. Composite material modeling is included for the modeling insights it provides. Results from lattice simulations are included for a physics-based description of material breakdown. The literature indicates that weakest-link-based modeling approaches appear to be robust in that they can be extended to include parallel system models, provided disorder in the material is not too large. The Weibull distribution is argued to be the most appropriate statistical distribution to model the stochastic-strength response of graphite. Ultimately simplified design rules in conjunction with more sophisticated analytical techniques will need to be developed and incorporated in standards supported by organizations such as ASTM or ASME (Boiler & Pressure Vessel Code. Section III.Rules for Construction of Nuclear Power Plant Components), and approved by the Nuclear Regulatory Commission (NRC).
Author
Statistical Distributions; Structural Failure; Nuclear Reactors; Crack Initiation; Design Analysis; Composite Materials; Mathematical Models; Graphite; Reactor Design; Nuclear Fuels

20090005179 Lockheed Martin Engineering and Science Services, Hampton, VA, USA

Characterization of Solid Polymers, Ceramic Gap Filler, and Closed-Cell Polymer Foam Using Low-Load Test Methods

Herring, Helen M.; December 2008; 18 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNL07AA00B; Task NNL07AM74T; WBS-510505.03.07.01.07

Report No.(s): NASA/CR-2008-215538; LF99-7926; Copyright; Avail.: CASI: A03, Hardcopy

Various solid polymers, polymer-based composites, and closed-cell polymer foam are being characterized to determine their mechanical properties, using low-load test methods. The residual mechanical properties of these materials after environmental exposure or extreme usage conditions determines their value in aerospace structural applications. In this experimental study, four separate polymers were evaluated to measure their individual mechanical responses after thermal aging and moisture exposure by dynamic mechanical analysis. A ceramic gap filler, used in the gaps between the tiles on the Space Shuttle, was also tested, using dynamic mechanical analysis to determine material property limits during flight. Closed-cell polymer foam, used for the Space Shuttle External Tank insulation, was tested under low load levels to evaluate how the foam's mechanical properties are affected by various loading and unloading scenarios.

Author

Mechanical Properties; Ceramics; Fillers; Foams; Polymers; Aging (Materials); Load Tests; Structural Design; Temperature Effects

20090005210 Eltron Research, Inc., Boulder, CO USA

Polymer composites containing nanotubes

Bley, Richard A., Inventor; August 12, 2008; 19 pp.; In English

Contract(s)/Grant(s): NAS9-00116; NAS9-00028

Patent Info.: Filed August 25, 2004; US-Patent-7,411,019; US-Patent-Appl-SN-10/927,628; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005210

The present invention relates to polymer composite materials containing carbon nanotubes, particularly to those containing singled-walled nanotubes. The invention provides a polymer composite comprising one or more base polymers, one or more functionalized m-phenylenevinylene-2,5-disubstituted-p-phenylenevinylene polymers and carbon nanotubes. The invention also relates to functionalized m-phenylenevinylene-2,5-disubstituted-p-phenylenevinylene polymers, particularly to m-phenylenevinylene-2,5-disubstituted-p-phenylenevinylene polymers having side chain functionalization, and more particularly to m-phenylenevinylene-2,5-disubstituted-p-phenylenevinylene polymers having olefin side chains and alkyl epoxy side chains. The invention further relates to methods of making polymer composites comprising carbon nanotubes.

Official Gazette of the U.S. Patent and Trademark Office

Carbon Nanotubes; Composite Materials; Polymer Matrix Composites; Polymers

20090005233 NASA, Washington, DC USA

Electrospun Electroactive Polymers

Harrison, Joycelyn S., Inventor; Burney, Kristin J., Inventor; Ounaies, Zoubeida, Inventor; Park, Cheol, Inventor; Siochi, Emilie J., Inventor; 16 Mar. 2006; 17 pp.; In English

Patent Info.: Filed Filed 18 Dec. 04; US-Patent-Appl-SN-11-017 546; US 2006/0057377

Report No.(s): PB2008-101193; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005233

Electroactive polymers are produced via electrospinning. The induction of electroactivity via electrospinning can be utilized with one or more soluble polymers with polarizable moieties. Suitable polymer classes include but are not limited to polyimides, polyamides, vinyl polymers, polyurethanes, polyureas, polythioureas, polyacrylates, polyesters, and biopolymers. Any one or more solvents sufficient to dissolve the one or more polymers of interest and make a spinnable solution can be utilized. The polymer can be electrospun into fiber and fibrous nonwoven mat. The electroactive polymer can be doped with inclusions, such as nanotubes, nanofibers, and piezoceramic powders for dielectric enhancement The availability of electroactive polymer fibers and fibrous nonwoven mat will enable many new applications for electroactive polymers.

Author

Electroactive Polymers; Fabrication; Polyimides

20090006038 Thomas, Kayden, Horstemeyer and Risley, LLP, Atlanta, GA, USA

Composite Materials Having Low Filler Percolation Thresholds and Methods of Controlling Filler Interconnectivity

Gerhardt, R. A., Inventor; Qu, R., Inventor; Li, Z., Inventor; Samuels, R. J., Inventor; Capozzi, C. J., Inventor; 16 Feb 06; 23 pp.; In English

Contract(s)/Grant(s): NSF-DMR-0076153

Patent Info.: Filed Filed 16 Feb 06; US-Patent-Appl-SN-11-357 582

Report No.(s): PB2008-106123; No Copyright; Avail.: CASI: A03, Hardcopy

Composite materials are disclosed having low filler percolation thresholds for filler materials into the composite matrix material along with methods of controlling filler interconnectivity within the composite matrix material. Methods are, thus, disclosed that provide the ability to control the desired properties of the composites. The composites of the present disclosure are characterized by a 'pseudo-crystalline' microstructure formed of matrix particles and filler particles where the matrix particles are faceted and substantially retain their individual particle boundaries and where the filler particles are interspersed between the matrix particles at the individual matrix particle boundaries such that the filler particles form a substantially interconnected network that substantially surrounds the individual faceted matrix particles. In an exemplary embodiment, the composites are formed by selecting matrix particles and filler particles wherein the ratio of the average size of the matrix particles to the average size of the filler particles is about 10 or more. The selected matrix particles exhibit a glass transition temperature. The matrix particles and the filler particles are mechanically mixed and then subjected to a temperature above the glass transition temperature of the matrix particles and a compression pressure for a period of time sufficient to cause the matrix particles to undergo deformation so as to compress them together eliminating void spaces between the particles without melting the matrix material.

NTIS

Composite Materials; Fillers; Patent Applications; Percolation

20090006609 NASA, Washington, DC USA

Interphase for ceramic matrix composites reinforced by non-oxide ceramic fibers

DiCarlo, James A., Inventor; Bhatt, Ramakrishna, Inventor; Morscher, Gregory N., Inventor; Yun, Hee-Mann, Inventor; September 23, 2008; 12 pp.; In English

Patent Info.: Filed June 24, 2003; US-Patent-7,427,428; NASA-Case-LEW-17240-1; US-Patent-Appl-SN-10/601,657; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006609

A ceramic matrix composite material is disclosed having non-oxide ceramic fibers, which are formed in a complex fiber architecture by conventional textile processes; a thin mechanically weak interphase material, which is coated on the fibers; and a non-oxide or oxide ceramic matrix, which is formed within the interstices of the interphase-coated fiber architecture. During composite fabrication or post treatment, the interphase is allowed to debond from the matrix while still adhering to the fibers, thereby providing enhanced oxidative durability and damage tolerance to the fibers and the composite material.

Official Gazette of the U.S. Patent and Trademark Office

Ceramic Fibers; Ceramic Matrix Composites; Oxides

25
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*.

20090005136 Brookhaven National Lab., Upton, NY USA

Spectroscopic Studies of Structure, Dynamics and Reactivity in Ionic Liquids

Wishart, J. F.; Oct. 2007; 5 pp.; In English

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

Report No.(s): DE2007-921047; BNL-79590-2007-CP; No Copyright; Avail.: National Technical Information Service (NTIS)

Ionic liquids (ILs) are a rapidly expanding family of condensed-phase media with important applications in energy production, nuclear fuel and waste processing, improving the efficiency and safety of industrial chemical processes, and pollution prevention. ILs are generally nonvolatile, noncombustible, highly conductive, recyclable and capable of dissolving

a wide variety of materials. They are finding new uses in chemical synthesis, catalysis, separations chemistry, electrochemistry and other areas. Ionic liquids have dramatically different properties compared to conventional molecular solvents, and they provide a new and unusual environment to test our theoretical understanding of charge transfer and other reactions. We are interested in how IL properties influence physical and dynamical processes that determine the stability and lifetimes of reactive intermediates and thereby affect the courses of chemical reactions and product distributions. Successful use of ionic liquids in radiation-filled environments, where their safety advantages could be significant, requires an understanding of ionic liquid radiation chemistry.
NTIS
Liquids; Reactivity; Spectroscopy

20090005137 Brookhaven National Lab., Upton, NY USA
Tetraalkylphosphonium Polyoxometalates as Novel Ionic Liquids
Dietz, M. L.; Rickert, P. G.; Antonio, M. R.; Firestone, M. A.; Wishart, J. F.; Nov. 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-921048; BNL-79591-2007-CP; No Copyright; Avail.: Department of Energy Information Bridge

The pairing of a Lindqvist or Keggin polyoxometalate (POM) anion with an appropriate tetraalkylphosphonium cation, has been shown to yield an original family of ionic liquids (POM-ILs), among them salts liquid at or near ambient temperature. The physicochemical properties of several such inorganic liquids, in particular their thermal properties, suggests the possible application of these compounds as robust, thermally-stable solvents for liquid-liquid extraction. A preliminary evaluation of the potential of POM-ILs in this application is presented.
NTIS
Anions; Cations; Liquids

20090005920 Air Force Research Lab., Edwards AFB, CA USA
Rearrangement of 3-Membered 1,1,2-Trifluorobromonium and Iodonium Ions and Comparison of Trifluorochloronium to Fluorocarbeniuim Ions
Shellhamer, D; Davenport, K; Forberg, H; Herrick, M; Jones, R; Rodriguez, S; Sanabria, S; Trager, N; Weiss, R; Heasley, V; Boatz, J; Jan 2008; 9 pp.; In English
Contract(s)/Grant(s): CJE-0345551; CHE-0640547; Proj-2303
Report No.(s): AD-A490473; AFRL-RZ-ED-A-2008-082; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490473

In this paper we investigate the influence that a 4-halosubstituent has on formation of three-membered halonium ions and their rearrangement to five-membered ring intermediates when chloronium, bromonium and iodonium ions from alkenes 1, 2 and 3 are formed in aprotic solvent (Scheme 1). We also compare the open-ion chloronium ions with the open-carbocations from addition of a proton to terminal fluorosubstituted alkenes.
DTIC
Chemical Reactions; Fluorohydrocarbons; Ions; Quantum Chemistry

20090006024 Pacific Northwest National Lab., Richland, WA, USA
Chemistry of Ultra-Radiopure Materials
Miley, H. S.; Aalseth, C. E.; Day, A. R.; Farmer, O. T.; Fast, J. E.; January 2007; 8 pp.; In English
Report No.(s): DE2007-920540; No Copyright; Avail.: Department of Energy Information Bridge

Ultra-pure materials are needed for the construction of the next generation of ultra-low level radiation detectors. These detectors are used for environmental research as well as rare nuclear decay experiments, e.g. probing the effective mass and character of the neutrino. Unfortunately, radioactive isotopes are found in most construction materials, either primordial isotopes, activation/spallation products from cosmic-ray exposure, or surface deposition of dust or radon progeny. Copper is an ideal candidate material for these applications. High-purity copper is commercially available and, when even greater radiopurity is needed, additional electrochemical purification can be combined with the final construction step, resulting in electroformed copper of extreme purity. Copper also offers desirable thermal, mechanical, and electrical properties. To bridge the gap between commercially-available high purity copper and the most stringent requirements of next-generation low-background experiments, a method of additional chemical purification is being developed based on well-known copper electrochemistry. This method is complemented with the co-development of surface cleaning techniques and more sensitive

assay for both surface and bulk contamination. Developments in the electroplating of copper, assay of U and Th in the bulk copper, and the removal and prevention of residual surface contamination will be discussed relative to goals of less than 1 microBq/kg Th.
NTIS
Copper; Radiation Detectors

20090006057 Air Force Research Lab., Edwards AFB, CA USA
Energetic Ionic Liquids Based on Lanthanide Nitrate Complex Anions (Postprint)
Tao, Guo-Hong; Huang, Yangen; Shreeve, Jean'ne M; Boatz, Jerry A; Jan 2008; 9 pp.; In English
Contract(s)/Grant(s): HDTRA1-07-1-0024; NSF CHE-0315275; Proj-5026
Report No.(s): AD-A490627; AFRL-RZ-ED-JA-2008-332; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490627

Energetic ionic liquids based on anionic rare earth nitrate complexes, Cat+3[Ln(NO3)6](3-), where Cat+ is guanidinium, 4-amino-triazolium, 1-methyl-4-amino-triazolium, 1-ethyl-4-aminotriazolium, 1-butyl-4-amino-triazolium, 1,5-diamino-tetrazolium, and 1,5-diamino-4-methyltetrazolium, were prepared. The hexanitrato lanthanum (cerium) salts with the latter two cations are the first CO-balanced energetic ionic liquids that are hydrolytically and air stable with impact sensitivities of ~27 J. For environmental considerations, these ionic liquids were obtained by a simple method using nitrate-containing precursors. All salts are fully characterized by IR, NMR, elemental analysis, thermal stability, phase behavior, density, and water content determinations. Based on theoretical calculations, these new compounds have potential as propellants.
DTIC
Anions; Cerium; Chemical Composition; Lanthanum; Liquids; Nitrates; Nuclear Magnetic Resonance; Rare Earth Elements

20090006070 Army Research Lab., Adelphi, MD USA
Investigation into the Effect of Reagent Choice on the Dielectric Properties of the Ferroelectric Oxides Ba(MTa)0.05Ti0.9O3 (where M=Sc, Er, Ho or Y)
Miller, Virginia L; Tidrow, Steven C; Oct 2008; 24 pp.; In English
Report No.(s): AD-A488030; ARL-TR-4622; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA488030

This report investigates the effects of reagent choice on the physical properties of ferroelectric oxides of the composition Ba(MTa)0.05Ti0.9O3 (M=Sc, Er, Ho or V). These materials are of particular interest because they possess relatively low to medium dielectric constants and improved tunabilities. In this project, samples of Ba(MTa)0.05Ti0.9O3 (M=Sc, Er, Ho or Y) were prepared using two different synthetic methods. The first method consisted of heating a stoichiometric mixture of binary carbonates and oxides in air at 1500 C for 25 hours. In the second synthetic method, Ba(MTa)0.05Ti0.9O3 was prepared using the same reaction conditions as the first method, but stoichiometric mixtures of BaTiO3 and Ba2MTaO6 (M= Sc, Er, Ho or Y) were used as the reagents. The goal of this project was to determine if using BaTiO3 and Ba2MTaO6 as reagents in the synthesis of Ba(MTa)0.05Ti0.9O3, rather than binary oxides and carbonates, would alter and possibly improve the material's dielectric properties. The results indicated that the choice of reagents had a noticeable effect on the dielectric properties. Materials prepared using BaTiO3 and Ba2MTaO6 had larger dielectric constants and were more temperature sensitive than the materials prepared using binary carbonates and oxides.
DTIC
Dielectric Properties; Ferroelectric Materials; Ferroelectricity; Oxides; Selection

20090006094 Lethbridge Univ., Lethbridge, Alberta Canada
Synthesis, NMR and Vibrational Spectroscopic Characterization, and Computational Study of the cis-IO2F32- Anion (Postprint)
Mack, Johnathan P; Gerken, Michael; Boatz, Jerry; Mar 15, 2008; 7 pp.; In English
Contract(s)/Grant(s): Proj-5026
Report No.(s): AD-A490499; AFRL-RZ-ED-JA-2007-497; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490499

The N(CH3)4(+) salt of the cis-IO2F3(2-) anion was synthesized from [N(CH3)4][IO2F2] and excess [N(CH3)4][F] in CH3CN solvent. The [N(CH3)4]2[IO2F3] salt was characterized by Raman, infrared, and 19F solid-state MAS NMR

spectroscopy. Geometry optimization and calculation of the vibrational frequencies at the DFT level of theory corroborated the experimental finding that the IO2F3(2-) anion exists as a single isomer with a cis-dioxo and mer-trifluoro arrangement. The fluorine atom in IO2F3(2-) that is trans to one of the oxygen atoms is very weakly bound with a calculated bond length of 228.1 pm. The IO2F3(2-) anion is only the second example of an AEO2F3 species after XeO2F3(-).
DTIC
Anions; Characterization; Chemical Bonds; Fluorides; Iodine; Nuclear Magnetic Resonance; Spectroscopy; Vibration

20090006106 Teledyne Brown Engineering, Huntsville, AL USA
Quantifying 'Persistence' In The Context Of Find, Fix, Finish
Rice, Roy E; Jun 15, 2007; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488106; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Partial contents:Set the Stage, Define the problem, Probability derivation, Limits, Derivatives to show rate of change, Persistent ISR Ratio (PIR), Examples.
DTIC
Problem Solving; Operating Systems (Computers)

20090006113 Air Force Research Lab., Edwards AFB, CA USA
Liquid State Thermochemical Decomposition of Neat 1,3,5,5-Tetranitrohexahydropyrimidine (DNNC) and its DNNC-d2, DNNC-d4, DNNC-d6 Structural Isotopomers: Mechanistic Entrance into the DNNC Molecule
Shackelford, S A; Menapace, J A; Goldman, J F; Nov 25, 2007; 19 pp.; In English
Contract(s)/Grant(s): Proj-5026
Report No.(s): AD-A491044; AFRL-PR-ED-JA-2007-303; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491044
Global kinetics for the liquid state thermochemical decomposition of neat 1,3,5,5-tetranitrohexahydropyrimidine (DNNC), perdeuterio-labeled DNNC-d6, and partially deuterium-labeled DNNC-d2 and DNNC-d4 isotopomers were obtained by isothermal differential scanning calorimetry (IDSC). Molecular kinetic deuterium isotope effect (KDIE) values obtained with DNNC and DNNC-d6 from 174 to 194-deg C revealed that C-H bond rupture regulates both an endothermic catalytic initiation and the exothermic propagation of the liquid thermochemical decomposition process. Using IDSC-based KDIE comparisons with the DNNC-d2, DNNC-d4, and DNNC-d6 isotopomers, a more detailed chemical structure/mechanistic relationship emerged by entering the interior of the DNNC molecule. Here structural kinetic KDIE results showed the rate-controlling C-H bond rupture has its origin at the non-equivalent C-2 methylene group sandwiched between the two nitrated DNNC nitrogen ring atoms, versus at the chemically equivalent C-4 and C-6 methylene ring positions located elsewhere in the DNNC molecule. Elucidation of such mechanistic features should aid in the structural design of new high energy compounds with improved thermochemical properties. A 170.0 kJ/mol activation energy appeared for the endothermic induction period, and a lower 104.2 kJ/mol activation energy was determined for the exothermic acceleratory portion of the DNNC decomposition process. The global liquid and solid state thermochemical decomposition processes for DNNC are compared.
DTIC
Decomposition; Kinetics; Thermochemistry

20090006114 Politecnico di Milano, Milan, Italy
Anion-Driven Self-Assembly Processes Based on Halogen-Bonding
Metrangolo, Pierangelo; Jul 10, 2007; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8655-06-1-3042
Report No.(s): AD-A491049; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491049
This report results from a contract tasking Polytechnic of Milan as follows: From a supramolecular point of view anionic species play a key role in many mineral or biological processes. Since XB has been rationalized as a charge transfer interaction with a strong electrostatic character, the higher the electron density on the donor site, the stronger the resulting interaction. The increase of electron density on the anions was pursued by using inorganic salts (ISs), as source of co-ordinating anions.

The complexed anions are thus expected to become nucleophilic enough to give rise to strong XBs able to drive the self-assembly of PFCs, HOs, and ISs.
DTIC
Anions; Bonding; Electrostatics; Halogens; Self Assembly

20090006199 Army Research Lab., Aberdeen Proving Ground, MD USA
Theoretical Investigation of H2 Combustion on alphaAl2O3 Support
Synowczynski, Jennifer; Andzelm, Jan W; Vlachos, D G; Nov 2008; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491360; ARL-TR-4642; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Based on Density Functional Theory Generalized Gradient Approximation (DFT-GGA) calculations, we provide a theoretical model for the effect of the catalytic support (alpha alumina oxide (alphaAl2O3)) on the dissociation of molecular hydrogen (H2), molecular oxygen (O2), hydroxyl (OH), water (H2O), and the surface diffusion of oxygen and hydrogen species along the Al2O3 (0001) surface. These processes are key to understanding the inverse spillover effect that occurs during hydrogen combustion on alumina surfaces. Our results indicate the dissociation of O2 is not thermodynamically favored on the Al2O3 surface. However, both H2 and H2O can dissociate, forming hydroxyls with oxygen atoms in the second atomic layer. Once dissociated, oxygen species can diffuse locally but encounter a large barrier to long-range surface diffusion in the absence of defects or other species. In contrast, the barrier to the long-range surface diffusion of hydrogen is modest under ideal conditions.
DTIC
Aluminum Oxides; Catalysis; Combustion; Hydrogen

20090006200 Army Research Lab., Aberdeen Proving Ground, MD USA
DFT Study of H2 Combustion on alphaAl2O3 Supported Pt Clusters
Synowczynski, Jennifer; Andzelm, Jan W; Vlachos, D G; Nov 2008; 22 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491362; ARL-TR-4643; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Based on Density Functional Theory Generalized Gradient Approximation (DFT-GGA) calculations, we provide a theoretical model for the hydrogen (H2) combustion on alumina oxide (Al2O3) supported catalytically active platinum (Pt) nanoclusters. In a previous report (Synowczynski, 2008), we identified several adsorption and dissociation processes that occur on the Al2O3 support and demonstrated that products from these reactions can migrate along the Al2O3 surface. In this report, we build on this model to show how these products influence catalytic activity at the Pt particle. We also identify new reactant structures that are unique to the Pt/Al2O3 interface. These processes are key to understanding the inverse spillover effect and the influence of the Pt/Al2O3 interface during H2combustion on Al2O3 surfaces.
DTIC
Aluminum Oxides; Catalysis; Combustion; Hydrogen; Platinum

20090006273 Air Force Research Lab., Edwards AFB, CA USA
Practical Methylation Procedure for (1H)-1,2,4-Triazole (Postprint)
Belletire, John L; Bills, Robert A; Shackelford, Scott A; Sep 2007; 9 pp.; In English
Contract(s)/Grant(s): Proj-23030423
Report No.(s): AD-A491734; AFRL-PR-ED-JA-2007-326; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491734

Conversion of (1H)-1,2,4-triazole to its sodium salt with methanolic sodium methoxide is followed by reaction with iodomethane. A scalable approach that overcomes problems associated with water-soluble starting material and water-soluble product combined continuous extraction (chloroform/water) with a final short-path distillation under a controlled vacuum to obtain spectroscopically pure 1-methyl-1,2,4-triazole in 63 percent yield. Adaptation to microwave synthesis conditions, while providing a faster reaction time, offers no product yield or purification advantages over the conventional approach described. Conversions of this product to related derivatives such as 1,4-dimethyl-1,2,4-triazolium iodide and 1-methyl-1,2,4-triazolium hydrochloride are readily achieved.
DTIC
Methylation; Water

20090006287 Air Force Research Lab., Edwards AFB, CA USA

Ionic Liquids as Hypergolic Fuels (Postprint)

Hawkins, Tommy; Vaghjiani, Ghanshyam; Rosander, Michael; Chambreau, Steven; Schneider, Stefan; Drake, Gregory; Jan 2008; 3 pp.; In English

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A491837; AFRL-RZ-ED-JA-2008-041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491837

After seminal work presented a decade ago, ionic liquids (IL) have now received a lot of attention as energetic materials for propellant applications. In bipropellant rocket engines, it is desirable to achieve ignition by means of a hypergolic reaction and so to minimize system complexity. Hypergolic bipropellants are defined as fuel and oxidizer combinations that, upon contact, chemically react and release enough heat to spontaneously ignite, eliminating the need for an additional ignition source. This also makes them highly reliable for spacecraft and satellites which need to fire their rocket engines hundreds, or even thousands, of times during their lifetime. Unfortunately, no reliable a priori method for prediction of hypergolicity for fuel - oxidizer pairs is available today. The initial 'hunting for the hypergol', as John Clark entitled one of the chapters in his book Ignition!, took place mainly during WWII. At that time, such toxic systems as 'C-Stoff' (a mixture of N2H4H2O, methanol and water) and others consisting of triethyl amine, aniline, toluidine, xylidine and N-methyl aniline were developed. Today, environmental and health concerns are becoming more and more pressing in the propellant world. Nevertheless, hydrazine and its methylated derivatives are still the state-of-the-art fuels for bipropellant applications. Most of the problems handling hydrazine and its derivatives are related to their volatility, as they are carcinogenic vapor toxins. For these reasons, it is exceedingly attractive to replace hydrazine with ILs which have become paragons of environmental friendliness, green chemistry and low vapor toxicity.

DTIC

Fuels; Liquid Propellant Rocket Engines; Liquid Rocket Propellants; Liquids

20090006288 Air Force Research Lab., Edwards AFB, CA USA

Alkene- and alkyne- substituted methylimidazolium bromides: structural effects and Physical properties (Postprint)

Schneider, Stefan; Drake, Gregory; Hall, Leslie; Hawkiins, Tommy; Rosander, Michael; Smith, Dennis; Aug 2007; 8 pp.; In English

Contract(s)/Grant(s): Proj-2303

Report No.(s): AD-A491845; AFRL-PR-ED-JA-2007-097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491845

Several bromide salts composed of methylimidazolium cations possessing unsaturated sidechains (allyl-, 3-butenyl-, propargyl-, 2-butynyl-, and 2-pentynyl-) have been synthesized and characterized by multinuclear NMR, vibrational spectroscopy, and DSC, X-ray and elemental analysis. X-ray structures of 1-(2-butynyl)-3-methylimidazolium bromide, 1-propargyl-3-methylimidazolium bromide as well as the X-ray structure of 1-allyl-3- methylimidazolium bromide which was previously identified as a room temperature ionic liquid, were all determined.

DTIC

Alkenes; Alkynes; Bromides; Liquids

20090006319 Dority and Manning, Greenville, SC, USA; Clemson Univ., SC USA

Process for Separating Metallic from Semiconducting Single-Walled Carbon Nanotubes

Sun, Ya-Ping, Inventor; 16 Mar. 2006; 15 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NCC1-01036

Patent Info.: Filed Filed 16 Dec. 04; US-Patent-Appl-SN-11-013900; US 2006/0054555

Report No.(s): PB2008-101691; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006319

A method for separating semiconducting single-walled carbon nanotubes from metallic single-walled carbon nanotubes is disclosed. The method utilizes separation agents that preferentially associate with semiconducting nanotubes due to the electrical nature of the nanotubes. The separation agents are those that have a planar orientation, pi-electrons available for association with the surface of the nanotubes, and also include a soluble portion of the molecule. Following preferential association of the separation agent with the semiconducting nanotubes, the agent/nanotubes complex is soluble and can be

solubilized with the solution enriched in semiconducting nanotubes while the residual solid is enriched in metallic nanotubes. Author

Carbon Nanotubes; Metals; Semiconductors (Materials); Nanotubes; Nanotechnology

20090006327 NASA, Washington, DC USA; NASA Langley Research Center, Hampton, VA, USA

Carbon Nanotube Based Light Sensor

Wincheski, Russell A., Inventor; Smits, Jan M., Inventor; Jordan, Jeffrey D., Inventor; Watkins, Anthony Neal, Inventor; Ingram, JoAnne L., Inventor; 16 Mar. 2006; 14 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS1-00135

Patent Info.: Filed Filed 10 Sep. 04; US-Patent-Appl-SN-10-943831; US 2006/0054788

Report No.(s): PB2008-101692; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006327

A light sensor substrate comprises a base made from a semi-conductive material and topped with a layer of an electrically non-conductive material. A first electrode and a plurality of carbon nanotube (CNT)-based conductors are positioned on the layer of electrically non-conductive material with the CNT-based conductors being distributed in a spaced apart fashion about a periphery of the first electrode. Each CNT-based conductor is coupled on one end thereof to the first electrode and extends away from the first electrode to terminate at a second free end. A second or gate electrode is positioned on the non-conductive material layer and is spaced apart from the second free end of each CNT-based conductor. Coupled to the first and second electrode is a device for detecting electron transfer along the CNT-based conductors resulting from light impinging on the CNT-based conductors.

Author

Carbon Nanotubes; Light (Visible Radiation); Sensors

20090006422 Explosives Research and Development Establishment, Waltham Abbey, UK

The Suitability of the Oxidants Liquid Oxygen Hydrogen Peroxide and Nitric Acid in Liquid Propellant Systems for Operational Use

Wiseman, L A; Oct 1948; 20 pp.; In English

Report No.(s): AD-A492067; ERDE-TM-13/M/48; No Copyright; Avail.: Defense Technical Information Center (DTIC)

No abstract available

Hydrogen Peroxide; Liquid Oxygen; Liquid Rocket Propellants; Nitric Acid; Oxidizers

20090006435 California Univ., Los Angeles, CA USA

Development of Nanoplatelet Composites

Hahn, H T; Choi, O; Wang, Zhe; Dec 8, 2008; 18 pp.; In English

Contract(s)/Grant(s): F9550-05-1-0138

Report No.(s): AD-A492125; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Graphite nanoplatelets (GNPs) are an attractive class of reinforcement materials as they offer both high modulus and high strength. GNPs have a thickness of less than 100 nm although their planar dimensions can be as large as a few micrometers. As with any other nanoscale particles, their effectiveness as a reinforcement phase depends on the surface functionalization, which controls dispersion and interfacial bonding. A simple surface oxidation using nitric acid is shown to yield as good an improvement in composite properties as a few other functional groups chemically bonded to the surface do. The properties discussed include modulus, strength, fracture toughness, adhesive strength, thermal and electrical conductivities, and dielectric constants. Methods of further exfoliating graphite nanoplatelets are discussed together with the associated benefits on composite properties. Potential applications of graphite nanoplatelet composites are presented to conclude the report.

DTIC

Ceramics; Graphite; Polymers

20090006441 Pennsylvania State Univ., University Park, PA USA

Molecular Dynamics Simulation of Supercritical Spray Phenomena

Micci, Michael M; Sep 26, 2008; 11 pp.; In English

Contract(s)/Grant(s): FA9550-04-1-0012

Report No.(s): AD-A492151; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Results showed that the way the fluid-wall interaction is modeled in molecular dynamics simulations has a strong effect

on the resultant simulation of liquid injection into a gas. It was found that modeling the wall as individual atoms (atomistic model) interacting with the fluid resulted in the fluid remaining in an injection tube absent any pressure or body force to force it into a gaseous region while a stochastically modeled diffusely reflecting wall with no attraction between the fluid and the wall resulted in the fluid being injected into the gas even in the absence of pressure or body forces. Since a non-atomistically modeled wall has reduced computational requirements compared to an atomistic wall, efforts centered on an examination of possible non-atomistic continuous fluid-wall interaction models that would not only correctly reproduce fluid thermodynamic properties such as pressure but would also reproduce the same fluid injection behavior as an atomistic wall model. Several non-atomistic fluid-wall models were examined in terms of their ability to correctly predict the fluid pressure in the injection tube over a range of fluid densities as well as their ability to reproduce atomistic wall injection behavior, but none were found able to reproduce atomistic wall behavior.
DTIC
Molecular Dynamics; Simulation; Sprayers

20090006456 Lehigh Univ., Bethlehem, PA USA
Optimizing Grain Boundary Complexions to Produce Dense Pressure-Less Sintered Boron Carbide (B4C)
Harmer, Marin P; Dillon, Shen J; Nov 14, 2008; 16 pp.; In English
Contract(s)/Grant(s): FA9550-07-1-0564
Report No.(s): AD-A492285; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this seedling grant was to explore the possible existence and role of grain boundary complexions in the sintering of boron carbide by two means. First, we have developed a novel processing strategy, which exploits the use of a chemical (dopant) gradient in order to facilitate the ease of identification and characterization of grain boundary complexions. Second, we have characterized commercially prepared samples in which different dopants led to significant differences in grain growth behavior (abnormal versus abnormal). The results of this study determined that sintering and grain growth in boron carbide is highly sensitive to dopant chemistry and amount. The chemical gradient model experiment revealed that yttria can readily activate complexion transitions in boron carbide. Alumina promotes abnormal grain growth in boron carbide by activating a grain boundary complexion transition from type I (sub monolayer adsorption) to type lit (multilayer adsorption). The use of multiple dopants is effective in stabilizing grain boundary complexion type tin boron carbide and in preventing abnormal grain growth. Further work on the identification and control of grain boundary complexions in boron carbide is highly recommended.
DTIC
Boron Carbides; Grain Boundaries; Sintering

20090006474 Aerospace Corp., Los Angeles, CA USA
Lamp Reliability Studies for Improved Satellite Rubidium Frequency Standard
Frueholz, R P; Wun-Fogle, M; Eckert, H U; Volk, C H; Jones, P F; Dec 1981; 25 pp.; In English
Report No.(s): AD-A492390; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In response to the premature failure of Rb lamps used in Rb atomic clocks onboard Navstar GPS satellites The Aerospace Corporation has initiated experimental and theoretical investigations into their failure mechanism. The primary goal of these studies is the development of an accelerated life test for future GPS lamps. At this time the primary failure mechanism has been identified as consumption of the lamp's Rb charge via direct interaction between Rb and the lamp's glass surface. The most effective parameters to accelerate the interaction between the Rb and the glass are felt to be rf excitation power and lamp temperature. Differential scanning calorimetry is used to monitor the consumption of Rb within a lamp as a function of operation time. This technique has already yielded base line Rb consumption data for CPS lamps operating under normal conditions. In order to insure acceleration methods do not alter the mechanism of the Rb-glass interaction detailed surface studies yielding information about the mechanism of interaction are in progress. It has been found that penetration profiles of Rb into pyrex surfaces can be analyzed in terms of one-dimensional diffusion models Diffusion coefficients may be extracted via these models. The surface studies also indicate that Rb exists in at least two forms in pyrex, a thin colored surface layer and the major colorless penetration component. Further experiments are in progress to extend these results to a wide variety of glasses.
DTIC
Frequency Standards; Global Positioning System; Luminaires; Reliability; Rubidium

20090006475 Royal Armament Research and Development Establishment, Fort Halstead, UK
Co-Ordination Compounds as Sensitizers for Percussion Cap Compositions
Bean, C M; Jan 1949; 49 pp.; In English
Report No.(s): AD-A492392; RARDE-37/48; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The possibility of using co-ordination compounds as sensitizers of percussion cap compositions has been investigated. Fairly promising results have been obtained which are regarded as an indication that there is scope for much further work on similar lines. No recommendations are made for Service use of the compositions described.
DTIC
Chemical Composition; Percussion

20090006505 NASA Langley Research Center, Hampton, VA USA
Polyimide Foams
Vazquez, Juan M., Inventor; Cano, Roberto J., Inventor; Jensen, Brian J., Inventor; Weiser, Erik S., Inventor; 23 Mar. 2006; 10 pp.; In English
Patent Info.: Filed Filed 5 May 05; US-Patent-Appl-SN-11-124640; US 2006/0063848
Report No.(s): PB2008-101914; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006505

A fully imidized, solvent-free polyimide foam having excellent mechanical, acoustic, thermal, and flame resistant properties is produced. A first solution is provided, which includes one or more aromatic dianhydrides or derivatives of aromatic dianhydrides, and may include one or more aromatic diamines, dissolved in one or more polar solvents, along with an effective amount of one or more blowing agents. This first solution may also advantageously include effective amounts respectively of one or mores catalysts, one or more surfactants, and one or more fire retardants. A second solution is also provided which includes one or more isocyanates. The first and second solutions are rapidly and thoroughly mixed to produce an admixture, which is allowed to foam--in an open container, or in a closed mold--under ambient conditions to completion produce a foamed product. This foamed product is then cured by high frequency electromagnetic radiation, thermal energy, or a combination thereof. Alternatively, the process is adapted for spraying or extrusion.
Author
Anhydrides; Foams; Polyimides; Aromatic Compounds

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20090005011 Texas Univ., Austin, TX, USA
Evaluation of Influence of Hole Making Upon the Performance of Structural Steel Plates and Connections
Brown, J. D.; Lubitz, D. J.; Cekov, Y. C.; Frank, K. H.; Keating, P. B.; Jan. 2007; 235 pp.; In English
Report No.(s): PB2008-106529; Copyright; Avail.: National Technical Information Service (NTIS)

A large experimental study was undertaken to determine the effect of hole making upon the strength, ductility, and fatigue performance of structural steel plates and connections. The variables included steel strength, plate thickness, hole size, punch to die clearance, galvanizing, temperature, and edge distance. Approximately 300 tension and fatigue tests were performed. The study agreed with the results of previous research that plates with punched holes have lower strength and ductility than ones with drilled holes. The fatigue performance of plates with punched holes was also less than ones with drilled holes. Galvanizing further reduced the fatigue strength of plates with punched holes. The effect upon hole making upon the fatigue strength and to some extent the tensile strength reduced when fully pretensioned bolts were used. Empty holes had a lower fatigue strength then holes used in a bolted connection. The practice of increasing the hole diameter by 1/16 in. when calculating the net section of a tension member did not account for the reduction in strength when the hole was punched. It is recommended that this increase in hole be eliminated and the tension strength of members with punched holes be taken as 90% of normal design values.
NTIS
Metal Plates; Steels

20090005126 Air Force Research Lab., Wright-Patterson AFB, OH USA

Microstructure Evolution During Warm Working of Ti-6Al-4V with a Colony Alpha Microstructure

Semiatin, S L; Shevchenko, S V; Ivasishin, O M; Glavicic, M G; Chun, Y B; Hwang, S K; Sep 2008; 76 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A490788; AFRL-RX-WP-TP-2008-4352; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The development of crystallographic texture, the preferred orientation of grains in a polycrystalline aggregate, during thermomechanical processing (TMP) can play an important role with regard to the secondary-forming response (e.g., deep drawing of sheet) and service performance (e.g., strength, elastic modulus, ductility, fracture toughness) of metallic materials. Crystallographic texture, or simply texture for succinctness, may arise as a result of large-strain deformation, dynamic/static recrystallization, grain growth, or phase transformation. A second form of anisotropy, mechanical texturing or mechanical fibering, refers to the alignment of microstructure, inclusions, etc., during deformation processes and may also affect mechanical properties such as ductility and fracture toughness. This latter form of texture is not discussed in the present article. DTIC

Aluminum Alloys; Colonies; Crystallography; Microstructure; Simulation; Textures; Thermomechanical Treatment; Titanium Alloys; Vanadium Alloys

20090005919 Air Force Research Lab., Wright-Patterson AFB, OH USA

The Effect of Preheat Temperature and Inter-Pass Reheating on Microstructure and Texture Evolution During Hot Rolling of Ti-6Al-4V

Salem, A A; Glavicic, M G; Semiatin, S L; Feb 2008; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A490459; AFRL-RX-WP-TP-2008-4344; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490459

The effect of preheat temperature and inter-pass reheating on microstructure and texture evolution during unidirectional hot rolling of Ti-6Al-4V in the alpha + beta field was investigated. Three different heating schedules were used to roll plates at 10 pct. reduction per pass to a 3:1 total reduction (true strain = 1.15): 1) preheat at 955 deg C with inter-pass reheating for 3 minutes, 2) preheat at 955 deg C without inter-pass reheating, and 3) preheat at 815 deg C with production practice. The microstructures and textures were determined using electron-backscatter and X-ray diffraction techniques. The results revealed that the intensity of basal poles decreased along the rolling direction and increased along the normal and transverse directions with decreasing rolling (furnace) temperature or the elimination of reheating between passes. DTIC

Aluminum Alloys; Heating; Microstructure; Temperature Effects; Textures; Titanium Alloys; Vanadium Alloys

20090006008 Air Force Research Lab., Wright-Patterson AFB, OH USA

Microstructure Evolution During Warm Working of Ti-6Al-4V with a Colony Alpha Microstructure (Preprint)

Mironov, S; Murzinova, M; Zherebtsov, S; Salishchev, G A; Semiatin, S L; Sep 2008; 25 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-4347

Report No.(s): AD-A490456; AFRL-RX-WP-TP-2008-4351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490456

A high-resolution electron-backscatter-diffraction (EBSD) technique was employed to investigate microstructure evolution during warm working of Ti-6Al-4V with a colony alpha microstructure. Particular emphasis was paid to the specific mechanisms governing this process. Microstructure development was found to be driven mainly by the geometrical requirements of the imposed strain and by the kinking of alpha lamellae. For the most part, the lamellar microstructure was surprisingly stable during straining with limited globularization observed only in kinked alpha colonies. The kinking process was shown to be closely linked with the development of shear bands within the colonies. These observations suggest that changes in strain path may be beneficial in promoting globularization during warm working. DTIC

Aluminum Alloys; Colonies; Hot Working; Microstructure; Titanium Alloys; Vanadium Alloys

20090006021 Sandia National Labs., Albuquerque, NM USA

Atomically Engineering Cu/Ta Interfaces

Zhou, X. W.; Webb, E. B.; Sep. 2007; 67 pp.; In English

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

Report No.(s): DE2007-920464; SAND2007-5941; No Copyright; Avail.: Department of Energy Information Bridge

This report summarizes the major research and development accomplishments for the late start LDRD project (investment area: Enable Predictive Simulation) entitled 'Atomically Engineering Cu/Ta Interfaces'. Two ultimate goals of the project are: (a) use atomistic simulation to explore important atomistic assembly mechanisms during growth of Cu/Ta multilayers; and (b) develop a non-continuum model that has sufficient fidelity and computational effciency for use as a design tool. Chapters 2 and 3 are essentially two papers that address respectively these two goals. In chapter 2, molecular dynamics simulations were used to study the growth of Cu lms on (010) bcc Ta and Cu(sub x) Ta(sub 1-x) alloy lms on (111) fcc Cu. The results indicated that fcc crystalline Cu lms with a (111) texture are always formed when Cu is grown on Ta. The Cu lms are always polycrystalline even when the Ta substrate is single crystalline. These polycrystalline lms are composed of grains with only two dierent orientations, which are separated by either orientational grain boundaries or mist dislocations. In chapter 3, a simplied computational method, diusional Monte Carlo (dMC) method, was developed to address long time kinetic processes of materials.

NTIS

Surface Roughness; Grain Boundaries; Molecular Dynamics

20090006056 Missouri Univ., Rolla, MO USA

Modeling and Simulation of a Laser Deposition Process (Preprint)

Liou, Frank; Fan, Zhiqiang; Pan, Heng; Newkirk, Joseph; Slattery, Kevin; Chou, Hsin-Nan; Kinsella, Mary; Sep 2007; 14 pp.; In English

Contract(s)/Grant(s): FA8650-04-C-5704; Proj-2865

Report No.(s): AD-A490608; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490608

A laser deposition process involves the supply of metallic powders into a laser-heated spot where the powder is melted and forms a melt puddle which quickly solidifies into a bead. In order to design an effective system, the laser beam, the powder beam, and their interactions need to be fully understood. In this paper, the laser-material interaction within the melt pool is reported using a multi-scale model: a macroscopic model to model mass, heat, and momentum transfer. Experiments were also conducted to validate the simulation model.

DTIC

Deposition; Laser Applications; Laser Deposition; Mathematical Models; Metal Powder; Simulation

20090006142 Frankford Arsenal, Philadelphia, PA USA

Thermomechanical Treatments on High Strength Al-Zn-Mg(-Cu) Alloys

Di Russo, E; Conserva, M; Gatto, F; Dec 1974; 21 pp.; In English

Contract(s)/Grant(s): Proj-1T162105AH85

Report No.(s): AD-A491180; FA-TA-74037; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491180

An investigation was carried out to determine the metallurgical properties of Al-Zn-Mg and Al-Zn-Mg-Cu alloy products processed according to newly developed Final Thermomechanical Treatments (FTMT) of T-AHA type. The results show that these cycles can be utilized to produce wrought products of high purity Al-Zn-Mg(-Cu) alloys characterized by equivalent toughness and ductility and much higher strength than conventionally processed commercial purity materials. Based on transmission electron microscopy studies, it was found that such improved behavior of FTMT material is attributable to the superposition of hardening effects, from aging precipitation and from dislocations. Preliminary stress-corrosion and fatigue tests indicate that these properties are not substantially influenced by T-AHA thermomechanical process. Further work is needed in this area, in order to better understand the directions to follow for developing better alloys.

DTIC

High Strength; High Strength Alloys; Thermodynamics; Thermomechanical Treatment

20090006344 Colburn (Cantor), LLP, Bloomfield, CT, USA

Tape Casting Method and Tape Cast Materials

Hui, Shiqiang, Inventor; Zhang, Yude, Inventor; Xiao, Danny, Inventor; Wu, Mingzhong, Inventor; 9 Mar. 2006; 14 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS3 00073; F29601-02-C-0031; NSF DMI 0216929

Patent Info.: Filed Filed 10 Jun .05; US-Patent-Appl-SN-11-150592; US 2006/0049540

Report No.(s): PB2008-101699; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006344

A precursor tape casting method is one in which chemical precursors are converted into a final chemical phase from green tapes to products. Because chemical precursors are employed rather than the final powder materials, sintering is not required to form the material. Lower annealing temperatures instead of high temperature sintering allow the formation of grains of about 1 to about 100 nanometers in the final material. In addition, when the final material is a magnetic/insulator composite, improved magnetic properties may be obtained.

Author

Casting; Composite Materials; Annealing

20090006388 Naval Research Lab., Washington, DC USA

Comparison of the Noise Penalty of a Raman Amplifier Versus an Erbium-doped Fiber Amplifier for Long-haul Analog Fiber-optic Links

Devgan, Preetpaul S; Diehl, John F; Urick, Vincent J; Williams, Keith J; Dec 17, 2008; 17 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491951; NRL/MR/5650--08-9167; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A Raman amplifier is compared to an erbium-doped fiber amplifier for a 14 km analog fiber-optic link requiring the amplifier pump at the end of the link. The noise penalty for each amplifier at a given photocurrent is measured and compared. An analytical expression comparing the analog metrics as a function of noise penalty and photocurrent for different amplifiers is derived and used. The Raman amplifier has a lower noise penalty performance for a long-haul analog fiber-optic link versus an erbium-doped fiber amplifier placed at the end of the link. The best compromise comes from a hybrid amplifier, which combines the Raman amplifier with the erbium-doped fiber amplifier and offers the best RF performance while taking only a minimal penalty on the RF noise figure and spurious free dynamic range.

DTIC

Doped Crystals; Erbium; Fiber Optics; Raman Spectra

20090006393 Air Force Research Lab., Wright-Patterson AFB, OH USA

Eddy Current Assessment of Near-Surface Residual Stress in Shot-Peened Inhomogeneous Nickel-Base Superalloys

Yu, Feng; Blodgett, Mark P; Nagy, Peter B; Mar 2006; 13 pp.; In English

Report No.(s): AD-A491970; F09650-00-D-0018; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recently, it has been shown that shot-peened nickel-base superalloys exhibit an approximately 1% increase in apparent eddy current conductivity at high inspection frequencies, which can be exploited for nondestructive subsurface residual stress assessment. Unfortunately, microstructural inhomogeneity in certain as-forged and precipitation hardened nickel-base superalloys, like Waspaloy, can lead to significantly larger electrical conductivity variations of as much as 4 6%. This intrinsic conductivity variation adversely affects the accuracy of residual stress evaluation in shot-peened and subsequently thermal relaxed specimens, but does not completely prevent it. Experimental results are presented to demonstrate that the conductivity variation resulting from volumetric inhomogeneities in as-forged engine alloys do not display significant frequency dependence. This characteristic independence of frequency can be exploited to distinguish these inhomogeneities from near surface residual stress and cold work effects caused by surface treatment, which, in contrast, are strongly frequency-dependent.

DTIC

Eddy Currents; Heat Resistant Alloys; Nickel Alloys; Residual Stress; Shot Peening

20090006465 Naval Air Warfare Center, Patuxent River, MD USA

Modeling and Prediction of Corrosion-Fatigue Failures in AF1410 Steel Test Specimens

Rusk, David T; Hoppe, Wally; Braisted, William; Powar, Nilesh; Jan 12, 2009; 108 pp.; In English

Contract(s)/Grant(s): F42600-00-D-0039-0011

Report No.(s): AD-A492308; NAWCADPAX/TR-2008/60; 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 multiyear 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. An Equivalent Stress Riser (ESR) model has been proposed for AF1410 steel that extends traditional notched fatigue analysis methods to applications with multiple corrosion notches present. An approximate elasticity solution featuring a Fast Fourier Transform of the corroded surface data was developed, and is used to identify local stress concentration areas that may initiate fatigue cracks under loading. Groups of image pixels with stress concentration values above a certain threshold are treated as idealized semi-elliptical notches, with corrosion-fatigue (C-F) notch factor values assigned based on notch geometry and a calibration to an experimental database of failures on bare, unnotched AF1410 C-F test plates. Median life prediction results for abrasive blasted and polished sets of test specimens show a level of conservatism between 1.0 and 3.0 for most predictions, with more severe levels of corrosion on the polished set having a higher level of conservatism. Validation tests were performed using cadmium plated C-F test plates, with the ESR life predictions showing a level of conservatism similar to the predictions on the bare, abrasive blasted C-F test plates. The ESR model was adapted to account for stress gradient effects, and demonstrated by performing a life prediction on a partial WLI scan of the corroded surface of an F/A-18C/D arresting shank.

DTIC

Corrosion; Failure; Fast Fourier Transformations; High Strength Steels; Metal Fatigue; Steels; Stress Concentration; Surface Roughness

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*.

20090005061 Townsend, Townsend and Crew, LLP, San Francisco, CA, USA

Coatings for Carbon Nanotubes

Collier, C. P., Inventor; Giapis, K. P., Inventor; Esplandiu, M. J., Inventor; 22 Sep. 2005; 50 pp.; In English

Contract(s)/Grant(s): NAS7-1407; NIH 1 R21 GM071702-02

Patent Info.: Filed 10 May 05; US-Patent-Appl-SN-11/126,795; US 2005/0208304

Report No.(s): PB2007-105214; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005061

A coated nanotube that includes an inner nanotube having an exterior surface, and a plasma deposited layer covering at least part of the exterior surface of the inner nanotube. Also, a method of making a coated nanotube, the method where the method includes the steps of generating a plasma from a coating precursor, and exposing an inner nanotube to the plasma, where a plasma deposited layer is formed on at least a portion of the inner nanotube. Additionally, a method of making a coated nanotube that includes the steps of providing an inner nanotube, and evaporating a metal into the inner nanotube, where the metal forms a coating layer on at least a portion of the inner nanotube.

Official Gazette of the U.S. Patent and Trademark Office

Carbon Nanotubes; Coatings; Nanotubes; Patent Applications

20090005080 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Surface and Interface of Micro and Nanostructured Silicon Films Deposited on AISI D6 Tool Steel Substrates by EB-PVD

deDeusFurtado, Nivea Maria; [2008]; 98 pp.; In Portuguese; Original contains color illustrations; CD-ROM contains full text document in PDF format

Report No.(s): INPE-15155-TDI/1287; Copyright; Avail.: CASI: C01, CD-ROM; A05, Hardcopy

In this work it is proposed to obtain the silicon thin films adherent on surfaces of tool-steel AISI D6 substrates and the

characterization of films, substrate and film-substrate interfaces. Silicon thin films were deposited on polished surfaces of the metallic substrates by physical vapor deposition from the vaporization of silicon by electron beam technique (EB-PVD). These films were deposited with established thickness values of approximately 20, 100 e 500 nm, at 200 C. Film surfaces were characterized by scanning electron microscopy (SEM) to analyze the structural morphologies; by energy dispersive X-ray (EDS) to identify the chemical elements; by X-ray diffraction (XRD) to identify de crystalline chemical compounds; by atomic force microscopy (AFM) to scan the surface morphologies (surface roughness); and by Raman spectroscopy (RS) to analyze the residual surface stresses in the film-substrate assemblies. Film-substrate interfaces were analyzed by Auger electron spectroscopy (AES) to obtain the atomic silicon concentration profile. The results obtained from SEM and AFM analyzes showed that the deposited films presented structures in the nanometric (thickness of approximately 20 and 100 nm) and micrometric (thickness of 500 nm) ranges. Films deposited at 200 C showed the formation of diluted interfaces due to the thermal activated diffusion of silicon atoms, whose the thickness were proportional to the deposition time. However, the results obtained from the Raman spectroscopy analyses of the residual stress of the film-substrate assemblies are not satisfactory. These results are related to the chemical non-homogeneity and structural anisotropy of the films, interfaces and substrates. The results indicate some advantages and limits related to the techniques used for the characterization of the surfaces and the film-substrate interfaces.

Author

Silicon Films; Thin Films; Characterization; Nanostructure (Characteristics); Vapor Deposition; Metal Surfaces; Substrates; Tools; Steels

20090005213 Banner and Witcoff Ltd., Chicago, IL, USA; Banner and Witcoff Ltd., Chicago, IL, USA; NASA, Washington, DC USA

Compositions and Methods for Preparing Multiple-Component Composite Materials

Sutaria, Manish P., Inventor; Gafner, Felix H., Inventor; Cipriani, Ronald A., Inventor; Egner, Randy, Inventor; 12 Jan. 2006; 13 pp.; In English

Contract(s)/Grant(s): NAS8-00081; N00024-97-C-4130

Patent Info.: Filed 10 Sep. 04; US-Patent-Appl-SN-10-938076; US 2006/0008549

Report No.(s): PB2007-113689; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005213

Methods for preparing fibrous monolith composite materials include continuously extruding cell and boundary material compositions. A filament is formed from a cell material composition and passed through a chamber of an extrusion assembly. A boundary material composition is extruded generally about the cell material composition filament and the two material compositions are co-extruded to form an extruded coated filament.

Official Gazette of the U.S. Patent and Trademark Office

Ceramics; Cermets; Composite Materials; Patent Applications

20090005224 Ingersoll (Buchanan), PC, Alexandria, VA, USA

Method of Synthesizing Small-Diameter Carbon Nanotubes with Electron Field Emission Properties

Liu, Jie, Inventor; Du, Chunsheng, Inventor; Qian, Ccheng, Inventor; Gao, Bo, Inventor; Qiu, Qi, Inventor; Zhou, Otto Z., Inventor; 16 Mar. 2006; 14 pp.; In English

Contract(s)/Grant(s): NAG1-01061

Patent Info.: Filed Filed 16 Dec. 04; US-Patent-Appl-SN-11-012 341; US 2006/0055303

Report No.(s): PB2008-101210; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005224

Carbon nanotube material having an outer diameter less than 10 nm and a number of walls less than ten are disclosed. Also disclosed are an electron field emission device including a substrate, an optionally layer of adhesion-promoting layer, and a layer of electron field emission material. The electron field emission material includes a carbon nanotube having a number of concentric graphene shells per tube of from two to ten, an outer diameter from 2 to 8 nm, and a nanotube length greater than 0.1 microns. One method to fabricate carbon nanotubes includes the steps of (a) producing a catalyst containing Fe and Mo supported on MgO powder, (b) using a mixture of hydrogen and carbon containing gas as precursors, and (c) heating the catalyst to a temperature above 950 degrees C. to produce a carbon nanotube. Another method of fabricating an electron field emission cathode includes the steps of (a) synthesizing electron field emission materials containing carbon nanotubes with a number of concentric graphene shells per tube from two to ten, an outer diameter of from 2 to 8 nm, and a length greater than

0.1 microns, (b) dispersing the electron field emission material in a suitable solvent, (c) depositing the electron field emission materials onto a substrate, and (d) annealing the substrate.
Official Gazette of the U.S. Patent and Trademark Office
Carbon Nanotubes; Electron Emission; Field Emission; Patent Applications

20090005225 NASA Goddard Space Flight Center, Greenbelt, MD USA
Method for Manufacturing High Quality Carbon Nanotubes
Benavides, Jeanette M., Inventor; 2 Mar. 2006; 6 pp.; In English
Patent Info.: Filed Filed 8 Nov. 02; US-Patent-Appl-SN-10-292 952; US 2006/0042927
Report No.(s): PB2008-100757; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005225

A non-catalytic process for the production of carbon nanotubes includes supplying an electric current to a carbon anode and a carbon cathode which have been securely positioned in the open atmosphere with a gap between them. The electric current creates an electric arc between the carbon anode and the carbon cathode, which causes carbon to be vaporized from the carbon anode and a carbonaceous residue to be deposited on the carbon cathode. Inert gas is pumped into the gap to flush out oxygen, thereby preventing interference with the vaporization of carbon from the anode and preventing oxidation of the carbonaceous residue being deposited on the cathode. The anode and cathode are cooled while electric current is being supplied thereto. When the supply of electric current is terminated, the carbonaceous residue is removed from the cathode and is purified to yield carbon nanotubes.
Author
Carbon Nanotubes; Manufacturing; Cathodes; Nanostructure Growth; Vaporizing; Anodes

20090006212 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Biologically Inspired Polymer Micro-Patterned Adhesives
Cheung, Eugene; Sitti, Metin; Nov 2008; 50 pp.; In English
Contract(s)/Grant(s): W911NF-07-D-0001; Proj-DTRA-8R22GA
Report No.(s): AD-A491482; ECBC-CR-097; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Synthetic micro-pillar dry adhesives were developed based on the micro- and nano-structures used by geckos and beetles. These bio-inspired adhesives will supplement the existing respirator peripheral seal to enhance protection in wet or dirty environments and during head movements. Polyurethane microfiber arrays were fabricated with various geometries. Adhesion was measured on hard, soft, rough, and smooth surfaces. Small diameter, spatulate-tipped microfibers showed the greatest adhesion on all substrates. The sealing capability of an encapsulated fiber array surpassed the requirements of the military exhalation valve leakage test. Additional work is required to optimize the fiber material and geometry to achieve the required adhesion for respirator face seals. The U.S. Army Edgewood Chemical Biological Center (ECBC) is investigating novel sealing technologies for respiratory protective masks to address current shortfalls in operational performance due to improper fitting and donning practices. One promising area is biologically inspired dry adhesives. Geckos, spiders, beetles, flies, and many other climbing lizards and insects have a variety of sub-millimeter scale fibers on their feet to robustly and efficiently climb on a wide range of smooth and rough surfaces. These microlnano structures enable strong, robust, and repeatable adhesion and friction in addition to being self-cleaning of dirt and other contaminants on surfaces. This work aims to investigate the usage of a synthetic version of these fibrillar adhesion mechanisms in improving mask sealing performance.
DTIC
Adhesives; Masks

20090006444 Sonnenschein Nath and Rosenthal. LLP, Chicago, IL, USA
Long Cycle Life Elevated Temperature Thin Film Batteries
West, William C., Inventor; Whitacre, Jay F., Inventor; 23 Mar. 2006; 17 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed Filed 22 Jul 05; US-Patent-Appl-SN-11-187560; US 2006/0062904
Report No.(s): PB2008-100702; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006444

A method of preparing a cathode electrode suitable for use in a thin film battery that includes applying an adhesion layer

on a substrate; forming a current collector layer on the adhesion layer; and forming a layer of a Group 6 oxide composition on the current collector layer, wherein the Group 6 oxide composition consists essentially of MoO(sub 3) or WO(sub 3). Author

Cathodes; Electrodes; High Temperature; Life (Durability); Thin Films; Lithium Batteries

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*.

20090006119 Army Tank-Automotive Research and Development Command, Warren, MI USA

Alternative Fuels: Are we Making the Right Choices?

Weimer, Todd P; May 2008; 42 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491078; TARDEC-18801; DAU-SSCF-MW08-4; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491078

Our world is dependent on fossil fuels, and so is our military. As discovery of oil has slowed, our demand has increased. How long before the world's reserves will be exhausted depends on who is asked. What alternative fuel is the solution to our impending dilemma depends on the research scientists. The choices they make affect us all. But what considerations are factored into making these decisions? The choices the research scientists make can impact the Army both economically and operationally. This paper seeks to identify some key considerations when selecting an alternative fuel. The paper compares the choices of the research scientists to Army logisticians. Differences of considerations may affect the Army's long-term operations.

DTIC

Energy Policy; Fossil Fuels

20090006399 Army Engineer Research and Development Center, Vicksburg, MS USA

Characterization and Fate of Gun and Rocket Propellant Residues on Testing and Training Ranges

Jenkins, Thomas F; Ampleman, Guy; Thiboutot, Sonia; Bigl, Susan R; Taylor, Susan; Walsh, Michael R; Faucher, Dominic; Mantel, Richard; Poulin, Isabelle; Dontsova, Katerina M; Walsh, Marianne E; Brochu, Sylvie; Hewitt, Alan D; Jan 2008; 597 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491994; ERDC-TR-08-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Over the past two years, the U.S. Army Engineer Research and Development Center and the Defence R&D Canada Valcartier have partnered to develop an improved understanding of the distribution and fate of propellant residues on military training ranges in SERDP Project ER-1481. As a portion of this work, field studies have been conducted to estimate the mass of propellant residues deposited per round fired from various munitions. This research included artillery, mortars, small arms, shoulder-fired rockets, and several large missiles. Particles of the propellant residues deposited have been collected and studied, and initial experiments conducted to measure the rate of release of nitroglycerin (NG) and 2,4-dinitrotoluene (DNT) after deposition. Field studies have been conducted at a number of U.S. and Canadian installations to determine the mass and distribution of residue accumulation from different types of munitions. Depth profiling has been accomplished to document the depth to which these residues have penetrated the shallow subsoil. Laboratory column studies have been conducted with NG, nitroguanidine, and diphenylamine to document transport rates for solution phase propellant constituents and develop process descriptors for use in mathematical models to enable prediction of fate and transport for these constituents. Subsequent column studies have utilized intact propellants. The major accomplishments from these field and laboratory studies are presented.

DTIC

Deposition; Education; Gun Propellants; Residues; Rocket Propellants

20090006421 Explosives Research and Development Establishment, Waltham Abbey, UK

An Assessment of Metals as Rocket Fuels

Luft, N W; Wiseman, L A; Mar 1950; 23 pp.; In English

Report No.(s): AD-A492064; ERDE-TM-1/M/50; No Copyright; Avail.: Defense Technical Information Center (DTIC)

An assessment has been made of the use of the metals Li, Be, B, Mg, Al alone, in suspension in a hydrocarbon, and as hydrides, with the oxidant Nitric Acid. The best performance is obtained with systems based on Be and B, but the increase in performance, compared with a hydrocarbon fuel, is not sufficient to warrant a great deal of research on these fuels, particularly for medium size motors (approx 5000 lbs. thrust). Some objections to the use of metals, even for lower performance systems, are discussed.

DTIC

Fuels; Metals

20090006434 Texas Univ., Houston, TX USA

Immune Suppression by Dermal Application of JP-8 Jet Fuel

Ullrich, Stephen E; Oct 13, 2008; 9 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0402

Report No.(s): AD-A492119; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The initial focus of this work was to test the hypothesis that dermal application of jet fuel induced immune suppression. Using a mouse model of dermal exposure we noted that applying JP-8 to the skin induced immune suppression. Both primary and recall immune reactions were suppressed by applying JP-8. Cytokine production by JP-8-treated keratinocytes particularly prostaglandin E2 and interleukin-10 drive immune suppression. During the current funding period we made three important discoveries. First, we found that the aromatic compounds within jet fuel drive immune suppression. When synthetic jet fuel (S-8), which is totally devoid of aromatic compounds, was applied to the skin, no immune suppression was noted. Adding back a cocktail of the 7 most prevalent aromatic compounds found JP-8 to S-8, rendered it immune suppressive. Second, we found that JP-8 activated cytokine production in skin cells by activating the production of reactive oxygen species, which in turn activated NF-kappaBeta, which led to cytokine production and immune suppression. Finally we found that applying JP-8 to the skin activated the migration of mast cells from the skin to the lymph nodes. Blocking the migration, by interfering with the signals that regulate mast cell migration, blocked immune suppression.

DTIC

Jet Engine Fuels; JP-8 Jet Fuel; Skin (Anatomy)

20090006600 Georgia Tech Research Corp., Atlanta, GA USA

Stagnation point reverse flow combustor

Zinn, Ben T., Inventor; Neumeier, Yedidia, Inventor; Seitzman, Jerry M., Inventor; Jagoda, Jechiel, Inventor; Weksler, Yoav, Inventor; September 16, 2008; 19 pp.; In English

Contract(s)/Grant(s): NCC3-982

Patent Info.: Filed August 26, 2004; US-Patent-7,425,127; US-Patent-Appl-SN-10/927,205; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006600

A method for combusting a combustible fuel includes providing a vessel having an opening near a proximate end and a closed distal end defining a combustion chamber. A combustible reactants mixture is presented into the combustion chamber. The combustible reactants mixture is ignited creating a flame and combustion products. The closed end of the combustion chamber is utilized for directing combustion products toward the opening of the combustion chamber creating a reverse flow of combustion products within the combustion chamber. The reverse flow of combustion products is intermixed with combustible reactants mixture to maintain the flame.

Official Gazette of the U.S. Patent and Trademark Office

Combustion Chambers; Combustion; Stagnation Point; Reversed Flow

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*.

20090005212 SunPower, Inc., Athens, OH USA
Pulse tube cooler having 1/4 wavelength resonator tube instead of reservoir
Gedeon, David R., Inventor; October 14, 2008; 6 pp.; In English
Contract(s)/Grant(s): NAS5-02021
Patent Info.: Filed August 23, 2005; US-Patent-7,434,409; US-Patent-Appl-SN-11/209,984; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005212

An improved pulse tube cooler having a resonator tube connected in place of a compliance volume or reservoir. The resonator tube has a length substantially equal to an integer multiple of 1/4 wavelength of an acoustic wave in the working gas within the resonator tube at its operating frequency, temperature and pressure. Preferably, the resonator tube is formed integrally with the inertance tube as a single, integral tube with a length approximately 1/2 of that wavelength. Also preferably, the integral tube is spaced outwardly from and coiled around the connection of the regenerator to the pulse tube at a cold region of the cooler and the turns of the coil are thermally bonded together to improve heat conduction through the coil.
Official Gazette of the U.S. Patent and Trademark Office
Cryogenic Cooling; Cryogenic Equipment; Cryogenics; Resonators

20090006137 Quartzlock (UK) Ltd., Devon, UK
On an Improved Method of Resolving the Frequency Difference Between Two Very Accurate and Stable Frequency Signals
Percival, Richard; Green, Clive; Dec 1999; 13 pp.; In English
Report No.(s): AD-A491154; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491154

With the advance in accuracy and stability of modern atomic clocks, the need for a very precise method of detecting instabilities in their signals has arisen. For example, with two hydrogen masers with a 1 in 10(15) frequency difference, the drift rate of phase due to the frequency difference will be 1fs per second or 3.6ps per hour. No ordinary universal counter would be capable of resolving the difference between the two signals.
DTIC
Atomic Clocks; Frequencies; Resolution

20090006145 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA
Hybrid Vehicles
Dec 8, 2008; 39 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491193; ATC-TOP-2-1-003; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491193

This TOP provides standardized tests recommended for evaluating hybrid vehicles. Because of the development of hybrid propulsion techniques for military wheeled and tracked vehicles new testing procedures to assess the automotive and safety design of these systems are required. This document provides a listing of and reference to pertinent existing TOPs recommended for that assessment. As hybrid specific test procedures are developed and validated through methodology testing, they will be added to the individual TOP listed.
DTIC
Evaluation; Hybrid Propulsion; Standardization; System Effectiveness; Tracked Vehicles

20090006277 Naval Postgraduate School, Monterey, CA USA
Battlefield Visualization and Database Creation System Using One Meter Terrain
Baer, Wolfgang; Campbell, Todd R; Baer, Nikolaus; Dec 2005; 16 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491770; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491770

Integration of battlefield simulation systems in operational scenarios requires the accurate calculation of concealment,

cover, and detectability to properly enhance the soldier's performance and effectiveness on the battlefield. Measurement and visualization of tactical battlefield features requires the generation of metrically accurate terrain databases at high resolution over large areas. Systems capable of generating and utilizing such data have been expensive and slow. A low cost PC based system has been designed to address the generation and utilization of one-meter resolution terrain in large area, tactical battlefield simulations. The architecture and development is designed to incrementally approach the performance of human vision systems. Technical features described include an efficient all integer based ray trace algorithm, which allows video realistic battlefield visualization from girded sensor derived data, a multi-theme variable resolution ground descriptor database, real time rendering table to accommodate season, lighting and sensor variations and tools for rapid in field data correction and updating. The system is called Perspective View Nascent Technologies (PVNT). The package has been developed as a research project by the Naval Postgraduate School, TRADOC, OTC Ft. Hood and Nascent Systems Inc. It's major advantages are that it runs on a Laptop PC, contains an extremely efficient ray trace algorithm, performs real time rendering, handles complex surface features for low angle oblique views, and is freely available to DOD users.
DTIC
Data Bases; Simulation; Terrain

20090006397 Naval Postgraduate School, Monterey, CA USA
Work Smarter, Not Harder: Guidelines for Designing Simulation Experiments
Sanchez, Susan M; Dec 2005; 14 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491983; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We present the basic concepts of experimental design, the types of goals it can address, and why it is such an important and useful tool for simulation. A well-designed experiment allows the analyst to examine many more factors than would otherwise be possible, while providing insights that could not be gleaned from trial-and-error approaches or by sampling factors one at a time. We focus on experiments that can cut down the sampling requirements of some classic designs by orders of magnitude, yet make it possible and practical to develop an understanding of a complex simulation model and gain insights into its behavior. Designs that we have found particularly useful for simulation experiments are illustrated using simple simulation models, and we provide links to other resources for those wishing to learn more. Ideally, this tutorial will leave you excited about experimental designs--and prepared to use them--in your upcoming simulation studies.
DTIC
Experiment Design; Simulation

20090006401 Royal Greenwich Observatory, Herstmonceux, UK
Time-Related Activities at the Royal Greenwich Observatory
Pilkington, J D; Dec 1986; 5 pp.; In English
Report No.(s): AD-A491997; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Royal Greenwich Observatory (RGO) has a long history of involvement in timekeeping which began in 1675 when Charles II established an observatory in Greenwich Park to provide the astronomical foundations of a practical method for finding the longitude of ships at sea. The widespread acceptance of the methods developed at Greenwich led in 1884 to the adoption of the Greenwich meridian as the international zero of longitude and of mean solar time on the Greenwich meridian (OMT) as the basis of the international system of time zones. More recently the RCO has played a significant part in the development of modern timekeeping. For example, RGO worked with the National physical Laboratory in the initial evaluation of the caesium frequency in terms of an astronomical timescale, and participated in the international coordination of time signals in the early 196Os and in defining the new UTC system that was introduced in 1972. RGO has operated commercial caesium-beam clocks in-house since 1966 and has collaborated with the US Naval Observatory (USNO) in monitoring Loran-C signals for timing purposes since 1969. In the 197Os we collaborated with the US Naval Research Laboratory in time-transfer experiments using the Navigation Technology Satellites which were precursors of the Global Positioning System, but we have found it progressively more difficult to obtain staff and resources for this kind of work. These difficulties arise partly from changes in the technological basis of precise timekeeping, and partly from changes in the responsibilities of the Observatory, the objectives of its sponsoring agency and the level of funding of this agency relative to the demands now made upon it.
DTIC
Global Positioning System; Navigation Satellites; Observatories; Time Signals

20090006402 Naval Air Systems Command, Patuxent River, MD USA

Improving Integrated Operation in the Joint Integrated Mission Model (JIMM) and the Simulated Warfare Environment Data Transfer (SWEDAT) Protocol

Mutschler, David W; Dec 2005; 17 pp.; In English

Report No.(s): AD-A492014; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Simulated Warfare Environment Data Transfer (SWEDAT) is a shared memory interface currently managed by the Joint Integrated Mission Model (JIMM). It allows integrated operation of resources whereby the JIMM threat environment, stimulators virtual cockpits, systems under test, and other agents are combined within the same simulation exercise. The Air Combat Environment Test and Evaluation Facility (ACETEF), the Joint Strike Fighter (JSF) Program, and other agencies use it extensively for both constructive analyses and real-time installed system test. Since its creation JIMM and SWEDAT have been enhanced to improve capability and performance. More recent improvements include message queues, alternative coordinate systems, and dynamic simulated system control. This paper will describe the SWEDAT architecture recent improvements, and planned efforts to further performance.

DTIC

Message Processing; Models; Protocol (Computers); Simulation; Warfare

20090006424 National Research Council of Canada, Ottawa, Ontario Canada

Frequency Standards Work and Timekeeping at the National Research Council of Canada

Boulanger, J; Costain, C C; Douglas, R J; Jacques, C; Morris, D; Tremblay, P; Vanier, J; Dec 1986; 10 pp.; In English

Report No.(s): AD-A492102; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A conference paper on the frequency standards and time standards research being performed at the National Research Council of Canada.

DTIC

Canada; Frequency Standards; Time Measurement

20090006425 Naval Observatory, Washington, DC USA

An Automated Alarm Program for HP5071A Frequency Standards

Chadsey, H; Dec 1999; 8 pp.; In English

Report No.(s): AD-A492103; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the 1997 PTTI paper titled 'Maintenance of HP 5O71A Primary Frequency Standards at USNO,' Chadsey and Kubik presented findings to that date on USNO's efforts to evaluate the devices' performance according to their internal operational parameters. This paper presents methods used to evaluate those parameters and automatically detect abnormal operation. Some of the developmental difficulties will be discussed, as will some general guidelines on the tolerances USNO uses to detect problems with the HP 5071A frequencies standards. The importance of monitoring of the operating parameters of the HP 5071A cesium frequency standard was covered in a 1997 PTTI paper by Chadsey and Kubik. It was noted that by having a computer periodically inquire and permanently file the 22 parameters via the RS-232 connection, one could diagnose and in some cases predict the device's failure. All the data analysis was performed manually when that first paper was written. Manual analysis may be acceptable for some locations which have only a few HP 5071 A devices, but when five or more devices are involved, the personnel costs go up very quickly. The need to regularly look at the parameters for over 40 devices at USNO in Washington, DC drove the development of automating the data analysis toward an alarm system. Warnings were to be issued whenever a device exhibited abnormal behavior.

DTIC

Frequency Standards; Warning Systems

20090006426 Naval Observatory, Washington, DC USA

GPS Time Steering

Klepczynski, W J; Fliegel, H F; Allan, D W; Dec 1986; 14 pp.; In English

Report No.(s): AD-A492104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The importance of the Global Positioning System (GPS) for global time transfer makes it desirable to steer GPS time as closely as possible to the UTC rate. Currently, GPS time is maintained to satisfy two system requirements. First, GPS time is steered to within one microsecond of UTC(USNO) when the leap seconds imposed on UTC since 1980 have been removed. Second, the GPS Navigation Message gives the offset UTC(USNO) - GPS time to users with an error not to exceed 100 nanoseconds. User performance would be improved, however, if changes in the GPS time rate were smaller and more

gradually imposed than at present. Three current developments are expected to improve GPS time steering performance: the installation of a stable clock ensemble at the GPS Master Control Station: improvement of supporting hardware; and application of control theory to steering procedures.
DTIC
Global Positioning System; Steering; Universal Time

20090006427 Naval Observatory, Washington, DC USA
Remote Clock Calibration Via GPS
Lukac, Carl F; Luther, George H; Charron, Laura G; Keating, Richard E; Dec 1986; 12 pp.; In English
Report No.(s): AD-A492105; No Copyright; Avail.: Defense Technical Information Center (DTIC)

During the summer of 1986, the USA Naval Observatory (USNO) equipped an automotive van as a Mobile Electronic Laboratory for a dual purpose experiment. As a second part of this experiment, the GPS receiver would be used in the same manner as a portable cesium clock at selected field installations to examine the operational feasibility of such an application of GPS receivers. At various sites the GPS receiver and one portable cesium clock were used to obtain measurements against each on-site clock. There were, thus, two independent methods used to determine the difference USNO Master Clock (USNO MC) minus Site Clock. This paper will address this second part of the dual experiment only.
DTIC
Atomic Clocks; Calibrating; Clocks; Global Positioning System

20090006428 Naval Observatory, Washington, DC USA
Test Results of the STI GPS Time Transfer Receiver
Hall, David L; Handlan, Jim; Wheeler, Paul; Dec 1982; 19 pp.; In English
Report No.(s): AD-A492107; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Global time transfer, or synchronization, between a user clock and USNO UTC time can be performed using the Global Positioning System (GPS), and commercially available time transfer receivers. This paper presents the test results of time transfer using the GPS system and a Stanford Telecommunications, Inc. (STI) Time Transfer System (TTS) Model 502. Tests at the GPS Master Control Site (MCS) in Vandenburg, California and at the USA Naval Observatory (USNO) in Washington, D.C. are described. An overview of GPS, and the STI TTS 502 is presented. A discussion of the time transfer process and test concepts is included.
DTIC
Clocks; Global Positioning System; Receivers

20090006432 SRI International Corp., Menlo Park, CA USA
Development and Deployment of In Situ Mass Spectrometers
Short, R T; Toler, Strawn K; Jan 7, 2009; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-07-C-0720; Proj-P18063
Report No.(s): AD-A492116; ESD-18065-FR-08-436; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objectives for this project were diverse, including underwater mass spectrometer (MS) deployments focusing on quantitative measurements of dissolved gases, and improvements on existing 200-amu systems and peripherals. Plume mapping capabilities were to be extended by integrating the underwater MS with a remotely operated vehicle (ROV), and by exploring methods to mathematically improve the spatial and temporal resolution of membrane introduction MS measurements. Instrumental developments (e.g., a novel, modular, deep-water syringe sampling pump system) were to further extend the analytical capabilities of the systems. In-line acidification methods were to be explored to more thoroughly study aqueous carbon systems in the field. Alternative membrane materials, such as carbon nanotubes, were also to be evaluated. Major accomplishments in each of these areas of research and development are discussed below.
DTIC
Deployment; Mass Spectrometers

20090006450 Naval Observatory, Washington, DC USA
Portable Clock Analyses
Withington, F N; Dec 1982; 5 pp.; In English
Report No.(s): AD-A492256; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The portable clock remains the most frequently used means of time dissemination and of calibration of precise clocks to

the U.S. Naval Observatory Master Clock (USNO MC). Because of this, portable clock trips and the factors that influence the confidence placed in the measurements obtained must be understood. In this paper, the general philosophy of trips and some of the error factors that can occur are discussed. The stability of individual USNO portable clocks is determined by analysis of pre- and post-trip measurements obtained through the USNO data Acquisition and Control System. Using these data, this paper explores their historical accuracy and determines error budgets. The feasibility of determining a statistical 'reliability factor' based on the pre- and post-trip readings of an individual clock is also examined. From these studies the dependability and reliability of portable clock trips as a whole, may be concluded.
DTIC
Clocks; Portable Equipment

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*.

20090005003 Bureau of Labor Statistics, Washington, DC, USA
Usability Issues Associated with Converting Establishment Surveys to Web-Based Data Collection
Fox, J. E.; Mockovak, W.; Fisher, S. K.; Rho, C.; January 2003; 10 pp.; In English
Report No.(s): PB2008-106622; No Copyright; Avail.: CASI: A02, Hardcopy

In an effort to combat non-response, survey managers continually seek new ways to encourage respondents to participate in their surveys. One approach is to offer respondents the option of selecting from multiple reporting modes so that they can select the mode they prefer. The Internet is one of the newest modes available and offers a variety of benefits. For example, respondents can access the Internet easily from their desktop PCs, so they can complete the survey at their convenience. Properly designed surveys can introduce instructions, edits, and help screens that simplify the respondents task by guiding them through the completion process. From a survey managers point of view, the Internet eliminates or reduces data entry costs, because respondents enter data themselves. Further, Web surveys can check data as the respondent works, so the need for follow-up phone calls or post-data collection processes is minimized. With these obvious benefits, the Internet offers the potential for enhancing response rates, improving data quality, and improving timeliness of reporting. In addition, the potential for cost savings also exists, although in some cases offering an additional data collection mode might actually increase costs. On the other hand, there are some possible drawbacks to Web data collection. This paper focuses on the usability of dedicated Web-based government surveys, where usability is defined as the effectiveness, efficiency, and satisfaction experienced by respondents as they provide the requested survey data. At BLS, we are dedicated to developing usable Web surveys. This paper describes our experiences and lessons learned in designing Web surveys for establishments.
NTIS
Data Acquisition; Data Base Management Systems; Labor; Surveys

20090005020 Bureau of Labor Statistics, Washington, DC, USA
Comparing the Effectiveness of Alternative Approaches for Displaying Edit-Error Messages in Web Forms
Mockovak, W.; January 2008; 19 pp.; In English
Report No.(s): PB2008-106217; No Copyright; Avail.: CASI: A03, Hardcopy

Many organizations routinely ask people to submit information via the Web. When entries are incomplete or questionable, the website can let users know what is wrong by using very simple visual cues such as the display of a graphic symbol by an item (for example, a red asterisk or a question mark) or the use of more detailed messages presented in a variety of formats. Regardless of the approach used, such checks are viewed as an important tool for improving the quality of data obtained in interactive Web forms, including self-completed survey forms (Anderson et al., 2003; Fox et al., 2004). Designers of Web forms make the explicit assumption that the use of online edits will lead to higher quality data under the principle get it right at the source. However, usability testing of some Web survey applications at the Bureau of Labor Statistics (BLS) has revealed two problems with some edit messages used in survey instruments. First, some users never see the edit message when the screen refreshes, so they repeat the action they just took. Second, even when users do notice the edit message, they may not read or follow the instructions. On some commercial or government sites, an application might require that entries must meet certain criteria before the user is allowed to continue (defined as a hard edit). In other applications (for example, voluntary surveys), concerns that hard edits might frustrate the user, lead to increased burden, and even result in a user exiting a form

without completing it encourage organizations to use soft edits. Soft edits warn users of a potential problem, but do not require them to make changes to an entry.
NTIS
Errors; Messages; Surveys; Websites

20090005104 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Markov Model of Satellite Communication Networks
MoraesJunior, Heitor Angelo; [2008]; 135 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15257-TDI/1342; Copyright; Avail.: CASI: C01, CD-ROM; A07, Hardcopy

One of the main purposes of satellite communication systems is to connect geographically distant individuals, allowing the transmission of data, radio and television signs, mobile telephony, internet connection, and others. In this work we model a satellite communication system by a Markov process. Initially, we consider a constellation with six geostationary satellites in a single orbit. Then, we consider that the satellites move relative to the Earth, and, hence, the signs that are being emitted for a satellite are transferred to the next satellite that occupies its place, an operation called handoff. We assume that call arrivals are uniformly distributed over the satellites cover areas and follow a Poisson distribution, and that call duration times are exponentially distributed. Expressions are presented for obtaining the following performance measures: the average number of calls between satellites, average numbers of used channels, call-blocking probabilities and call rejection rate in each connection and in the system, and effective arrival rate of the calls in each connection. In the proposed Markov model the process state space grows exponentially when the number of satellites increase, therefore, we present a decomposition method that allows us to handle larger geostationary systems. Numeric results are presented.
Author
Markov Processes; Satellite Communication; Satellite Networks

20090005922 Assistant Secretary of the Army (Acquisition, Logistics and Technology), Fort Belvoir, VA USA
Future Combat Systems (Brigade Combat Team) Joint Multinational Experimentation
Crosby, Troy; Deakyne, Charlene; Schnorrenberg, Scott; Jun 2008; 4 pp.; In English
Report No.(s): AD-A490498; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490498

As the weather clears at the Nevada Test and Training Range, Soldiers, government personnel, and contractor partners begin to bring the Future Combat Systems (FCS) equipment and network online. The team works quickly getting the unattended ground sensors, mobile ad hoc network, and vehicles ready to execute the experimentation mission plan. Connections from the FCS Brigade Combat Team (BCT) to the Combined Forces Land Component Command (CFLCC), the U.S. Navy (USN) Maritime Operations Center, and the U.S. Air Force (USAF) Combined Air and Space Operations Center must be ready to pass situational awareness (SA), Joint fires requests, and intelligence, surveillance, and reconnaissance (ISR) information. This is just another typical day for the FCS Experimentation Team during a phase of the Joint Expeditionary Force Experiment (JEFX) 2008.
DTIC
Combat; Computer Networks; Government Procurement; Interoperability; Military Operations; Weapon Systems

20090006033 Fish and Neave IP Group, Boston, MA, USA; Public Health Dept., Kamloops, British Columbia, Canada
Speech Analyzing System with Adaptive Noise Codebook
Preuss, R. D., Inventor; Fabbri, D. R., Inventor; Cruthirds, D. R., Inventor; 15 Feb 06; 20 pp.; In English
Contract(s)/Grant(s): AF-N00024-03-C-6314
Patent Info.: Filed Filed 15 Feb 06; US-Patent-Appl-SN-11-355 777
Report No.(s): PB2008-106108; No Copyright; Avail.: CASI: A03, Hardcopy

Presented herein are systems and methods for generating an adaptive noise codebook for use with electronic speech systems. The noise codebook includes a plurality of entries which may be updated based on environmental noise sounds. The speech system includes a speech codebook and the adaptive noise codebook. The system identifies speech sounds in an audio signal using the speech and noise codebooks.
NTIS
Coding; Patent Applications

20090006053 Army Acquisition Support Center, Fort Belvoir, VA USA

A Look at the Future Combat Systems (Brigade Combat Team) Program -- An Interview with MG Charles A. Cartwright

Jun 2008; 13 pp.; In English

Report No.(s): AD-A490521; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490521

The Future Combat Systems (FCS) Brigade Combat Team (BCT) program is the cornerstone of the Army's modernization effort. The FCS(BCT) consists of a family of manned and unmanned systems, connected by a common network, that provides Soldiers and leaders with leading-edge technologies and capabilities they can use to dominate in asymmetric and conventional warfare and complex environments. MG Charles A. Cartwright, FCS(BCT) Program Manager (PM), recently took the time to provide an FCS(BCT) program update by responding to interview questions posed by Army AL&T Magazine staff.

DTIC

Combat; Evaluation; Feedback; Government Procurement; Project Management; System Effectiveness; Weapon Systems

20090006154 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Integrated Approach to Airborne Laser Communication

Louthain, James A; Dec 2008; 151 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491250; AFIT/DEE/ENG/09-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491250

Lasers offer tremendous advantages over RF communication systems in bandwidth and security, due to their ultra-high frequency and narrow spatial beamwidth. Atmospheric turbulence causes severe received power variations and high bit error rates (BERs) in airborne laser communication. Airborne optical communication systems require special considerations in size, complexity, power, and weight. Conventional adaptive optics systems correct for the phase only and cannot correct for strong scintillation, but here the two transmission paths are separated sufficiently so that the strong scintillation is 'averaged out' by incoherently summing up the two beams in the receiver. This requisite separation distance is derived for multiple geometries, turbulence conditions, and turbulence effects. Integrating multiple techniques into a system alleviates the deleterious effects of turbulence without bulky adaptive optics systems. Wave optics simulations show multiple transmitters, receiver and transmitter trackers, and adaptive thresholding significantly reduce the BER (by over 10,000 times).

DTIC

Airborne Lasers; Optical Communication; Radio Frequencies; Transmittance

20090006194 Marine Corps Development and Education Command, Quantico, VA USA

The U.S. Navy and the Global War on Terrorism: Applying the Lessons of the War on Drugs

Lasky, Joshua; Jan 2008; 35 pp.; In English

Report No.(s): AD-A491331; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The US Navy must apply the lessons of the War on Drugs and lead a global, multilateral, joint, interagency maritime campaign that achieves Maritime Domain Awareness, provides operational command and control, and shores up the maritime borders of weak coastal states.

DTIC

Communication Networks; Drugs; Navy; Terrorism; Warfare

20090006208 Surrey Univ., Guildford, UK

Heterogeneous System-on-a-Chip Design for Self-Powered Wireless Sensor Networks in Non-Benign Environments

Vladimirova, Tanya; Barnhart, David J; Mar 2008; 59 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8655-06-1-3053

Report No.(s): AD-A491470; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A new dimension of system architecture design is emerging where hundreds to thousands of ultralight (<10g) sensor nodes will collectively perform a spectrum of wireless sensor network missions in a distributed fashion. To support this architecture, high volume production of sensor nodes at low cost is required. This proposed basic research project is aimed at the development of a technique to design and fabricate self-powered wireless sensor nodes monolithically as a system-on-a-chip (SoC) with a commercially available complementary metal-on-silicon (CMOS) very large scale integration (VLSI) process. Two essential technologies specifically targeted at non-benign environments have been investigated and reported on: integrated solar cells in CMOS and radiation hardening by design of asynchronous logic. A first-ever design for integrated

solar cells in commercial CMOS is presented. Two prototype designs have been designed, fabricated, and tested. The average efficiency of the first prototype is 2.4%, compared to an estimated, but unverified 1% from previous work. The actual efficiency of the junction is 8.3%, without considering the metallization overhead. An improved design demonstrates 3.44% efficiency, a 40% improvement. The junction efficiency alone is 11.3%. However, power from these first two prototypes cannot be harnessed properly in the current implementation. A final design, overcoming this limitation, has been submitted for fabrication and will be reported in a later publication. This novel development has potential widespread application to a rapidly growing number of solar self-powered SoC designs of any type.
DTIC
Heterogeneity; Systems Engineering; Systems-on-a-Chip; Wireless Communication

20090006217 Florida Univ., Gainesville, FL USA
MIMO-UAC for Rate Enhancement and Range Extension
Yang, Liuqing; Li, Jian; Dec 2008; 14 pp.; In English
Contract(s)/Grant(s): N00014-07-1-0193
Report No.(s): AD-A491511; 2; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our research focuses on the horizontal underwater acoustic communications. During this year, our research on multi-input multi-output underwater acoustic communications (MIMO-UAC) can be categorized into two thrusts: (1) Robust MIMO-UAC with Low-Complexity Receivers and (2) Enhanced Channel Estimation and Symbol Detection for High Speed MIMO-UAC. In terms of MIMO-UAC with low-complexity receivers, we have established a simple windowed least squares (LS) channel estimator, developed a differential MIMO scheme obviating channel estimation, and analyzed the effects of different doubly-selective channel models in UAC scenarios. For high-speed MIMO-UAC, we have focused on the channel estimation and symbol detection problems in MIMO-UAC. We have presented a cyclic approach approach for designing training sequences with good auto- and cross-correlation properties. Iterative adaptive approach (IAA) coupled with Bayesian information criterion and RELAX has been presented as an approach for estimating the channel impulse response. We also proposed a new detection method called RELAX-BLAST. Our proposed schemes are tested via both simulations and field data from the acoustic communications experiment (RACE'08) conducted by the Woods Hole Oceanographic Institution (WHOI).
DTIC
Acoustics; Asymmetry; Augmentation; Communication; MIMO (Control Systems); Sound Transmission; Underwater Communication

20090006219 North Carolina State Univ., Raleigh, NC USA
Secure Tracking in Sensor Networks
Chang, Chih-Chieh G; Snyder, Wesley E; Wang, Cliff; Jun 2007; 7 pp.; In English
Contract(s)/Grant(s): W911NF-04-D-0003
Report No.(s): AD-A491533; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Target tracking is a canonical issue in sensor networks research. However, tracking security has gained little or no attention. Once a sensor node is compromised, it will be able to inject false location information into the network, and those nodes receiving such information will suffer greatly in terms of tracking precision. This paper, to the best of our knowledge, is the first to explore the topic of security in the context of Bayesian tracking for sensor networks. We propose to activate more than one nodes at each time step, and use a relaxation labeling algorithm to detect malicious nodes whose reports are then removed. Simulations based on both linear and nonlinear motion models demonstrate that out algorithm works better than simply averaging over the results based on the redundant sets of nodes.
DTIC
Detectors; Mathematical Models; Security; Tracking (Position); Tracking Networks

20090006276 Army Electronics Command, Fort Huachuca, AZ USA
Measuring Urban Communications
Rasmussen, William; Welch, Conrad; McDonald, Janet; Colegrove, Thomas; Dec 2005; 19 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491766; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491766

Military operations in urban terrain (MOUT) increasingly become the common form of engagement in various conflicts around the world. Effective communications are critical. Emergency and safety response groups also require reliable

communications in these settings. At the same time, the amount of urban communications required in our cities continues to increase and its quality is important to the users and thus to the system providers. The degree and severity of the interactions of the communications signals with the materials comprising the urban environment varies greatly. Knowing and predicting these interactions and how to adjust for them increases the quality of the communications. Optimal transmitter power, the minimal number and locations of repeater equipment, areas of poor communications, as well as the suggested use of certain communications frequencies and/or communications equipment can be determined from such analyses.
DTIC
Military Operations; Telecommunication; Warfare

20090006378 Marine Corps Development and Education Command, Quantico, VA USA
The Signal Regiment Transformation: Elements Needed to Succeed
Martin, W M; Nussberger,; Feb 7, 2006; 13 pp.; In English
Report No.(s): AD-A491884; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Currently thirty-four of the now thirty seven active duty combat brigades in the U.S. Army are supporting the global war on terrorism thirteen are deployed, thirteen are training to deploy, and the other eight are reconstituting from recent deployments. At the center of these brigades are the combat support functions, including the Signal Regiment. The Signal Regiment and the U.S. Army are concurrently conducting the largest force transformation in the Army's history. The current Chief of Signal, Brigadier General Randolph Strong believes, 'the networks and information systems provided by the Signal Regiment are at the center and are key enablers to every ongoing transformation effort in the U.S. military.'2 As the 'first in, last out' warriors, the Signal Corps is changing more rapidly than the other traditional war fighting functions, but the regiment is not implementing the measures necessary for a successfully transformation. In order for the Signal Regiment to successfully transform in the current operating environment, the roles and responsibilities of the Signal Company Commander must be clearly defined within the newly formed Unit of Action, the use of commercial off the shelf (COTS) equipment and current systems upgrades must be maximized (until Warfighter Information Network-Tactical (WIN-T) is available), and soldiers must be effectively trained on changes the transformation within the Signal Regiment.
DTIC
Organizations; Signal Processing

20090006453 Illinois Univ., Urbana-Champaign, IL USA
Capacity of Multi-Channel Wireless Networks with Random (c,f) Assignment
Bhandari, Vartika; Vaidya, Nitin H; Jun 2007; 30 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0246; CNS 06-27074
Report No.(s): AD-A487160; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487160

We argued for the need to study the performance of multi-channel networks in situations where there are constraints on channel switching. We proposed some constraint models in [1] to capture some expected constraints, and analyzed two such models, viz., adjacent (c,f) assignment and random (c,f) assignment. We studied the impact of such restricted switching, quantified by the parameter f (where f is the number of channels an individual node may switch to) in the regime c = O(log n). One of our proposed models was termed random (c,f) assignment.
DTIC
Communication Networks; Multichannel Communication

20090006536 Illinois Univ., Urbana-Champaign, IL USA
Connectivity and Capacity of Multi-Channel Wireless Networks with Channel Switching Constraints
Bhandari, Vartika; Vaidya, Nitin H; Jan 2007; 39 pp.; In English
Contract(s)/Grant(s): W911NF-05-1-0246; CNS 06-27074
Report No.(s): AD-A487156; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487156

This paper argues for the need to address the issue of multi-channel network performance under constraints on channel switching. We present examples from emergent directions in wireless networking to motivate the need for such a study, and introduce some models to capture channel switching constraints. For some of these models, we study connectivity and capacity of a wireless network comprising n randomly deployed nodes, equipped with a single interface each, when there are c = O(log

n) channels of equal bandwidth w/c available. We consider an adjacent (c,f) channel assignment where a node may switch between f adjacent channels, but the adjacent channel block is randomly assigned.
DTIC
Communication Networks; Multichannel Communication

20090006538 NASA, Washington, DC USA
Ad Hoc Selection of Voice over Internet Streams
Macha, Mitchell G., Inventor; Bullock, John T., Inventor; August 19, 2008; 14 pp.; In English
Patent Info.: Filed October 24, 2002; US-Patent-7,415,005; US-Patent-Appl-SN-10/283,354; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006538

A method and apparatus for a communication system technique involving ad hoc selection of at least two audio streams is provided. Each of the at least two audio streams is a packetized version of an audio source. A data connection exists between a server and a client where a transport protocol actively propagates the at least two audio streams from the server to the client. Furthermore, software instructions executable on the client indicate a presence of the at least two audio streams, allow selection of at least one of the at least two audio streams, and direct the selected at least one of the at least two audio streams for audio playback.
Official Gazette of the U.S. Patent and Trademark Office
Communication Networks; Situational Awareness; Internets; Audio Data; Playbacks; Voice Data Processing

20090006555 Dayton Univ. Research Inst., OH USA
Organizational Effectiveness in the Tanker Airlift Control Center
Militello, Laura G; Offner, Anne K; Padula, Greg; Swindler, Stephanie D; Lyons, Joseph B; May 2008; 35 pp.; In English
Contract(s)/Grant(s): FA8650-06-C-6726; Proj-7184
Report No.(s): AD-A487490; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Tanker Airlift Control Center (TACC) controls more than 1200 aircraft and over 600 missions across 50 countries per day. This complex organization organically adapts to a constantly changing set of missions including wartime efforts, humanitarian relief, response to natural disasters, presidential movement, and many others. As such, the TACC represents a particularly fertile ground for studying organizational change. The research team drew from management and psychology literatures, and from operational experience to implement a range of strategies for facilitating change management and assessing the impact of organizational change. Methods included surveys, interviews, observations, focus groups, and facilitated workshops. The research team addressed a broad range of issues in the TACC and US Transportation Command (USTRANSCOM) over the course of this project. This project successfully demonstrated the benefits of a multidisciplinary team in furthering our understanding of how organizational change occurs in a complex socio-technical system such as the TACC.
DTIC
Complex Systems; Surveys; Transportation; Presidential Reports

20090006613 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Dialable Cryptography for Wireless Networks
Eaddie, Marnita T; Mar 2008; 125 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487430; AFIT/GCO/ENG/08-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of this research is to develop an adaptive cryptographic protocol, which allows users to select an optimal cryptographic strength and algorithm based upon the hardware and bandwidth available and allows users to reason about the level of security versus the system throughput. In this constantly technically-improving society, the ability to communicate via wireless technology provides an avenue for delivering information at anytime nearly anywhere. Sensitive or classified information can be transferred wirelessly across unsecured channels by using cryptographic algorithms. The research presented will focus on dynamically selecting optimal cryptographic algorithms and cryptographic strengths based upon the hardware and bandwidth available. The research will explore the performance of transferring information using various cryptographic algorithms and strengths using different CPU and bandwidths on various sized packets or files. This research will provide a foundation for dynamically selecting cryptographic algorithms and key sizes. The conclusion of the research provides a selection process for users to determine the best cryptographic algorithms and strengths to send desired information

without waiting for information security personnel to determine the required method for transferring. This capability will be an important stepping stone towards the military's vision of future Net-Centric Warfare capabilities.
DTIC
Cryptography; Radiotelephones; Security; Communication Networks; Radio Communication; 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*.

20090005032 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evaluation of Contact Separation Force Testing as a Screening Methodology for Electrical Socket Contacts
Green, Chris; Greenwell, Chris; Brusse, jay; Krus, Dennis; Leidecker, Henning; [2009]; 1 pp.; In English; Capacitor and Resistor Technology Symposium (CARTS), 30 Mar. - 2 Apr. 2009, Jacksonville, FL, USA
Contract(s)/Grant(s): NNG05-CA97C; Copyright; Avail.: Other Sources; Abstract Only

During system level testing intermittent and permanent open circuit failures of mated, crimp removable, electrical contact pairs were experienced. The root cause of the failures was determined to be low (but not zero) contact forces applied by the socket contact tines against the engaging pin. The low contact force reduces the effectiveness of the wiping action of the socket tines against the pin. The observed failure mode may be produced when insufficient wiping during mate, demate and small relative movement in use allows for the accumulation of debris or insulating films that electrically separate the contact pair. The investigation identified at least three manufacturing process control problems associated with the socket contacts that enabled shipment of contacts susceptible to developing low contact forces: (1) Improper heat treatment of the socket tines resulting in plastic rather than elastic behavior; (2) Overly thinned socket tines at their base resulting in reduced pin retention forces; (3) insufficient screening tests to identify parts susceptible to the aforementioned failure mechanisms. The results from an extensive screening program of socket contacts utilizing the industry standard contact separation force test procedures are described herein. The investigation shows this method to be capable of identifying initially weak sockets. However, sockets whose contact retention forces may degrade during use may not be screened out by pin retention testing alone. Further investigations are required to correlate low contact retention forces with increased electrical contact resistance in the presence of insulating films that may accumulate in the use environment.
Author
Electric Contacts; Contact Loads; Loads (Forces); Failure Modes; Failure Analysis

20090005053 National Renewable Energy Lab., Golden, CO USA
PEEM Thermal Stress and Reliability. Project Duration FY08 to FY 10
O'Keefe, M. P.; Bnnion, K.; Kelly, K.; Narumanchi, S.; Nov. 08, 2007; 15 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-921202; NREL-PR-540-42341; No Copyright; Avail.: National Technical Information Service (NTIS)

Advancing power electronics thermal stress and reliability is a critical factor in power electronics equipment. NREL aims to improve thermal stress and reliability of power electronics technologies.
NTIS
Electron Emission; Electron Microscopy; Electronic Equipment; Reliability; Thermal Stresses

20090005066 Alston and Bird, LLP, Charlotte, NC, USA
Structurally Integrable Electrode and Associated Assembly and Fabrication Method
Marshall, Joseph A., Inventor; Anderson, David M., Inventor; 24 Nov. 2005; 13 pp.; In English
Contract(s)/Grant(s): RITA-NCC2-9019; NCC2-9019
Patent Info.: Filed 19 May 04; US-Patent-Appl-SN-10-848655; US 2005/260870
Report No.(s): PB2007-109241; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005066

A structurally integrable electrode, an assembly with an integrated electrode, and an associated method are provided. The electrode is configured to provide an electrically conductive path between nodes of an electrical circuit of a structural member.

In particular, the electrode includes at least one conductive tow having a core and a conductive coating thereon. Electrically conductive contacts are connected to the ends of the tow, and at least one dielectric ply extends parallel to the tow to at least partially insulate the tow. Thus, the first and second contacts can be connected to the nodes of the circuit, and the tow can be structurally integrated with the structural member so that the tow provides an electrically conductive path between the nodes.
Official Gazette of the U.S. Patent and Trademark Office
Electrodes; Fabrication; Patent Applications

20090005100 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA
Radiation Tests of Highly Scaled High Density Commercial Nonvolatile Flash Memories
Irom, Farokh; Nguyen, Duc N.; December 2008; 22 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS7-03001; Proj. 102197
Report No.(s): JPL Publication 08-27; Copyright; Avail.: CASI: A03, Hardcopy

We tested the advanced commercial high density 8 Gb NAND flash memory from Samsung with heavy ions. We also tested the advanced commercial NOR flash memory from Spansion. The general conclusion is that the SEU and SEFI cross section is smaller than the older generation of flash memories. Another observation is a new high current phenomenon in the high density NAND and NOR flash memories. This high current phenomenon is destructive for Samsung NAND flash memory during READ and PROGRAM modes and during PROGRAM mode for Spansion NOR flash. The results in this report show that the high current phenomenon in scaled devices is a complex problem that is not fully understood. Processing details and oxide defects appear to play a role in gate rupture, and the differences in experimental observations by different groups may be because of difference in semiconductor processing. More work needs to be done to increase the level of understanding as well as how it may affect highly scaled commercial devices. The high current spikes phenomenon is on verge of becoming a serious problem as scaling continues and the transistors sizes become comparable to ion track widths.
Author
Computer Storage Devices; Electronic Equipment; Test Facilities; Memory (Computers); Radiation

20090005133 National Renewable Energy Lab., Golden, CO USA
Multi-Dimensional Electrochemical-Thermal Coupled Model of Large Format Cylindrical Lithium Ion Cells
Kim, G. H.; Smith, K.; Oct. 2007; 21 pp.; In English
Report No.(s): DE2007-920939; NREL/PR-42451; No Copyright; Avail.: National Technical Information Service (NTIS)

U.S. reliance on oil threatens our energy security and degrades air quality in many cities. Recognizing this, DOE established the Vehicle Technologies Program to lead the nation to a cleaner, more secure transportation future. One important aim of the program is to advance energy storage (ES) technologies for fuel cell, electric, and hybrid electric vehicles (FCVs, EVs and HEVs) to increase fuel efficiency and reduce emissions. NREL supports the program's Energy Storage activity, which advances these technologies by addressing cost, lifetime, abuse tolerance, and performance barriers. The vision for energy storage technologies is to develop durable, safe, and affordable advanced batteries and ultracapacitors that cover a wide range of vehicle applications, including FCVs, EVs and HEVs. These development efforts will also deliver technology that is directly applicable to heavy hybrid vehicle ES requirements.
NTIS
Cylindrical Bodies; Energy Storage; Lithium; Metal Ions

20090005150 Britt (Trask), Salt Lake City, UT, USA
Method of Preventing Junction Leakage in Field Emission Devices
Hofmann, J. J., Inventor; Lee, J. K., Inventor; Cathey, D. A., Inventor; Hush, G. E., Inventor; 11 Jan 06; 12 pp.; In English
Contract(s)/Grant(s): ARPA-DABT63-93-C-0025
Patent Info.: Filed Filed 11 Jan 06; US-Patent-Appl-SN-11-330 046
Report No.(s): PB2008-106127; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus for stabilizing the threshold voltage in an active matrix field emission device is disclosed. The apparatus includes the formation of radiation-blocking elements between a cathodoluminescent display screen of the FED and semiconductor junctions formed on a baseplate of the FED.
NTIS
Field Emission; Leakage; Patent Applications; Semiconductor Junctions

20090005151 Iandiorio and Teska., Walthan, MA, USA

Hall Thruster with Shared Magnetic Structure

Hruby, V. J., Inventor; Pote, B., Inventor; Tedrake, R. A., Inventor; Byrne, L. T., Inventor; Szabo, J. J., Inventor; 13 Dec 05; 24 pp.; In English

Contract(s)/Grant(s): OSD-F04611-03-M-3014

Patent Info.: Filed Filed 13 Dec 05; US-Patent-Appl-SN-11-301 857

Report No.(s): PB2008-106128; No Copyright; Avail.: CASI: A03, Hardcopy

A Hall thruster with a shared magnetic structure including a plurality of plasma accelerators each including an anode and a discharge zone for providing plasma discharge. An electrical circuit having one or more cathodes connected to the plurality of plasma accelerators emits electrons that are attracted to the anode in each of the plasma accelerators. A shared magnetic circuit structure establishes a transverse magnetic field in each of the plurality of plasma accelerators that creates an impedance to the flow of electrons toward the anode in each of the plurality of plasma accelerators and enables ionization of a gas moving through one or more of the plurality of plasma accelerators. The impedance localizes an axial electric field in the plurality of plasma accelerators for accelerating ionized gas through the one or more of the plurality of plasma accelerators to create thrust. NTIS

Hall Effect; Hall Thrusters; Magnetic Field Configurations; Patent Applications

20090005156 Hahn, Loeser and Parks, LLP, Akron, OH, USA

Stressed Liquid Crystals Materials for Light Modulation

West, J. L., Inventor; Glushchenko, A., Inventor; Zhang, G., Inventor; 12 Dec 05; 23 pp.; In English

Contract(s)/Grant(s): DARPA-444226

Patent Info.: Filed Filed 12 Dec 05; US-Patent-Appl-SN-11-299 993

Report No.(s): PB2008-106132; No Copyright; Avail.: CASI: A03, Hardcopy

A new light modulating material using interconnected unidirectionally oriented microdomains of a liquid crystal, dispersed in a stressed polymer structure, is provided. The light modulating material is prepared by dissolving the liquid crystal in an uncured monomer and then curing the monomer so that the polymer forms a well-developed interpenetrating structure of polymer chains or sheets that is uniformly dispersed through the film. When the film is subjected to stress deformation the liquid crystal undergoes a change in its unidirectional orientation. The concentration of the polymer is high enough to hold the shear stress, but is as low as possible to provide the highest switch of the phase retardation when an electric field is applied. The new materials are optically transparent and provide phase modulation of the incident light opposed to the low driving voltage, linear electro-optical response, and absence of hysteresis. It has been shown that these new materials may be successfully used in display applications, optical modulator, and beam steering devices. NTIS

Light Modulation; Liquid Crystals; Modulation; Patent Applications

20090005164 Schwegman, Lundberg, Woessner and Kluth, Minneapolis, Macau

System and Method for Adaptively Deskewing Parallel Data Signals Relative to a Clock

Jenkins, P. N., Inventor; Cornett, F. N., Inventor; 17 Apr 06; 19 pp.; In English

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

Patent Info.: Filed Filed 17 Apr 06; US-Patent-Appl-SN-11-405 387

Report No.(s): PB2008-106137; No Copyright; Avail.: CASI: A03, Hardcopy

A system and method of reducing skew between a plurality of signals transmitted with a transmit clock is described. Skew is detected between the received transmit clock and each of received data signals. Delay is added to the clock or to one or more of the plurality of data signals to compensate for the detected skew. The delay added to each of the plurality of delayed signals is updated to adapt to changes in detected skew. NTIS

Clocks; Patent Applications

20090005170 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA, USA

Distribution Automation Applications of Fiber Optics

Kirkham, Harold; Johnston, Alan; Friend, Heather; October 15, 2008; 103 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): NAS7-03001; DE-AI01-79ET 29372 (Mod. A009)

Report No.(s): Jpl Publication 89-10, Rev A; No Copyright; Avail.: CASI: A06, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005170

Motivations for interest and research in distribution automation are discussed. The communication requirements of distribution automation are examined, and shown to exceed the capabilities of power line carrier, radio and telephone systems. A fiber-optic-based communication system is described that is co-located with the distribution system and that could satisfy the data rate and reliability requirements. A cost comparison shows that it could be constructed at a cost that is similar to that of a power line carrier system. The requirements for fiber optic sensors for distribution automation are discussed. The design of a data link suitable for optically-powered electronic sensing is presented. Empirical results are given. A modeling technique that has been used to understand the reflections of guided light from a variety of surfaces is described. An optical position indicator design is discussed. Systems aspects of distribution automation are discussed, in particular the lack of interface, communications and data standards. The economics of distribution automation are examined.

Author

Fiber Optics; Automation; Economics; Electric Power

20090005173 Honeywell International, Inc., Morristown, NJ, USA

Bias-Adjusted Giant Magnetoresistive (GMR) Devices for Magnetic Random Access Memory (MRAM) Applications

Katti, R. R., Inventor; 18 Apr 06; 13 pp.; In English

Contract(s)/Grant(s): DTRA01-00-C-0002

Patent Info.: Filed Filed 18 Apr 06; US-Patent-Appl-SN-11-405 783

Report No.(s): PB2008-106125; No Copyright; Avail.: CASI: A03, Hardcopy

A bias-adjusted giant magnetoresistive (GMR) device includes a ferromagnetic reference layer, which has a magnetization that remains relatively fixed when a range of magnetic fields is applied, and a ferromagnetic switching layer, which has a magnetization that can be changed by applying a relatively small magnetic field. In MRAM applications, the switching layer stores data in the form of the particular orientation of its magnetization relative to the magnetization of the reference layer. At least one of the reference and switching layers is split into at least two ferromagnetic layers separated by one or more layers of a nonmagnetic conductor, such that the hysteresis curve of resistance versus applied magnetic field is substantially symmetric about zero applied magnetic field.

NTIS

Bias; Magnetic Storage; Magnetoresistivity; Patent Applications; Random Access Memory

20090005177 NASA Glenn Research Center, Cleveland, OH, USA

Ultra High Power and Efficiency Space Traveling-Wave Tube Amplifier Power Combiner With Reduced Size and Mass for NASA Missions

Simons, Rainee N.; Wintucky, Edwin G.; Wilson, Jeffrey D.; Force, Dale A.; [2008]; 7 pp.; In English; Original contains black and white illustrations

Contract(s)/Grant(s): 342556.06.01.10.01.02

Report No.(s): E-16802; No Copyright; Avail.: Other Sources

In the 2008 International Microwave Symposium (IMS) Digest version of our paper, recent advances in high power and efficiency space traveling-wave tube amplifiers (TWTAs) for NASA s space-to-Earth communications are presented. The RF power and efficiency of a new K-Band amplifier are 40 watts and 50% and that of a new Ka-Band amplifier are 200 watts and 60%. An important figure-of-merit, which is defined as the ratio of the RF power output to the mass (W/kg) of a TWT, has improved by a factor of ten over the previous generation Ka- Band devices. In this extended paper, a high power, high efficiency Ka-band combiner for multiple TWTs, based on a novel hybrid magic-T waveguide circuit design, is presented. The measured combiner efficiency is as high as 90%. In addition, at the design frequency of 32.05 GHz, error-free uncoded BPSK/QPSK data transmission at 8 megabits per second (Mbps), which is typical for deep space communications is demonstrated. Furthermore, QPSK data transmission at 622 Mbps is demonstrated with a low bit error rate of 2.4x10(exp -8), which exceeds the deep space state-of-the-art data rate transmission capability by more than two orders of magnitude. A

potential application of the TWT combiner is in deep space communication systems for planetary exploration requiring transmitter power on the order of a kilowatt or higher.
Author
Power Amplifiers; Microwave Amplifiers; Millimeter Waves; Power Conditioning; Satellite Communication; Space Exploration; Waveguides; Traveling Wave Tubes; Aerospace Engineering; Extremely High Frequencies

20090005214 NASA Langley Research Center, Hampton, VA, USA
Piezoelectric Composite Apparatus and a Method for Fabricating the Same
Wilkie, W. Keats, Inventor; Bryant, Robert G., Inventor; Fox, Robert L., Inventor; Hellbaum, Richard F., Inventor; High, James W., Inventor; Jalink, Antony, Jr.; Little, Bruce D.; Mirick, Paul H.; 26 Jan. 2006; 13 pp.; In English
Patent Info.: Filed Filed 18 May 05; US-Patent-Appl-SN-11-134598; US 2006/0016055
Report No.(s): PB2008-100605; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005214

A method for fabricating a piezoelectric fiber sheet comprises providing a plurality of wafers of piezoelectric material, bonding the wafers together with an adhesive material to form a stack of alternating layers of piezoelectric material and adhesive material, and cutting through the stack in a direction substantially parallel to the thickness of the stack and across the alternating layers of piezoelectric material and adhesive material to provide at least one piezoelectric fiber sheet having two sides comprising a plurality of piezoelectric fibers in juxtaposition to the adhesive material.
Official Gazette of the U.S. Patent and Trademark Office
Actuators; Fabrication; Patent Applications; Piezoelectric Actuators; Piezoelectricity

20090005223 NASA Langley Research Center, Hampton, VA USA
Flexible Framework for Capacitive Sensing
Woodard, Stanley E., Inventor; Taylor, Bryant D., Inventor; 16 Mar. 2006; 8 pp.; In English
Patent Info.: Filed Filed 8 Aug 05; US-Patent-Appl-SN-11-203 583; US 2006/0053899
Report No.(s): PB2008-101238; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005223

A flexible framework supports electrically-conductive elements in a capacitive sensing arrangement. Identical frames are arranged end-to-end with adjacent frames being capable of rotational movement therebetween. Each frame has first and second passages extending therethrough and parallel to one another. Each of the first and second passages is adapted to receive an electrically-conductive element therethrough. Each frame further has a hollowed-out portion for the passage of a fluent material therethrough. The hollowed-out portion is sized and shaped to provide for capacitive sensing along a defined region between the electrically-conductive element in the first passage and the electrically-conductive element in the second passage.
Official Gazette of the U.S. Patent and Trademark Office
Capacitance; Detection; Patent Applications

20090005235 Evans and Molinelli, PLLC, Fairfax Station, VA, USA
Method and Apparatus for Processing High Time-Bandwidth Signals Using a Material with Inhomogeneously Broadened Absorption Spectrum
Merkel, Kristian, Inventor; Cole, Zachary, Inventor; Rupavatharam, Krishna Mohan, Inventor; Babbitt, William R., Inventor; Wagner, Kelvin, Inventor; Chang, Tiejun; 9 Mar. 06; 42 pp.; In English
Contract(s)/Grant(s): NAG2-1323
Patent Info.: Filed Filed 12 May 03; US-Patent-Appl-SN-10-515 089; US 2006/0049981
Report No.(s): PB2008-101703; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005235

Techniques for analog processing of high time-bandwidth-product (TBP) signals use a material with an inhomogeneously broadened absorption spectrum including multiple homogeneously broadened absorption lines. A first set of signals on optical carriers interact in the material during a time on the order of a phase coherence time of the homogeneously broadened absorption lines to record an analog interaction absorption spectrum. Within a time on the order of a population recovery time for a population of optical absorbers it the material, the interaction absorption spectrum in the material is read to produce a digital readout signal. The readout signal represents a temporal map of the interaction absorption spectrum, and includes frequency components that relate to a processing result of processing the first set of signals. The techniques allow processing

of RADAR signals for improved range resolution to a target, as well as speed of the target, among other uses.
Author
Absorption Spectra; Bandwidth; Signal Processing; Time Signals; Absorbers (Materials)

20090005241 NASA Glenn Research Center, Cleveland, OH, USA
Challenges and New Trends for Piezoelectric Actuators
Sehirlioglu, Alp; February 07, 2008; 22 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NAS3-01138; WBS 984754.02.07.03.16.04; Copyright; Avail.: CASI: A03, Hardcopy

BiScO3-PbTiO3 ceramics with TC greater than 400 C has been successfully processed. Despite the increase in TC, excess Pb addition increases both the bulk conductivity and the grain boundary contribution to conductivity at elevated temperatures. Conductivity at elevated temperatures, that limits the operating temperature for actuators, has been greatly reduced by excess Bi additions. Excess Bi doping improves poling conditions resulting in enhanced piezoelectric coefficient (d(sub 33) = 408 pC/N).
Author
Ceramics; High Temperature; Piezoelectric Actuators; Trends; Curie Temperature

20090005947 National Renewable Energy Lab., Golden, CO USA; California Inst. of Tech., Pasadena, CA USA
Si Passivation and Chemical Vapor Deposition of Silicon Nitride
Atwater, H. A.; Nov. 2007; 39 pp.; In English
Report No.(s): DE2007-919971; NREL/SR-520-42325; No Copyright; Avail.: National Technical Information Service (NTIS)

This research program investigated chemical and physical methods for Si surface passivation for application in crystalline Si and thin Si film photovoltaic devices. Overall, our efforts during the project were focused in three areas: (i) synthesis of silicon nitride thin films with high hydrogen content by hot wire chemical vapor deposition (ii) investigation of the role of hydrogen passivation of defects in crystalline Si and Si solar cells by out diffusion from hydrogenated silicon nitride films (iii) investigation of the growth kinetics and passivation of hydrogenated polycrystalline Si grown by hot wire chemical vapor deposition. Work on hydrogen-passivated silicon nitride synthesis was applied to solar cell passivation in collaboration with industrial partners at Evergreen Solar and thin film silicon passivation in collaboration with BP Solar. By way of enumeration, under this contract 3 PhD theses were published, along with 16 journal publications. Researchers working under this subcontract have also been actively serving the photovoltaics technical community -- the Principal Investigator served as a co-organizer for the Materials Research Society Symposium A in 2006 and served as a subpanel chair for the DOE Basic Energy Sciences Workshop on Basic Research in Solar Energy Utilization in 2005.
NTIS
Passivity; Silicon Nitrides; Solar Cells; Thin Films; Vapor Deposition

20090005998 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Measurement of the Dielectric Constant of Seawater at L-Band: Techniques and Measurements
Lang, R.; Utku, C.; Tarkocin, Y.; LeVine, D.; January 05, 2009; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Satellite instruments, that will monitor salinity from space in the near future, require an accurate relationship between salinity/temperature and seawater dielectric constant. This paper will review measurements that were made of the dielectric constant of seawater during the past several years. The objective of the measurements is to determine the dependence of the dielectric constant of seawater on salinity and on temperature, more accurately than in the past. by taking advantage of modem instrumentation. The measurements of seawater permittivity have been performed as a function of salinity and temperature using a transmission resonant cavity technique. The measurements have been made in the salinity range of 10 to 38 psu and in the temperature range of IOU C to 35 C. These results will be useful in algorithm development for sensor systems such as SMOS and Aquarius. The measurement system consists of a brass microwave cavity that is resonant at 1.413 GHz. The seawater is introduced into the cavity through a capillary glass tube having an inner diameter of 0.1 mm. The diameter of the tube has been made very small so that the amount of seawater introduced in the cavity is small - thus maintaining the sensitivity of the measurements and allowing the use of perturbation theory predicting the seawater permittivity. The change in resonant frequency and the change in cavity Q can be used to determine the real and imaginary pare of the dielectric constant of seawater introduced into the slender tube. The microwave measurements are made by an HPS722D network analyzer. The cavity has been immersed in a u~ateriethylene-glycol bath which is connected to a Lauda circulator. The

circulator keeps the brass cavity at a temperature constant to within 0.01 degrees. The system is automated using a Visual Basic program to control the analyzer and to collect the data. The results of the dielectric constant measurements of seawater will be presented. The measurement results will be compared with permittivity values generated from the Kline and Swift relationship. Two methods of calibration will be discussed, The errors that each technique introduces into the measurement resulls will be reviewed. Temperature stability, frequency drift and the effect of increasing cavity transmission loss on the unloaded cavity Q will also be discussed.
Author
Satellite Instruments; Permittivity; Perturbation Theory; Sea Water; Salinity; Thermal Stability; Calibrating; Cavity Resonators; Microwaves; Cavities

20090006035 General Motors Corp., Detroit, MI, USA
High Performance Thermoelectric Nanocomposite Device
Yang, J., Inventor; Snyder, D. D., Inventor; 15 Feb 06; 7 pp.; In English
Contract(s)/Grant(s): DE-FC26(SUB)-04NT42278
Patent Info.: Filed Filed 15 Feb 06; US-Patent-Appl-SN-11-354 685
Report No.(s): PB2008-106119; No Copyright; Avail.: CASI: A02, Hardcopy

A thermoelectric device includes a nanocomposite material with nanowires of at least one thermoelectric material having a predetermined figure of merit, the nanowires being formed in a porous substrate having a low thermal conductivity and having an average pore diameter ranging from about 4 nm to about 300 nm.
NTIS
Nanocomposites; Patent Applications; Thermoelectric Materials; Thermoelectricity

20090006082 Air Force Research Lab., Kirkland AFB, NM USA
Many-Body Effects on Optical Carrier Cooling in Intrinsic Semiconductors at Low Lattice Temperatures
Huang, Danhong; Alsing, P M; Jul 11, 2008; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-2304
Report No.(s): AD-A487092; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487092

Based on the coupled density and energy balance equations, a dynamical model is proposed for exploring many-body effects on optical carrier cooling not lattice cooling in steady state in comparison with the earlier findings of current-driven carrier cooling in doped semiconductors X. L. Lei and C. S. Ting, Phys. Rev. B 32, 1112 1985 and tunneling-driven carrier cooling through discrete levels of a quantum dot H. L. Edwards et al., Phys. Rev. B 52, 5714 1995 . This dynamical carrier-cooling process is mediated by a photoinduced nonthermal electron-hole composite plasma in an intrinsic semiconductor under a thermal contact with a low-temperature external heat bath, which is a generalization of the previous theory for a thermal electron-hole plasma H. Haug and S. Schmitt-Rink, J. Opt. Soc. Am. B 2, 1135 1985 . The important roles played by the many-body effects such as band-gap renormalization, screening, and excitonic interaction are fully included and analyzed by calculating the optical-absorption coefficient, spontaneous emission spectrum, and thermalenergy exchange through carrier-phonon scattering. Both the optical carrier cooling and heating are found with increasing pump-laser intensity when the laser photon energy is set below and above the band gap of an intrinsic semiconductor. In addition, the switching from carrier cooling to carrier heating is predicted when the frequency detuning of a pump laser changes from below the band gap to above the band gap.
DTIC
Cooling; Low Temperature; Many Body Problem; Semiconductors (Materials)

20090006111 Washington State Univ., Pullman, WA USA
The P3 Power Generation System for Advanced Missile Defense Applications
Nov 2008; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DASG60-02-C-0084
Report No.(s): AD-A491030; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491030

The P3 project was to develop and demonstrate a highly flexible, highly modular power system for advanced missile defense applications. With its flexible, modular design, the P3 power system has the potential to become the basic building block around which the Army can build power sources for a wide variety of military platforms. The P3 can provide increased

mission endurance and flexibility due to its flexible operation requirements. The P3 power generation system can be operated to produce power from both low and high quality waste heat sources, as well as, operate as a stand alone power supply. For example, hot surfaces such as electronic cases, exhaust pipes, or vehicle surfaces are all viable candidates as heat sources. In addition, the P3 power system can use waste heat from other power producing devices. The heart of the P3 power system is a piezoelectric membrane generator in which mechanical power is converted to electrical power. The use of piezoelectric materials to produce power promises some special advantages. Some of these advantages are: high energy density, simplicity of fabrication, and amenability to batch manufacturing with resultant economies of scale. The primary deliverable for this project is a P3 power generation prototype. The complete system will consist of a system of engines capable of producing power from waste heat.
DTIC
Antimissile Defense; Missile Defense; Supplying

20090006115 Army Tank-Automotive Research and Development Command, Warren, MI USA
Normally-off 4H-SiC Trenched Gate MOSFETs with High Mobility (Preprint)
Wu, J; Hu, J; Zhao, J H; Wang, X; Li, X; Fursin, L; Burke, T; Feb 28, 2007; 16 pp.; In English
Report No.(s): AD-A491067; TARDEC-16966; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491067

A normally-off 4H-SiC trenched gate MOSFET structure with epitaxial buried channel, coupled with improved fabrication processes has resulted in substantially improved channel mobility. Fabricated devices subject to high-temperature ohmic contact rapid thermal annealing at 850 deg. C for 5 min exhibit a peak field-effect mobility (micro(sub FE)) of 95 cm2/Vs at room temperature (25 deg. C) and 255 cm2/Vs at 200 deg. C, which are among the highest reported to date. The dependence of channel mobility and threshold voltage on buried channel depth is investigated to explore the optimum range of channel depth.
DTIC
Fabrication; Field Effect Transistors; Metal Oxide Semiconductors; Mobility; Oxides; Reliability; Semiconductors (Materials); Silicon Carbides

20090006182 Michigan Univ., Ann Arbor, MI USA
Framing Camera Improvements and hydrodynamic Experiments
Drake, R P; Dec 31, 2007; 18 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00173-06-1-G906; BAA-67-05-01
Report No.(s): AD-A491261; DRDA-06-3311; F015351; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have newly completed a MicroChannel Plate (MCP) evaluation system, in addition to our existing large-MCP mounting system. We developed an improved computational model and conceptual understanding of MCP performance. We also propose to participate in hydrodynamic experiments at NRL whenever they occur, to prepare for an experiment for NIKE to study the onset of turbulence via the Kelvin Helmholtz instability, and if circumstances permit to conduct such an experiment.
DTIC
Framing Cameras; Microchannel Plates

20090006190 Texas Univ., Arlington, TX USA
Fabrication of Single Electron Devices within the Framework of CMOS Technology
Koh, Seong J; Kim, Choong-Un; Dec 2008; 23 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-05-1-0030
Report No.(s): AD-A491301; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although single-electron devices have many advantages over conventional electronic devices and are therefore expected to have important applications for military, space, and commercial use, many fabrication challenges associated with nanoscale geometrical control have limited their implementation for practical use. The aim of this project was to create new single-electron device architecture and its associated fabrication techniques to realize single-electron device fabrication on a large scale, thereby enabling their implementation for practical applications. We demonstrated 1) chip-level fabrication of single-electron transistors, 2) that they can be fabricated in completely parallel processing, with each device individually addressable, 3) clear I-V characteristics of Coulomb blockade/staircase and Coulomb oscillations, and 4) that they can operate

at room temperature. These results show that fabrication of integrated systems of room-temperature single-electron devices is now possible, paving a pathway toward practical use of single-electron devices.
DTIC
CMOS; Electronic Equipment; Fabrication

20090006202 Royal Naval Scientific Service, London, UK
Journal of the Royal Naval Scientific Service. Volume 29, Number 6, November 1974
Nov 1974; 52 pp.; In English
Report No.(s): AD-A491371; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Contains several articles including topics on wrap-around antennas, SRN3 Hovercraft, training and research, statistics and reliability, and book reviews, notes and news, retirements and obituaries.
DTIC
Aircraft; Antennas

20090006226 Marine Corps Development and Education Command, Quantico, VA USA
Non-Kinetic Operations: The Challenges in Rebuilding Iraq's Infrastructure and Capacity
Llantero, Ferdinand F; Jan 2008; 42 pp.; In English
Report No.(s): AD-A491579; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The U.S. reconstruction of infrastructure in Iraq, particularly the reconstruction of the electrical system, served as a non-kinetic force multiplier for the coalition forces to set conditions to create a secure and stable country.
DTIC
Electric Equipment; Iraq

20090006336 NASA, Washington, DC USA
Integrator Circuitry for Single Channel Radiation Detector
Holland, Samuel D., Inventor; Delaune, Paul B., Inventor; Turner, Kathryn M., Inventor; August 12, 2008; 30 pp.; In English
Patent Info.: Filed May 31, 2006; US-Patent-7,411,198; US-Patent-Appl-SN-11/421,174; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006336
Input circuitry is provided for a high voltage operated radiation detector to receive pulses from the detector having a rise time in the range of from about one nanosecond to about ten nanoseconds. An integrator circuit, which utilizes current feedback, receives the incoming charge from the radiation detector and creates voltage by integrating across a small capacitor. The integrator utilizes an amplifier which closely follows the voltage across the capacitor to produce an integrator output pulse with a peak value which may be used to determine the energy which produced the pulse. The pulse width of the output is stretched to approximately 50 to 300 nanoseconds for use by subsequent circuits which may then use amplifiers with lower slew rates.
Official Gazette of the U.S. Patent and Trademark Office
Integrators; Circuits; Radiation Detectors

20090006351 NASA Langley Research Center, Hampton, VA USA
System and Method for Monitoring Piezoelectric Material Performance
Moses, Robert W., Inventor; Fox, Robert L., Inventor; Chattin, Richard L., Inventor; Shams, Qamar A., Inventor; Fox, Christopher L., Inventor; 9 Mar. 2006; 9 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed Filed 8 Sep. 04; US-Patent-Appl-SN-10-943655; US 2006/0049833
Report No.(s): PB2008-101701; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006351
A system and method are provided for monitoring performance capacity of a piezoelectric material that may form part of an actuator or sensor device. A switch is used to selectively electrically couple an inductor to the piezoelectric material to form an inductor-capacitor circuit. Resonance is induced in the inductor-capacitor circuit when the switch is operated to create the circuit. The resonance of the inductor-capacitor circuit is monitored with the frequency of the resonance being indicative of performance capacity of the device's piezoelectric material.
Author
Piezoelectricity; Performance Tests; Switching Circuits

20090006374 Massachusetts Inst. of Tech., Boston, MA USA
Dielectric Elastomer Actuated Systems and Methods
Dubowsky, Steven, Inventor; Hafez, Moustapha, Inventor; Lichter, Matthew, Inventor; Weiss, Peter, Inventor; Wingert, Andreas, Inventor; August 12, 2008; 46 pp.; In English
Patent Info.: Filed November 8, 2002; US-Patent-7,411,331; US-Patent-Appl-SN-10/291,217; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006374

The system of the present invention includes an actuator having at least two electrodes, an elastomeric dielectric film disposed between the two electrodes, and a frame attached to the elastomeric dielectric film. The frame provides a linear actuation force characteristic over a displacement range. The displacement range is preferably the stroke of the actuator. The displacement range can be about 5 mm and greater. Further, the frame can include a plurality of configurations, for example, at least a rigid members coupled to a flexible member wherein the frame provides an elastic restoring force. In preferred embodiments, the rigid member can be, but is not limited to, curved beams, parallel beams, rods and plates. In a preferred embodiment the actuator can further include a passive element disposed between two flexible members such as, for example, links to tune a stiffness characteristic of the actuator. The passive element can be a bi-stable element. Further, the actuator can include a plurality of layers of the elastomeric dielectric film integrated into the frame. The elastomeric film can be made of different materials such as, for example, acrylic, silicone and latex.
Official Gazette of the U.S. Patent and Trademark Office
Dielectrics; Elastomers; Actuators

20090006403 Christie, Parker and Hale, LLP, Pasadena, CA, USA
Carbon Nanotube High-Current-Density Field Emitters
Manohara, Haish M., Inventor; Bronikowski, Michael J., Inventor; 30 Mar. 2006; 14 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed Filed 24 May 05; US-Patent-Appl-SN-11-137725; US 2006/0066202
Report No.(s): PB2008-102010; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006403

High-current density field emission sources using arrays of nanofeatures bundles and methods of manufacturing such field emission sources are provided. Variable field emission performance is provided with the variance in the bundle diameter and the inter-bundle spacing, and optimal geometries for the lithographically patterned arrays were determined. Arrays of 1-mu m and 2-mu m diameter multi-walled carbon nanotube bundles spaced 5 mu m apart (edge-to-edge spacing) were identified as the most optimum combination, routinely producing 1.5 to 1.8 A/cm(sup 2) at low electric fields of approximately 4 V/mu m, rising to >6 A/cm(sup 2) at 20 V/mu m over a about 100-mu m-diameter area.
Author
Carbon Nanotubes; Current Density; Emitters; Field Emission; High Current

20090006423 Army Electronics Technology and Devices Lab., Fort Monmouth, NJ USA
U.S. Army PTTI/Frequency-Control Activities and Plans
Vig, John R; Dec 1986; 10 pp.; In English
Report No.(s): AD-A492095; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary mission of the Frequency Control and Timing Branch, ETD Laboratory, is to develop the oscillators and clocks needed by evolving Army communications, navigation, surveillance, identification-friend-or-foe (IFF) and electronic warfare (EW) systems. The main emphasis is on the development of small, low-power, high-precision quartz crystal oscillators. This paper summarizes the current (1986) in-house and contractual programs and the directions that future programs are expected to take.
DTIC
Crystal Oscillators; Frequency Control; Frequency Standards

20090006528 Department of the Navy, Washington, DC USA
Coaxial Transducer
Ruffa, Anthony A, Inventor; Sep 29, 2008; 11 pp.; In English
Report No.(s): AD-D020393; No Copyright; Avail.: Other Sources

The invention as disclosed is of a coaxial transducer that uses lead zirconate titanate ceramic or other suitable material

as an isolator between the conductors in a coaxial cable to transmit acoustic power at useful levels. The lead zirconate titanate ceramic is diced into thin disks and placed in between spacers made of much stronger insulating material. The coaxial cable is then integrated into a conventional double-armored steel tow cable with a typical diameter of 1'. This provides substantial longitudinal strength and provides crushing resistance to the lead zirconate titanate ceramic when the cable is being deployed or retrieved over a sheave under tension.
DTIC
Coaxial Cables; Lead Zirconate Titanates; Transducers

20090006532 NASA Langley Research Center, Hampton, VA USA; NASA, Washington, DC USA
Wireless Fluid Level Measuring System
Taylor, Bryant D., Inventor; Woodard, Stanley E., Inventor; 16 Mar. 2006; 12 pp.; In English; Original contains color and black and white illustrations
Patent Info.: Filed Filed 12 Sep 05; US-Patent-Appl-SN-11-229438; US 2006/0053880
Report No.(s): PB2008-101234; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006532

A level-sensing probe positioned in a tank is divided into sections with each section including (i) a fluid-level capacitive sensor disposed along the length thereof, (ii) an inductor electrically coupled to the capacitive sensor, (iii) a sensor antenna positioned for inductive coupling to the inductor, and (iv) an electrical conductor coupled to the sensor antenna. An electrically non-conductive housing accessible from a position outside of the tank houses antennas arrayed in a pattern. Each antenna is electrically coupled to the electrical conductor from a corresponding one of the sections. A magnetic field response recorder has a measurement head with transceiving antennas arrayed therein to correspond to the pattern of the housing's antennas. When a measurement is to be taken, the measurement head is mechanically coupled to the housing so that each housing antenna is substantially aligned with a specific one of the transceiving antennas.
Official Gazette of the U.S. Patent and Trademark Office
Detection; Patent Applications; Wireless Communication; Fluids

20090006535 NASA Langley Research Center, Hampton, VA USA
Interrupt-Based Phase-Locked Frequency Multiplier
Palumbo, Daniel L., Inventor; 23 Mar. 2006; 8 pp.; In English; Original contains black and white illustrations
Patent Info.: Filed Filed 17 Sep 04; US-Patent-Appl-SN-10-943825; US 2006/0061396
Report No.(s): PB2008-101972; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006535

A method and system utilize a processor's digital timer and two interrupts to form a frequency multiplier. The first interrupt's processing time window is definable by a first number of counts C(sub 1) of the digital timer while the second interrupt's processing time window is definable by a second number of counts C(sub 2) of the digital timer. A count value CV utilized by the system/method is based on a desired frequency multiplier N, the timer clock rate, and the time required for one cycle of an input signal. The first interrupt is triggered upon completion of one cycle of the input signal at which point the processing time window associated therewith begins. The second interrupt is triggered each time the timer's overflow signal is generated at which point the processing time window associated with the second interrupt begins. During the occurrence of the second interrupt's processing, the count value CV is modified to maintain the first interrupt's processing time window approximately centered between two of the second interrupt's processing time windows.
Official Gazette of the U.S. Patent and Trademark Office
Frequency Multipliers; Patent Applications; Phase Locked Systems

20090006558 Army Research Lab., Adelphi, MD USA
Development of a Profiling Scanner
Chiu, David Y; Alexander, Troy; Sep 2008; 38 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487557; ARL-TR-4573; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the design, operation, and performance of a two-dimensional (2-D) profiling scanner system using 16 laser diodes, 16 photo sensors, and a personal computer (PC) controller. A profiling scanner provides output images that reveal the size, height, and outline or shape of an object. This information can be useful in various military and related applications. The Radiometric Sensor Development and Applications Team of the Sensors and Electron Devices Directorate

(SEDD) at the U.S. Army Research Laboratory (ARL), has developed a 2-D profiling scanner system to study its operational characteristics, performance, and effectiveness in detecting targets in the battlefield, and homeland security environments.
DTIC
Electronic Equipment; Photometers

20090006569 Brookhaven National Lab., Upton, NY, USA; Consejo Superior de Investigaciones Cientificas, Madrid, Spain
Metal Oxide Nanoparticles
Fernandez-Garcia, M.; Rodriguez, J. A.; January 2007; 60 pp.; In English
Contract(s)/Grant(s): DE-AC02-98CH10886
Report No.(s): DE2007-920627; BNL-79479-2007-BC; No Copyright; Avail.: Department of Energy Information Bridge

This chapter covers the fundamental science, synthesis, characterization, physicochemical properties and applications of oxide nanomaterials. Explains fundamental aspects that determine the growth and behavior of these systems, briefly examines synthetic procedures using bottom-up and top-down fabrication technologies, discusses the sophisticated experimental techniques and state of the art theory results used to characterize the physico-chemical properties of oxide solids and describe the current knowledge concerning key oxide materials with important technological applications.
NTIS
Metal Oxides; Nanoparticles; Oxides

20090006593 Toledo Univ., OH USA
Circuit with a Switch for Charging a Battery in a Battery Capacitor Circuit
Stuart, Thomas A., Inventor; Ashtiani, Cyrus N., Inventor; August 26, 2008; 11 pp.; In English
Contract(s)/Grant(s): NAG3-2709
Patent Info.: Filed October 12, 2005; US-Patent-7,417,407; US-Patent-Appl-SN-11/249,048; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006593

A circuit for charging a battery combined with a capacitor includes a power supply adapted to be connected to the capacitor, and the battery. The circuit includes an electronic switch connected to the power supply. The electronic switch is responsive to switch between a conducting state to allow current and a non-conducting state to prevent current flow. The circuit includes a control device connected to the switch and is operable to generate a control signal to continuously switch the electronic switch between the conducting and non-conducting states to charge the battery.
Official Gazette of the U.S. Patent and Trademark Office
Circuits; Electric Switches; Electric Batteries; Charging; Capacitors; Electrical Engineering

20090006596 California Inst. of Tech., Pasadena, CA USA
Carbon nanotube switches for memory, RF communications and sensing applications, and methods of making the same
Kaul, Anupama B., Inventor; Wong, Eric W., Inventor; Baron, Richard L., Inventor; Epp, Larry, Inventor; November 4, 2008; 34 pp.; In English
Contract(s)/Grant(s): NAS7-1407
Patent Info.: Filed September 19, 2006; US-Patent-7,446,044; US-Patent-Appl-SN-11/523,273; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006596

Switches having an in situ grown carbon nanotube as an element thereof, and methods of fabricating such switches. A carbon nanotube is grown in situ in mechanical connection with a conductive substrate, such as a heavily doped silicon wafer or an SOI wafer. The carbon nanotube is electrically connected at one location to a terminal. At another location of the carbon nanotube there is situated a pull electrode that can be used to elecrostatically displace the carbon nanotube so that it selectively makes contact with either the pull electrode or with a contact electrode. Connection to the pull electrode is sufficient to operate the device as a simple switch, while connection to a contact electrode is useful to operate the device in a manner analogous to a relay. In various embodiments, the devices disclosed are useful as at least switches for various signals, multi-state memory, computational devices, and multiplexers.
Official Gazette of the U.S. Patent and Trademark Office
Carbon Nanotubes; Communication Equipment; Computer Storage Devices; Electrodes; Fabrication; Switches; Nanotechnology

20090006597 National Inst. of Aerospace Associates, Hampton, VA USA

Hybrid piezoelectric energy harvesting transducer system

Xu, Tian-Bing, Inventor; Jiang, Xiaoning, Inventor; Su, Ji, Inventor; Rehrig, Paul W., Inventor; Hackenberger, Wesley S., Inventor; November 4, 2008; 9 pp.; In English

Contract(s)/Grant(s): NCC1-02043

Patent Info.: Filed July 13, 2006; US-Patent-7,446,459; NASA-Case-LAR-17169-1; US-Patent-Appl-SN-11/486,200; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006597

A hybrid piezoelectric energy harvesting transducer system includes: (a) first and second symmetric, pre-curved piezoelectric elements mounted separately on a frame so that their concave major surfaces are positioned opposite to each other; and (b) a linear piezoelectric element mounted separately on the frame and positioned between the pre-curved piezoelectric elements. The pre-curved piezoelectric elements and the linear piezoelectric element are spaced from one another and communicate with energy harvesting circuitry having contact points on the frame. The hybrid piezoelectric energy harvesting transducer system has a higher electromechanical energy conversion efficiency than any known piezoelectric transducer.

Official Gazette of the U.S. Patent and Trademark Office

Circuits; Electromechanics; Piezoelectric Transducers; Piezoelectricity; Electricity

20090006623 HRL Labs., LLC, Malibu, CA USA

ONR D&I Electronics Technology Programs

Moon, Jeong; Sep 2008; 7 pp.; In English

Contract(s)/Grant(s): N00014-06-C-0054

Report No.(s): AD-A487453; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Program Status: One of the D&I program goals is to develop greatly improved field-plated MMW GaN HEMT devices with high ft/fmax, which will improve gain/PAE and output power of GaN HEMT MMIC PAs simultaneously. The 6-wafer MMW GaN MMIC lot is competed with the front-side processing and waiting for the back-side processing.

DTIC

High Electron Mobility Transistors; Wafers

20090006639 NASA Goddard Space Flight Center, Greenbelt, MD, USA

An Architecture for a 1.0GHz Direct RF Digitization-Type Multi-Purpose Digital RADAR

Mallik, Udayan; [2009]; 6 pp.; In English; Original contains black and white illustrations; No Copyright; Avail.: Other Sources

This paper describes the architecture and operation of a Direct RF-digitization Tgpe, Digital Radar. Two variants of the basic architecture are described. The first describes a Continuous Mode RADAR Transmitter and Receiver (Transciever), and, realtime signal processing and display architecture. The second describes a smaller, Burst Mode RADAR which can transcieve radio frequency signals without interruption for up to 37 seconds. The burst mode RADAR operates on an off-line signal processing and signal display design paradigm. Both systems can achieve a Pulse Repetition Rate up to lOMHc with 8 Received RF samples per Pulse Repetition Interval in applications such as remote sensing, or achieve up to 19KHz Pulse Repetition Rate with 4K Received samples per Pulse Repetition interval in applications such as investigations of atmospheric physics. The majority of RAD.4R electronics components are implemented in Digital CMOS, and analog circuits are restricted to signal amplification operations and Analog to Digital Conversion (ADC). Both RADAR architectures implement all signal processing steps in Software on a PC. An implementation of the proposed systems will create a IGHz, L-Baud Digital Radar - the highest frequency band achievable for systems not implementing an electronic IF downsample stage (after the receiver signal amplification stage), using commercially available off-the-shelf integrated circuits (IC).

Author

Atmospheric Physics; Digital Electronics; Digital Radar Systems; Radio Frequencies; Remote Sensing

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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*.

20090005022 NASA Langley Research Center, Hampton, VA, USA

Aeroelastic Response and Protection of Space Shuttle External Tank Cable Trays

Edwards, John W.; Keller, Donald F.; Schuster, David M.; Piatak, David J.; Rausch, Russ D.; Bartels, Robert E.; Ivanco, Thomas g.; Cole, Stanley R.; Spain, Charles V.; July 10, 2005; 17 pp.; In English; 41st AUAA/ASME/SAE/ASEE Joint Propulsion Conference, 10-13 Jul. 2005, Tucson, AZ, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 732759.07.08

Report No.(s): AIAA-Paper-2005-3627; No Copyright; Avail.: Other Sources

Sections of the Space Shuttle External Tank Liquid Oxygen (LO2) and Liquid Hydrogen (LH2) cable trays are shielded from potentially damaging airloads with foam Protuberance Aerodynamic Load (PAL) Ramps. Flight standard design LO2 and LH2 cable tray sections were tested with and without PAL Ramp models in the USA Air Force Arnold Engineering Development Center s (AEDC) 16T transonic wind tunnel to obtain experimental data on the aeroelastic stability and response characteristics of the trays and as part of the larger effort to determine whether the PAL ramps can be safely modified or removed. Computational Fluid Dynamic simulations of the full-stack shuttle launch configuration were used to investigate the flow characteristics around and under the cable trays without the protective PAL ramps and to define maximum crossflow Mach numbers and dynamic pressures experienced during launch. These crossflow conditions were used to establish wind tunnel test conditions which also included conservative margins. For all of the conditions and configurations tested, no aeroelastic instabilities or unacceptable dynamic response levels were encountered and no visible structural damage was experienced by any of the tested cable tray sections. Based upon this aeroelastic characterization test, three potentially acceptable alternatives are available for the LO2 cable tray PAL Ramps: Mini- Ramps, Tray Fences, or No Ramps. All configurations were tested to maximum conditions, except the LH2 trays at -15 deg. crossflow angle. This exception is the only caveat preventing the proposal of acceptable alternative configurations for the LH2 trays as well. Structural assessment of all tray loads and tray response measurements from launches following the Shuttle Return To Flight with the existing PAL Ramps will determine the acceptability of these PAL Ramp alternatives.

Author

Aeroelasticity; Computational Fluid Dynamics; External Tanks; Transonic Wind Tunnels; Wind Tunnel Tests; Space Shuttle Orbiters

20090005024 NASA Glenn Research Center, Cleveland, OH, USA

Preliminary Test Results of a Non-Contacting Finger Seal on a Herringbone-Grooved Rotor

Oral/Visual Presentation

Proctor, Margaret P.; Delgado, Irebert R.; November 18, 2008; 21 pp.; In English; NASA Seals and Secondary Flows Symposium, 18 Nov. 2008, Cleveland, OH, USA; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 561581.02.08.03.15.02

Report No.(s): E-16864; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005024

Low leakage, non-contacting finger seals have potential to reduce gas turbine engine specific fuel consumption by 2 to 3 percent and to reduce direct operating costs by increasing the time between engine overhauls. A non-contacting finger seal with concentric lift-pads operating adjacent to a test rotor with herringbone grooves was statically tested at 300, 533, and 700 K inlet air temperatures at pressure differentials up to 576 kPa. Leakage flow factors were approximately 70 percent less than state-of-the-art labyrinth seals. Leakage rates are compared to first order predictions. Initial spin tests at 5000 rpm, 300 K inlet air temperature and pressure differentials to 241 kPa produced no measurable wear.

Author

Labyrinth Seals; Rotors; Secondary Flow; Mathematical Models; Spin Tests; Gas Turbine Engines

20090005042 Air Force Research Lab., Wright-Patterson AFB, OH USA

Performance of Pylons Upstream of a Cavity-Based Flameholder in Non-Reacting Supersonic Flow (Postprint)

Haubelt, Lane C; King, Paul I; Gruber, Mark R; Carter, Campbell C; Hsu, Kuang-Yu M; Jul 2006; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-3012

Report No.(s): AD-A486915; AFRL-RZ-WP-TP-2008-2193; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Cavity-based fuel injection and flame holding, typically found in hydrocarbon-fueled scramjet applications, are of current interest for use in supersonic combustors. The Air Force Research Lab (AFRL) and the Air Force Institute of Technology (AFlT) are investigating the enhancement of fuel-air mixing with small pylons that project into the supersonic flow upstream of a flame holder. The pylons were of three sizes and were shaped as a thin triangular wedge with a 300 inclination angle. Four configurations (pylons plus baseline) were tested at two different fuel injection pressures in a Mach continuous flow wind tunnel housed at AFRL. The goal was to measure the mixing efficiency and shock loss of each pylon setup for comparison to the baseline condition of transverse injection without pylons. Intrusive and non intrusive techniques were used to obtain pitot pressure, total temperature, cone-static pressure, and laser induced Raman spectroscopy to determine species concentration over the cavity downstream of the injection port. Results showed that pylons increase fuel penetration, while not adding significantly to shock losses or overall mixing.

DTIC

Cavities; Flame Holders; Pylons; Reacting Flow; Struts; Supersonic Flow; Upstream

20090005069 Greer, Burns and Crain, Chicago, IL, USA

Method for Fabricating a Microscale Anemometer

Liu, Chang, Inventor; Chen, Jack, Inventor; 8 Dec. 05; 15 pp.; In English

Contract(s)/Grant(s): NAG5-8781; NSF IIS-99-84954; NSF IIS-0080639

Patent Info.: Filed 18 May 05; US-Patent-Appl-SN-11-132144; US 2005/0268455

Report No.(s): PB2007-110512; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005069

Method for fabricating a microscale anemometer on a substrate. A sacrificial layer is formed on the substrate, and a metal thin film is patterned to form a sensing element. At least one support for the sensing element is patterned. The sacrificial layer is removed, and the sensing element is lifted away from the substrate by raising the supports, thus creating a clearance between the sensing element and the substrate to allow fluid flow between the sensing element and the substrate. The supports are raised preferably by use of a magnetic field applied to magnetic material patterned on the supports.

Official Gazette of the U.S. Patent and Trademark Office

Anemometers; Fabrication; Patent Applications

20090005106 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Study of Numerical Methods for Solution of Problems of Transport Phenomenons in Unstructured Mesh

Rocha, Renata Sampaio; [2008]; 98 pp.; In English; Original contains color and black and white illustrations

Report No.(s): INPE-14822-TDI/1262; Copyright; Avail.: CASI: C01, CD-ROM; A05, Hardcopy

This work presents the specification of a computational library currently being developed in order to help find the errors that appear during the development of a numerical model. This library shows chromograms of the variable fields being calculated. It is capable to bring up to date the fields calculated in each iteration, this characteristic is interesting for localization and identification of possible sources of instabilities. The specification was carried through at the same time that several numeric methods were tested in order to find which were best suited for modeling the HFCVD reactor being currently utilized in the LAS/INPE. Simulations have shown that circumcenter based approach is a viable alternative for the transport equation diffusive terms modeling and for the pressure-velocity coupling the PRIME method was the best suited. The use of the new visualization library was a determinative factor in the solution of problems that had appeared during the implementation of the tested numerical methods.

Author

Numerical Analysis; Errors; Mathematical Models; Unstructured Grids (Mathematics); Computational Fluid Dynamics; Transport Theory

20090005186 NASA Dryden Flight Research Center, Edwards, CA, USA

CFD Analysis of Nozzle Jet Plume Effects on Sonic Boom Signature

Bui, Trong T.; January 05, 2009; 28 pp.; In English; 47th AIAA Aerospace Sciences Meeting, 5-8 Jan. 2009, Orlando, FL; Original contains color and black and white illustrations

Report No.(s): DFRC-843; AIAA Paper 2009-1054; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005186

An axisymmetric full Navier-Stokes computational fluid dynamics study is conducted to examine nozzle exhaust jet plume effects on the sonic boom signature of a supersonic aircraft. A simplified axisymmetric nozzle geometry, representative of the nozzle on the NASA Dryden NF-15B Lift and Nozzle Change Effects on Tail Shock research airplane, is considered. The computational fluid dynamics code is validated using available wind-tunnel sonic boom experimental data. The effects of grid size, spatial order of accuracy, grid type, and flow viscosity on the accuracy of the predicted sonic boom pressure signature are quantified. Grid lines parallel to the Mach wave direction are found to give the best results. Second-order accurate upwind methods are required as a minimum for accurate sonic boom simulations. The highly underexpanded nozzle flow is found to provide significantly more reduction in the tail shock strength in the sonic boom N-wave pressure signature than perfectly expanded and overexpanded nozzle flows. A tail shock train in the sonic boom signature is observed for the highly underexpanded nozzle flow. Axisymmetric computational fluid dynamics simulations show the flow physics inside the F-15 nozzle to be nonisentropic and complex. Although the one-dimensional isentropic nozzle plume results look reasonable, they fail to capture the sonic boom shock train in the highly underexpanded nozzle flow.

Author

Computational Fluid Dynamics; Plumes; Nozzle Flow; Gas Jets; Sonic Booms; Signatures; Nozzle Geometry; Computational Grids

20090005201 Battelle Columbus Labs., OH USA; Department of Public Works, Columbus, OH, USA

Environmental Technology Verification (ETV) Testing of a Multi-Parameter Water Quality Sensor: Sensicore, Inc. WaterPOINT 870

James, R.; Mangaraj, R.; Willenberg, Z.; Dindal, A.; Sep. 2007; 34 pp.; In English

Report No.(s): PB2008-106039; EPA/600/R-07/135; No Copyright; Avail.: CASI: A03, Hardcopy

The U.S. Environmental Protection Agency (EPA) supports the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies. ETV works in partnership with recognized testing organizations; with stakeholder groups consisting of buyers, vendor organizations, and permitters; and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible. The EPAs National Exposure Research Laboratory (EPA NERL) and its verification organization partner, Battelle, operate the Advanced Monitoring Systems (AMS) Center under ETV. The AMS Center recently evaluated the performance of the Sensicore WaterPOINT 870 (WP870), a multi-parameter water sensor. This test was carried out in collaboration with the Columbus, Ohio Department of Public Utilities Division of Power and Water (CDW).

NTIS

Proving; Quality Control; Water Quality

20090005203 Battelle Columbus Labs., OH USA

Environmental Technology Verification (ETV) Testing of a Ballast Exchange Assurance Meter: Dakota Technologies, Inc., BEAM 100

Schrock, M.; Ivancic, W.; Hunt, C.; Willenberg, Z.; Dindal, A.; Sep. 2007; 50 pp.; In English

Report No.(s): PB2008-106040; EPA/600/R-07/134; No Copyright; Avail.: National Technical Information Service (NTIS)

The U.S. Environmental Protection Agency (EPA) supports the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high-quality, peer-reviewed data on

technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies. ETV works in partnership with recognized testing organizations; with stakeholder groups consisting of buyers, vendor organizations, and permitters; and with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance (QA) protocols to ensure that data of known and adequate quality are generated and that the results are defensible. The EPAs National Exposure Research Laboratory (NERL) and its verification organization partner, Battelle, operate the Advanced Monitoring Systems (AMS) Center under ETV. The AMS Center recently evaluated the performance of Dakota Technologies, Inc.s Ballast Water Exchange Assurance Meter (BEAM) 100 in measuring colored dissolved organic matter (CDOM) fluorescence as a tool for evaluating ballast water exchange (BWE).
NTIS
Protocol (Computers); Proving; Quality Control; Water

20090005944 NASA Dryden Flight Research Center, Edwards, CA, USA
Design and Calibration of a Flowfield Survey Rake for Inlet Flight Research
Flynn, Darin C.; Ratnayake, Nalin A.; Frederick, Michael; January 05, 2009; 30 pp.; In English; 47th AIAA Aerospace Sciences Meeting and Exhibit, 5 Jan. 2009, Orlando, Fl, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005944

The Propulsion Flight Test Fixture at the NASA Dryden Flight Research Center is a unique test platform available for use on NASA's F-15B aircraft, tail number 836, as a modular host for a variety of aerodynamics and propulsion research. For future flight data from this platform to be valid, more information must be gathered concerning the quality of the airflow underneath the body of the F-15B at various flight conditions, especially supersonic conditions. The flow angularity and Mach number must be known at multiple locations on any test article interface plane for measurement data at these locations to be valid. To determine this prerequisite information, flight data will be gathered in the Rake Airflow Gauge Experiment using a custom-designed flowfield rake to probe the airflow underneath the F-15B at the desired flight conditions. This paper addresses the design considerations of the rake and probe assembly, including the loads and stress analysis using analytical methods, computational fluid dynamics, and finite element analysis. It also details the flow calibration procedure, including the completed wind-tunnel test and posttest data reduction, calibration verification, and preparation for flight-testing.
Author
Flow Distribution; Surveys; Wind Tunnel Tests; Engine Inlets; Computational Fluid Dynamics; Calibrating

20090005987 Reaction Engineering International, Salt Lake City, UT USA
Improved Kinetic Models for High-Speed Combustion Simulation
Montgomery, C J; Tang, Q; Sarofim, A F; Bockelie, M J; Gritton, J K; Bozzelli, J W; Gouldin, F C; Fisher, E M; Chakravarthy, S; Jun 2008; 161 pp.; In English
Contract(s)/Grant(s): FA8650-06-C-2658; Proj-1205
Report No.(s): AD-A488176; REI-4790; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Report developed under an STTR contract. The overall goal of this STTR project has been to improve the realism of chemical kinetics in computational fluid dynamics modeling of hydrocarbon-fueled scramjet combustors. A new, pressure-dependent detailed chemical kinetic model for a JP-8 surrogate has been created. Extinction strain rate measurements have been performed with an opposed-jet burner at subatmospheric conditions for a variety of fuels, namely: methane, ethylene, n-heptane, Jet A, n-decane, trimethylbenzene, and blends of n-decane and trimethylbenzene. Skeletal and quasi-steady-state (QSS) reduced mechanisms have been created based on the new mechanism and mechanisms from the literature for ethylene, JP-8, and n-decane. Parallel strategies for the in situ adaptive tabulation (ISAT) algorithm have been implemented and tested. Reduced mechanisms and ISAT have been demonstrated in the CFD++ and VULCAN CFD codes.
DTIC
Combustion; Computational Fluid Dynamics; High Speed; Hydrocarbons; Kinetics; Simulation; Supersonic Combustion Ramjet Engines

20090006196 Army Engineer Research and Development Center, Vicksburg, MS USA
Considerations for Modeling Vessel- Generated Currents and Bed Shear Stresses
Hammack, E A; Tate, J N; Oct 2008; 9 pp.; In English
Report No.(s): AD-A491348; ERDC/CHL CHETN-IX-17; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This Coastal and Hydraulics Engineering Technical Note (CHETN) contains a description of the new vessel effects capabilities in the hydrodynamic code ADaptive Hydrology/Hydraulics (ADH). Guidelines for creating initial mesh refinement along a sailing line are included as well as determining the values for parameters that control automatic mesh adaption during a simulation. ADH has also been extended to include calculations of bed shear stresses induced by flat-bottomed vessels. These shear stresses can be used in modeling sediment resuspension.
DTIC
Erosion; Flow Distribution; Hydraulics; Sediments; Shear Stress

20090006443 Royal Aerospace Establishment, Farnborough, UK
A Laboratory Apparatus for Testing and Assessing the Effects of Hot Rocket Gases on High Temperature Materials
Cockett, G H; Watt, W; Oct 1949; 25 pp.; In English
Report No.(s): AD-A492167; RAE-TN-MET-112; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The selection of suitable rocket materials is dependent on the use of an apparatus for assessing their resistance to hot nascent rocket gases. By burning a certain mixture of ammonia and acetylene in oxygen, a stream of hot gases is produced similar in composition and temperature to the combustion products of a kerosene-nitric acid propellant. A laboratory test rig, employing an ammonia-acetylene-oxygen flame is described together with mode of operation Full details of construction and temperature measurement are given. Test specimen temperatures of about 2400 deg C are attained and the resistance of the specimen is measured in terms of weight and dimension changes.
DTIC
High Temperature Gases; Laboratory Equipment; Refractory Materials; Rocket Engines; Temperature Effects

20090006452 Royal Armament Research and Development Establishment, Fort Halstead, UK
Controlled Fragmentation. 30. The Application of the Grooved Charge Principle to Spin-Stabilised Shell, 2
Titman, H; Taylor, T W; Jan 1952; 19 pp.; In English
Report No.(s): AD-A492280; RARDE-1/52; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The investigation into the application of the grooved-charge method of controlling fragmentation has been continued to see how well, with a spin-stabilized shell, a charge of H.E. cast into a fluted liner withstands the set-back and centrifugal forces when the shell is fired from a gun. Shells fitted with liners and filled with cast RDX/TNT 35/45 have been fired and recovered; the fragmentation of these shells is compared with that of unused shells. No appreciable difference was found although inspection of three of the recovered shells showed that some set-back of the liner and charge had occurred.
DTIC
Fragmentation; Spin Stabilization

20090006455 Royal Armament Research and Development Establishment, Fort Halstead, UK
Controlled Fragmentation. 32. The Application of the Grooved-Charge Principle to Spin-Stabilised Shell, 2
Titman, H; Taylor, T W; Sep 1952; 16 pp.; In English
Report No.(s): AD-A492284; RARDE-12/52; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The investigation into the application of the grooved-charge method of controlling fragmentation to spin-stabilised shell has been continued with the 3-in. 70 cal. shell to design D2(L)5851/GE/880. An attempt has been made to obtain full-length bar fragments, but only half-length bars were obtained. The failure was probably to the presence of a forward driving band, but the results have also indicated a need for further research with parallel-walled canisters of similarly hard steel.
DTIC
Fragmentation; Spin Stabilization

20090006533 Defence Science and Technology Organisation, Edinburgh, Australia
Solving Multi-Dimensional Problems of Gas Dynamics Using MATLAB
Antanovskii, L K; Jun 2008; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487259; DSTO-TR-2139; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487259

This report describes and implementation of a Godunov-type solver for gas dynamics equations in MATLAB(trade name).

The main attention is paid to providing a generic code that can be easily adapted to particular problems in one, two or three dimensions. This is achieved by employing a cell connectivity matrix thus allowing on to use various structured and unstructured meshes without modification of the core solver. The code has been thoroughly tested for MATLAB Version 7.6 (Release 2008a).
DTIC
Gas Dynamics; Flow Equations; Computational Fluid Dynamics

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*.

20090005037 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Automatic Extraction of Planetary Image Features
Troglio, G.; LeMoigne, J.; Moser, G.; Serpico, S. B.; Benediktsson, J. A.; [2009]; 2 pp.; In English; Third International Conference on Space Mission Challenges for Information Technology (SMC-IT 2009), 19-23 Jul. 2009, Pasadena, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

With the launch of several Lunar missions such as the Lunar Reconnaissance Orbiter (LRO) and Chandrayaan-1, a large amount of Lunar images will be acquired and will need to be analyzed. Although many automatic feature extraction methods have been proposed and utilized for Earth remote sensing images, these methods are not always applicable to Lunar data that often present low contrast and uneven illumination characteristics. In this paper, we propose a new method for the extraction of Lunar features (that can be generalized to other planetary images), based on the combination of several image processing techniques, a watershed segmentation and the generalized Hough Transform. This feature extraction has many applications, among which image registration.
Author
Image Processing; Data Acquisition; Pattern Recognition; Pattern Registration; Algorithms; Lunar Exploration

20090005081 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Evaluation of RADARSAT-1 Images Acquired under Distinct Viewing Geometry Applied for Geological Application in the Curaca River Valley (Bahia)
AlvesKnust, Sheila Soraya; [2008]; 150 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15187-TDI/1297; Copyright; Avail.: CASI: C01, CD-ROM; A07, Hardcopy

Synthetic aperture radar images have been successfully used in geological applications, mainly in moist tropical regions. However, only a few examples deal with radar images in semi arid regions, where the interaction between the electromagnetic radiation and the rock/soil is more direct, due to the lack of dense vegetation coverage. Therefore, the objective of this investigation is to evaluate the potential of providing geological information from a set of RADARSAT-1 satellite images, acquired under different incidence angles, look directions and spatial resolutions at the Curaca River Valley region. The study area is located in the north of Bahia state and has economic potential owing to copper mineralization hosted in mafic-ultramafic rocks. The study area is characterized by plain landscape, semi-arid weather, caatinga type vegetation and residual soil exposure. Two research approaches have been considered in this investigation: (a) qualitative, through visual monoscopic analysis of the high resolution images and stereoscopic in lower SAR resolution images; (b) quantitative, by principal component analysis, superficial roughness field measurement analysis, rock distinction statistic analysis (test-t Student), and the study between target and sensor parameters relations (simple regression analysis). The qualitative study showed good performance in characterizing geologically the region both with monoscopic and stereoscopic visual analysis, delimiting more precisely rock contacts, faults and structure cinematics. In relation to the quantitative study, the principal component analysis shows that the technique is efficient when studying the sensor parameters influence (incidence angles and look directions variations) with results indicating that the azimute sight variation is more relevant than the incidence angle in this type of environment. The backscattering statistical analysis corroborates this statement and also indicates that images with higher incidence angles and descendent orbit lead to better distinction results between the rock types. The analysis of the relationship between the backscattering coefficient and the target parameters indicated that the terrain micro roughness is the

main responsible for the target response variations. The effects of the local slope variation also contributed to the detected response variations.
Author
RADARSAT; Satellite Imagery; Data Acquisition; Image Analysis; Geological Surveys

20090005122 Naval Research Lab., Washington, DC USA
A Study of Radar Anti-Clutter Devices for Naval Use
Page, I H; Mar 1, 1945; 17 pp.; In English
Report No.(s): AD-A487510; NRL-R-2480; No Copyright; Avail.: Defense Technical Information Center (DTIC)
No abstract available
Clutter; Radio Frequencies; Radar Equipment

20090005254 Boeing Co., Chicago, IL USA
Parametrically disciplined operation of a vibratory gyroscope
Shcheglov, Kirill V., Inventor; Hayworth, Ken J., Inventor; Challoner, A. Dorian, Inventor; Peay, Chris S., Inventor; October 14, 2008; 30 pp.; In English
Contract(s)/Grant(s): NAS7-1402
Patent Info.: Filed July 29, 2005; US-Patent-7,437,253; US-Patent-Appl-SN-11/192,759; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005254
Parametrically disciplined operation of a symmetric nearly degenerate mode vibratory gyroscope is disclosed. A parametrically-disciplined inertial wave gyroscope having a natural oscillation frequency in the neighborhood of a sub-harmonic of an external stable clock reference is produced by driving an electrostatic bias electrode at approximately twice this sub-harmonic frequency to achieve disciplined frequency and phase operation of the resonator. A nearly symmetric parametrically-disciplined inertial wave gyroscope that can oscillate in any transverse direction and has more than one bias electrostatic electrode that can be independently driven at twice its oscillation frequency at an amplitude and phase that disciplines its damping to zero in any vibration direction. In addition, operation of a parametrically-disciplined inertial wave gyroscope is taught in which the precession rate of the driven vibration pattern is digitally disciplined to a prescribed non-zero reference value.
Official Gazette of the U.S. Patent and Trademark Office
Parameterization; Gyroscopes; Vibration

20090005855 NASA, Washington, DC USA
Simplified night sky display system
Castellano, Timothy P., Inventor; October 21, 2008; 8 pp.; In English
Patent Info.: Filed January 18, 2006; US-Patent-7,438,422; US-Patent-Appl-SN-11/340,816; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005855
A portable structure, simply constructed with inexpensive and generally lightweight materials, for displaying a selected portion of the night sky and selected planets, satellites, comets and other astronomically observable objects that are visually perceptible within that portion of the night sky. The structure includes a computer having stored signals representing the observable objects, an image projector that converts and projects the stored signals as visually perceptible images, a first curvilinear light-reflecting surface to receive and reflect the visually perceptible images, and a second curvilinear surface to receive and display the visually perceptible images reflected from the first surface. The images may be motionless or may move with passage of time. In one embodiment, the structure includes an inflatable screen surface that receives gas in an enclosed volume, supports itself without further mechanical support, and optionally self-regulates pressure of the received gas within the enclosed volume.
Official Gazette of the U.S. Patent and Trademark Office
Display Devices; Night Sky; Projectors; Planetariums; Astronomical Models

20090005858 Kentucky Univ., Lexington, KY USA

System and technique for retrieving depth information about a surface by projecting a composite image of modulated light patterns

Hassebrook, Laurence G., Inventor; Lau, Daniel L., Inventor; Guan, Chun, Inventor; October 21, 2008; 20 pp.; In English

Contract(s)/Grant(s): NCC5-222

Patent Info.: Filed May 21, 2003; US-Patent-7,440,590; US-Patent-Appl-SN-10/444,033; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005858

A technique, associated system and program code, for retrieving depth information about at least one surface of an object. Core features include: projecting a composite image comprising a plurality of modulated structured light patterns, at the object; capturing an image reflected from the surface; and recovering pattern information from the reflected image, for each of the modulated structured light patterns. Pattern information is preferably recovered for each modulated structured light pattern used to create the composite, by performing a demodulation of the reflected image. Reconstruction of the surface can be accomplished by using depth information from the recovered patterns to produce a depth map/mapping thereof. Each signal waveform used for the modulation of a respective structured light pattern, is distinct from each of the other signal waveforms used for the modulation of other structured light patterns of a composite image; these signal waveforms may be selected from suitable types in any combination of distinct signal waveforms, provided the waveforms used are uncorrelated with respect to each other. The depth map/mapping to be utilized in a host of applications, for example: displaying a 3-D view of the object; virtual reality user-interaction interface with a computerized device; face--or other animal feature or inanimate object--recognition and comparison techniques for security or identification purposes; and 3-D video teleconferencing/telecollaboration.

Official Gazette of the U.S. Patent and Trademark Office

Image Processing; Pattern Recognition; Photomapping; Image Classification; Image Analysis

20090005860 California Inst. of Tech., Pasadena, CA USA

Single mode whispering-gallery-mode resonator

Savchenkov, Anatoliy, Inventor; Strekalov, Dmitry V., Inventor; Matsko, Andrey B., Inventor; Ilchenko, Vladimir, Inventor; Maleki, Lutfollah, Inventor; October 21, 2008; 16 pp.; In English

Patent Info.: Filed November 17, 2005; US-Patent-7,440,651; US-Patent-Appl-SN-11/282,160; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005860

Whispering-gallery-mode (WGM) resonators configured to support only a single whispering gallery mode.

Official Gazette of the U.S. Patent and Trademark Office

Resonators; Whispering Gallery Modes; Q Factors; Resonant Vibration

20090005864 California Univ., Oakland, CA USA

Fluid control structures in microfluidic devices

Mathies, Richard A., Inventor; Grover, William H., Inventor; Skelley, Alison, Inventor; Lagally, Eric, Inventor; Liu, Chung N., Inventor; November 4, 2008; 27 pp.; In English

Contract(s)/Grant(s): NAG5-9659

Patent Info.: Filed December 29, 2003; US-Patent-7,445,926; US-Patent-Appl-SN-10/750,533; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005864

Methods and apparatus for implementing microfluidic analysis devices are provided. A monolithic elastomer membrane associated with an integrated pneumatic manifold allows the placement and actuation of a variety of fluid control structures, such as structures for pumping, isolating, mixing, routing, merging, splitting, preparing, and storing volumes of fluid. The fluid control structures can be used to implement a variety of sample introduction, preparation, processing, and storage techniques.

Official Gazette of the U.S. Patent and Trademark Office

Control Equipment; Elastomers; Microfluidic Devices; Microinstrumentation; Membranes

20090005970 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The James Webb Space Telescope

Gardner, Jonathan P.; [2009]; 1 pp.; In English; AKARI A Light to Illuminate the Misty University Conference, 16-20 Feb. 2009, Tokyo, Japan; No Copyright; Avail.: Other Sources; Abstract Only

The scientific capabilities of the James Webb Space Telescope (JWST) fall into four themes. The End of the Dark Ages:

First Light and Reionization theme seeks to identify the first luminous sources to form and to determine the ionization history of the universe. The Assembly of Galaxies theme seeks to determine how galaxies and the dark matter, gas, stars, metals, morphological structures, and active nuclei within them evolved from the epoch of reionization to the present. The Birth of Stars and Protoplanetary Systems theme seeks to determine the physical and chemical properties of planetary systems around nearby stars and of our own, and investigate the potential for life in those systems. To enable these for science themes, JWST will be a large (6.6m) cold (50K) telescope launched to the second Earth-Sun Lagrange point early in the next decade. It is the successor to the Hubble Space Telescope, and is a partnership of NASA, ESA and CSA. JWST will have four instruments: The Near-Infrared Camera, the Near-Infrared multi-object Spectrograph, and the Tunable Filter Imager will cover the wavelength range 0.6 to 5 microns, while the Mid-Infrared Instrument will do both imaging and spectroscopy from 5 to 28.5 microns. I review the status and capabilities of the observatory and instruments in the context of the major scientific goals. Author

Imaging Techniques; James Webb Space Telescope; Planetary Systems; Earth-Moon System

20090005971 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Spectroscopy using the Hadamard Transform V2

Fixsen, D. J.; Greenhouse, M. A.; MacKenty, J. W.; Mather, J. C.; January 18, 2009; 11 pp.; In English; SPIE Meeting, 18-22 Jan. 2009, San Jose, CA, USA; Original contains poor quality, truncated or crooked pages; Copyright; Avail.: CASI: A03, Hardcopy

The IRMOS (infrared multiobject spectrometer) is an imaging dispersive spectrometer, with a micromirror array to select desired objects. In standard operation, the mirrors are 'opened' in patterns such that the resulting spectra do not overlap on the detector. The IRMOS can also be operated in a Hadamard mode, in which the spectra are allowed to overlap, but are modulated by opening the mirrors in many combinations. This mode enables the entire field of view to be observed with the same sensitivity as in the standard mode if the uncertainty is dominated by the detector read noise. We explain the concept and discuss the benefits with an example observation of the Orion Trapezium using the 2.1 m telescope at Kitt Peak National Observatory.

Author

Infrared Spectrometers; Spectroscopy; Transformations (Mathematics); Mathematical Models

20090006009 Assistant Secretary of the Army (Acquisition, Logistics and Technology), Fort Belvoir, VA USA

Technology Transition -- Lessons Learned from Fido (registered trademark)/PackBot (registered trademark)

Parmentola, John A; Szkrybalo, Irena D; Dec 2007; 5 pp.; In English

Report No.(s): AD-A490457; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490457

Albert Einstein once said that we can't solve problems by using the same kind of thinking that was used to create them. This article relates how new thinking was used to successfully address an urgent critical need to counter a major threat to our ground forces overseas. Recently, the Defense Advanced Research Projects Agency (DARPA) awarded a 15-month, $10 million completion-type, cost-plus-fixed-fee contract to small business qualifier Boston Dynamics Inc. The company is building a dog-like robot with the capability to run fast, traverse rough terrain, jump over obstacles 40 inches tall or 2 meters wide, and operate for 2 hours without refueling. The priority application is a robot that could eventually accompany Soldiers in the field as a load-carrier across nearly any terrain. The prototype pictured here is dubbed 'BigDog' and measures 40 inches long, 28 inches tall, and weighs 165 pounds. The robot is powered by a gasoline engine driving a hydraulic actuation system. An onboard computer controls locomotion and handles a wide variety of sensors, including joint position, joint force, ground contact, ground load, a laser gyroscope, a stereo vision system, as well as monitors for hydraulic pressure, oil temperature, engine temperature, and battery charge. Once perfected, other sensors and capabilities like those discussed in this article could be programmed into the robot.

DTIC

Detection; Dogs; Explosive Devices; Explosives Detection; Government Procurement; Lessons Learned; Remote Sensing; Robotics; Robots; Technology Transfer

20090006092 Air Force Research Lab., Kirkland AFB, NM USA

Measuring Tilt and Focus for Sodium Beacon Adaptive Optics on the Starfile 3.5 Meter Telescope -- Conference Proceedings

Johnson, Robert; Sep 1, 2008; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DF299963; Proj-4866

Report No.(s): AD-A487991; AFRL-RD-PS-TP-2008-1008; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487991

Adaptive optics systems can measure high-order aberrations using an artificial laser beacon without the need for a relatively bright object near the object being imaged. Unfortunately, tilt and focus measurements are difficult to obtain from a laser beacon. One solution is to use light from the object being imaged to measure tilt and focus. Through analysis, I estimate the performance of using a Shack-Hartmann wavefront sensor with 2 by 2 subapertures for measuring tilt and focus. Specifically, I discuss implementing this scheme for the sodium beacon adaptive optics upgrade to the Starfire Optical Range (SOR) 3.5 m telescope. I use wave-optics simulation tools to evaluate the performance of the tilt and focus sensor in the SOR sodium beacon system.

DTIC

Adaptive Optics; Attitude (Inclination); Beacons; Conferences; Sodium; Telescopes

20090006102 Illinois Univ., Urbana, IL USA

Method for fabricating a microscale anemometer

Liu, Chang, Inventor; Chen, Jack, Inventor; November 18, 2008; 16 pp.; In English

Contract(s)/Grant(s): NAG5-8781

Patent Info.: Filed May 18, 2005; US-Patent-7,451,537; US-Patent-Appl-SN-11/132,144; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006102

Method for fabricating a microscale anemometer on a substrate. A sacrificial layer is formed on the substrate, and a metal thin film is patterned to form a sensing element. At least one support for the sensing element is patterned. The sacrificial layer is removed, and the sensing element is lifted away from the substrate by raising the supports, thus creating a clearance between the sensing element and the substrate to allow fluid flow between the sensing element and the substrate. The supports are raised preferably by use of a magnetic field applied to magnetic material patterned on the supports.

Official Gazette of the U.S. Patent and Trademark Office

Fabrication; Anemometers; Methodology; Microbalances

20090006195 SRI International Corp., Menlo Park, CA USA

A System Description of an Improved 10.6-muM Lidar System for Monostatic Optical Measurements of Battlefield Dust and Smoke

Van Der Laan, J E; Apr 1979; 50 pp.; In English

Contract(s)/Grant(s): DAAG29-77-C-0001

Report No.(s): AD-A491334; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A 10.6-um wavelength CO2 lidar system, designed specifically for measurements of battlefield dust and smoke, was installed in the U.S. Army Atmospheric Sciences Laboratory's laser Doppler velocimeter van. The system design addresses recommendations made following a smoke test field program using a prototype system at Dugway Proving Ground in September 1977. Improvements in range resolution, range jitter, side lobe clutter, and amplitude dynamic range were incorporated in the system. This report serves as a system technical manual.

DTIC

Dust; Optical Measurement; Optical Radar; Smoke

20090006398 Telecommunications Research Inst., Warsaw, Poland

Fundamentals of Bistatic Radar Polarimetry Using the Poincare Sphere Transformations. A Comparison of the Matrix and Quaternionic Formulation of the Optical and Radar Polarimetry

Czyz, Zbigniew H; Dec 7, 2002; 46 pp.; In English

Contract(s)/Grant(s): N00014-02-1-0222

Report No.(s): AD-A491992; B3/156-DL/2002; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Propagation (optical) and scattering (radar) transformations using Jones and Sinclair matrices, accordingly, have been

presented in both matrix and quaternionic forms exhibiting full agreement of the two approaches. The Kennaugh's inversion point techniques has been adopted to the Jones and nonsymmetrical Sinclair matrix. Poincare sphere models of those matrices have been presented and compared. Both spheres have same diameter and common inversion point but different axes and angles of rotation. Those differences have been explained by the dependence of description of the emerging wave's polarization on reversal of the propagation z-axis on the output.
DTIC
Matrices (Mathematics); Multistatic Radar; Optical Radar; Poincare Spheres; Polarimetry

20090006476 NASA, Washington, DC USA
Interferometric Polarization Control
Chuss, David T., Inventor; Wollack, Edward J., Inventor; Moseley, Samuel H., Inventor; Novak, Giles A., Inventor; August 12, 2008; 19 pp.; In English
Patent Info.: Filed June 20, 2006; US-Patent-7,412,175; US-Patent-Appl-SN-11/425,352; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006476

A signal conditioning module provides a polarimeter capability in a photometric system. The module may include multiple variable delay polarization modulators. Each modulator may include an input port, and a first arm formed to include a first reflector and first rooftop mirror arranged in opposed relationship. The first reflector may direct an input radiation signal to the first rooftop mirror. Each modulator also may include an output port and a second arm formed to include a second reflector and second rooftop mirror arranged in opposed relationship. The second reflector can guide a signal from the second rooftop mirror towards the output port to provide an output radiation signal. A beamsplitting grid may be placed between the first reflector and the first rooftop mirror, and also between the second reflector and the second rooftop mirror. A translation apparatus can provide adjustment relative to optical path length vis-a-vis the first arm, the second arm and the grid.
Official Gazette of the U.S. Patent and Trademark Office
Polarimeters; Interferometry; Photometry; Polarization; Signal Processing; Astronomical Polarimetry

20090006537 NASA, Washington, DC USA
Interferometric Rayleigh Scattering Measurement System
Bivolaru, Daniel, Inventor; Danehy, Paul M., Inventor; Lee, Joseph W., Inventor; August 19, 2008; 12 pp.; In English
Patent Info.: Filed August 1, 2006; US-Patent-7,414,708; NASA-Case-LAR-17235-1; US-Patent-Appl-SN-11/461,569; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006537

A method and apparatus for performing simultaneous multi-point measurements of multiple velocity components in a gas flow is described. Pulses of laser light are directed to a measurement region of unseeded gas to produce Rayleigh or Mie scattered light in a plurality of directions. The Rayleigh or Mie scattered light is collected from multiple directions and combined in a single collimated light beam. The Rayleigh or Mie scattered light is then mixed together with a reference laser light before it is passed through a single planar Fabry-Perot interferometer for spectral analysis. At the output of the interferometer, a high-sensitivity CCD camera images the interference fringe pattern. This pattern contains the spectral and spatial information from both the Rayleigh scattered light and the reference laser light. Interferogram processing software extracts and analyzes spectral profiles to determine the velocity components of the gas flow at multiple points in the measurement region. The Rayleigh light rejected by the interferometer is recirculated to increase the accuracy and the applicability of the method for measurements at high temperatures without requiring an increase in the laser energy.
Official Gazette of the U.S. Patent and Trademark Office
Gas Flow; Flow Velocity; Flow Measurement; Velocity Measurement; Interferometers; Interferometry; Rayleigh Scattering

20090006607 NASA, Washington, DC USA
Gas composition sensing using carbon nanotube arrays
Li, Jing, Inventor; Meyyappan, Meyya, Inventor; September 23, 2008; 10 pp.; In English
Patent Info.: Filed August 5, 2005; US-Patent-7,426,848; NASA-Case-ARC-15460-1; US-Patent-Appl-SN-11/203,576; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006607

A method and system for estimating one, two or more unknown components in a gas. A first array of spaced apart carbon nanotubes (''CNTs'') is connected to a variable pulse voltage source at a first end of at least one of the CNTs. A second end

of the at least one CNT is provided with a relatively sharp tip and is located at a distance within a selected range of a constant voltage plate. A sequence of voltage pulses {V(t.sub.n)}.sub.n at times t=t.sub.n (n=1, . . . , N1; N1.gtoreq.3) is applied to the at least one CNT, and a pulse discharge breakdown threshold voltage is estimated for one or more gas components, from an analysis of a curve I(t.sub.n) for current or a curve e(t.sub.n) for electric charge transported from the at least one CNT to the constant voltage plate. Each estimated pulse discharge breakdown threshold voltage is compared with known threshold voltages for candidate gas components to estimate whether at least one candidate gas component is present in the gas. The procedure can be repeated at higher pulse voltages to estimate a pulse discharge breakdown threshold voltage for a second component present in the gas.
Official Gazette of the U.S. Patent and Trademark Office
Carbon Nanotubes; Gas Analysis; Gas Composition; Threshold Voltage; Electric Potential

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*.

20090005237 International Trade Bridge, Inc., Beavercreek, OH, USA; NASA Kennedy Space Center, Cocoa Beach, FL, USA
Final Report on NASA Portable Laser Coating Removal Systems Field Demonstrations and Testing
Rothgeb, Matthew J; McLaughlin, Russell L.; May 2008; 55 pp.; In English; CD-ROM contains full text document in PDF format
Contract(s)/Grant(s): NNH06CC40C
Report No.(s): NASA/CR-2008-214752; Copyright; Avail.: CASI: C01, CD-ROM; A04, Hardcopy

Processes currently used throughout the National Aeronautics and Space Administration (NASA) to remove corrosion and coatings from structures, ground service equipment, small parts and flight components result in waste streams consisting of toxic chemicals, spent media blast materials, and waste water. When chemicals are used in these processes they are typically high in volatile organic compounds (VOC) and are considered hazardous air pollutants (HAP). When blast media is used, the volume of hazardous waste generated is increased significantly. Many of the coatings historically used within NASA contain toxic metals such as hexavalent chromium, and lead. These materials are highly regulated and restrictions on worker exposure continue to increase. Most recently the Occupational Safety and Health Administration (OSHA) reduced the permissible exposure limit (PEL) for hexavalent chromium (CrVI) from 52 to 5 micrograms per cubic meter of air as an 8-hour time-weighted average. Hexavalent chromium is found in numerous pretreatment and primer coatings used within the Space Shuttle Program. In response to the need to continue to protect assets within the agency and the growing concern over these new regulations, NASA is researching different ways to continue the required maintenance of both facility and flight equipment in a safe, efficient, and environmentally preferable manner. The use of laser energy to prepare surfaces for a variety of processes, such as corrosion and coating removal, weld preparation, and non destructive evaluation (NDE) is a relatively new application of the technology that has been proven to be environmentally preferable and in many cases less labor intensive than currently used removal methods. The novel process eliminates VOCs and blast media and captures the removed coatings with an integrated vacuum system. This means that the only waste generated are the coatings that are removed, resulting in an overall cleaner process. The development of a Portable Laser Coating Removal System (PLCRS) started as the goal of a Joint Group on Pollution Prevention (JG-PP) project, led by the Air Force, where several types of lasers in several configurations were thoroughly evaluated. Following this project, NASA decided to evaluate the best performers on processes and coatings specific to the agency. Laser systems used during this project were all of a similar design, between 40 and 500 Watts, most of which had integrated vacuum systems in order to collect materials removed from substrate surfaces during operation.
Derived from text
Coating; Corrosion; Pollution Control; Lasers; Portable Equipment; Air Pollution

20090005856 City Univ. of New York, NY USA

Tetravalent chromium doped laser materials and NIR tunable lasers

Alfano, Robert R., Inventor; Petricevic, Vladimir, Inventor; Bykov, Alexey, Inventor; October 21, 2008; 11 pp.; In English Contract(s)/Grant(s): NCC1-03009

Patent Info.: Filed December 7, 2005; US-Patent-7,440,480; US-Patent-Appl-SN-11/295,749; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005856

A method is described to improve and produce purer Cr.sup.4+-doped laser materials and lasers with reduced co-incorporation of chromium in any other valence states, such as Cr.sup.3+, Cr.sup.2+, Cr.sup.5+, and Cr.sup.6+. The method includes: 1) certain crystals of olivine structure with large cation (Ca) in octahedral sites such as Cr.sup.4+:Ca.sub.2GeO.sub.4, Cr.sup.4+:Ca.sub.2SiO.sub.4, Cr.sup.4+:Ca.sub.2Ge.sub.xSi.sub.1-xO.sub.4 (where 0<x<1), and/or 2) high-temperature solution growth techniques that enable the growth of the crystals below the temperature of polymorphic transitions by using low melting point solvent based on oxide, fluoride and/or chloride compounds. Purer Cr.sup.4+-doped laser materials are characterized by a relatively high concentration of Cr.sup.4+-lasing ion in crystalline host that makes these materials suitable for compact high power (thin disk/wedge) NIR laser applications.

Official Gazette of the U.S. Patent and Trademark Office

Additives; Chromium; Laser Materials; Lasers; Tunable Lasers

20090005857 International Trade Bridge, Inc., Cocoa Beach, FL, USA; International Trade Bridge, Inc., Beavercreek, OH, USA; NASA Kennedy Space Center, Cocoa Beach, FL, USA

Final Report on Portable Laser Coating Removal Systems Field Demonstrations and Testing

Rothgeb, Matthew J.; McLaughlin, Russell L.; May 2008; 54 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNH06CC40C

Report No.(s): NASA CR-2008-214754; NASA.PROJ.PLCRS.FTR.MR.01May08.F; Copyright; Avail.: CASI: A04, Hardcopy

Processes currently used throughout the National Aeronautics and Space Administration (NASA) to remove corrosion and coatings from structures, ground service equipment and small components results in waste streams consisting of toxic chemicals, spent media blast materials, and waste water. When chemicals are used in these processes they are typically high in volatile organic compounds (VOC) and are considered hazardous air pollutants (HAP). When blast media is used, the volume of hazardous waste generated is increased significantly. Many of the coatings historically used within NASA contain toxic metals such as hexavalent chromium, and lead. These materials are highly regulated and restrictions on worker exposure continue to increase. Most recently the EPA reduced the permissible exposure limit (PEL) for hexavalent chromium. The new standard lowers OSHA's PEL for hexavalent chromium from 52 to 5 micrograms of Cr(V1) per cubic meter of air as an 8-hour time-weighted average. Hexavalent chromium is found in the pretreatment and primer coatings used within the Shuttle Program. In response to the need to continue to protect assets within the agency and the growing concern over these new regulations, NASA is researching different ways to continue the required maintenance of both facility and flight equipment in a safe, efficient and environmentally preferable manner. The use of laser energy to remove prepare surfaces for a variety of processes, such as corrosion and coating removal, weld preparation and non destructive evaluation is a relatively new technology that has shown itself to be environmentally preferable and in many cases less labor intensive than currently used removal methods. The development of a Portable Laser Coating Removal System (PLCRS) started as the goal of a Joint Group on Pollution Prevention (JG-PP) project, led by the Air Force, where several types of lasers in several configurations were thoroughly evaluated. Following this project, NASA decided to evaluate the best performers on processes and coatings specific to the agency. Laser systems used during this project were all of a similar design, most of which had integrated vacuum systems in order to collect materials removed from substrate surfaces during operation. Due to the fact that the technology lends itself to a bide variety of processes, several site demonstrations were organized in order to allow for greater evaluation of the laser systems across NASA. The project consisted of an introductory demonstration and a more in-depth evaluation at Wright-Patterson Air Force Base. Additionally, field demonstrations occurred at Glenn Research Center and Kennedy Space Center. During these demonstrations several NASA specific applications were evaluated, including the removal of coatings within Orbiter tile cavities and Teflon from Space Shuttle Main Engine gaskets, removal of heavy grease from Solid Rocket Booster components and the removal of coatings on weld lines for Shuttle and general ground service equipment for non destructive evaluation (NDE). In addition, several general industry applications such as corrosion removal, structural coating removal, weld-line preparation and surface cleaning were evaluated. This included removal of coatings and corrosion from surfaces containing lead-based coatings and applications similar to launch-structure maintenance and Crawler maintenance.

During the project lifecycle, an attempt was made to answer process specific concerns and questions as they arose. Some of these initially unexpected questions concerned the effects lasers might have on substrates used on flight equipment including strength, surface re-melting, substrate temperature and corrosion resistance effects. Additionally a concern was PPE required for operating such a system including eye, breathing and hearing protection. Most of these questions although not initially planned, were fully explored as a part of this project. Generally the results from tesng were very positive. Corrosion was effectively removed from steel, but less successfully from aluminum alloys. Coatings were able to be removed, with varying results, generally dark, matte and thin coatings were easier to remove. Steel and aluminum panels were able to be cleaned for welding, with no known deleterious effects and weld-lines were able to have coatings removed in critical areas for NDE while saving time as compared to other methods.
Derived from text
Corrosion; Lasers; Maintenance; Laser Applications; Paint Removal

20090006099 NASA, Washington, DC USA
Laser fresnel distance measuring system and method
Campbell, Jonathan W., Inventor; Lehner, David L., Inventor; Smalley, Larry L., Inventor; Smith, legal representative, Molly C., Inventor; Sanders, Alvin J., Inventor; Earl, Dennis Duncan, Inventor; Allison, Stephen W., Inventor; Smith, Kelly L., Inventor; November 4, 2008; 7 pp.; In English
Patent Info.: Filed September 18, 2006; US-Patent-7,446,860; US-Patent-Appl-SN-11/527,648; No Copyright; Avail.:
CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006099

A method and system for determining range to a target are provided. A beam of electromagnetic energy is transmitted through an aperture in an opaque screen such that a portion of the beam passes through the aperture to generate a region of diffraction that varies as a function of distance from the aperture. An imaging system is focused on a target plane in the region of diffraction with the generated image being compared to known diffraction patterns. Each known diffraction pattern has a unique value associated therewith that is indicative of a distance from the aperture. A match between the generated image and at least one of the known diffraction patterns is indicative of a distance between the aperture and target plane.
Official Gazette of the U.S. Patent and Trademark Office
Distance Measuring Equipment; Lasers; Fresnel Integrals

20090006141 Naval Research Lab., Washington, DC USA
Laser-Pumped Coherent X-Ray FEL
Sprangle, Phillip; Penano, Joseph; Hafizi, Bahman; Nov 14, 2008; 36 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491178; NRL/MR/6790--08-9163; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491178

In a laser-pumped x-ray free electron laser (FEL) an intense laser field replaces the magnetic wiggler field of a conventional FEL. Depending on the intensity and quality of both the electron beam and pump laser, the Thomson backscattered radiation can be coherently amplified. in a conventional FEL, the generation of x-rays requires electron beam energies in the multi-GeV range. In a laser-pumped x-ray FEL, electron beam energies in the multi-MeV range would be sufficient. To generate coherent x-rays with this mechanism, a number of physics and technology issues must be addressed. Foremost among these are the stringent requirements placed on the electron beam quality and brightness as well as the pump laser intensity and pulse energy. The seed radiation for the laser-pumped FEL is the laser-induced spontaneous radiation. The evolution of incoherent radiation into coherent radiation as well as the power gain lengths associated with the coherent x-rays as a function of electron beam energy spread are analyzed and discussed. There is excellent agreement between our analytical results and GENESIS simulations for the radiated power, gain length, conversion efficiency, line-width and saturation length.
DTIC
Free Electron Lasers; Lasers; X Rays

20090006280 Naval Research Lab., Washington, DC USA
Magnetic Shielding and Vacuum Test for Passive Hydrogen Masers
Gubser, D U; Wolf, S A; Jacoby, A B; Jones, L D; Dec 1981; 10 pp.; In English
Report No.(s): AD-A491805; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491805

Vibration tests on high permeability magnetic shields used in the SAO-NRL Advanced Development Model (ADM)

hydrogen maser have been made. Magnetic shielding factors were measured before and after vibration at the Goddard Space Flight Center, magnetic field facility. Preliminary results indicate considerable (<25%) degradation. Test results on the NRL designed vacuum pumping station for the ADM hydrogen maser are also discussed. This system employs sintered zirconium carbon getter pumps, supplied by SAES Getters, to pump hydrogen plus small ion pumps to pump the inert gases. In situ activation tests and pumping characteristics indicated that the system can meet design specifications.
DTIC
Hydrogen Masers; Magnetic Fields; Magnetic Shielding; Masers; Vacuum Tests

20090006387 Naval Research Lab., Washington, DC USA
Ar-Xe Laser: The Path to a Robust, All-Electric Shipboard Directed Energy Weapon
Apruzese, J P; Sethian, J D; Giuliani, J L; Wolford, M F; Dec 18, 2008; 21 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491950; NRL/MR/6770--08-9147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

High Energy Lasers (HELs) long ago demonstrated their potential to destroy missiles in flight, a capability which could significantly reduce the threat to the fleet arising from anti-ship cruise missiles. However, no HELs have been deployed to date. Until recently, there was no laser that had credible prospects of meeting the Navy's requirements for safety, power, size, beam quality, electrical drive, and atmospheric propagation. The electron beam pumped Ar-Xe laser has been investigated in an ONR-sponsored 6.1 program at NRL. The results of this program are summarized in this Memorandum Report, and indicate that the Ar-Xe laser has strong potential to meet these requirements. A technical road map which scales the present parameters of the Ar-Xe laser to a deployable system is presented.
DTIC
High Power Lasers; Weapon Systems

20090006420 Johns Hopkins Univ., Laurel, MD USA
Integral Cavity Hydrogen Maser
Kunski, R; Dec 1986; 22 pp.; In English
Report No.(s): AD-A492062; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Continuing effort is being directed to developing a thermally, mechanically, and dimensionally stable microwave cavity for a hydrogen maser. The more stable cavity allows for less restricted tuning (or autotuning) of the maser. In addition, overall maser performance is directly related to the stability of the microwave cavity.
DTIC
Cavities; Hydrogen Masers; Masers

20090006440 Duke Univ., Durham, NC USA
Frequency Stability in a Wall-Coated Evacuated Cell: Preliminary Results
Rahman, C; Robinson, H G; Dec 1986; 7 pp.; In English
Report No.(s): AD-A492147; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Using a high-quality evacuated wall-coated sealed cell, first measurements on the frequency stability of the 6835 MHz 0-0 rubidium 87 hyperfine transition are reported. The intrinsic linewidth in the 24cc cell was ~10 Hz FWHM. A saturated absorption locked diode laser provided a stable optical pumping light source. Available equipment showed a monotonic frequency drift rate of - + 1 x 10(-12)/day. Additional experiments appear to confirm that light gas diffusion into the cell is the cause of this drift. The observed drift is closely matched by the calculated rate due to the diffusive influx of atmospheric helium through the cell wall. If such diffusion is the dominant cause of drift, improvement in frequency stability by orders of magnitude should be possible without penalties in size, weight, or cost.
DTIC
Cells (Biology); Coatings; Frequency Stability; Partitions (Structures); Walls

20090006471 Uglow (Kenneth M.), Sarasota, FL USA
A Signal Processing Scheme for Reducing the Cavity Pulling Factor in Passive Hydrogen Masers
Uglow, Kenneth M; Dec 1986; 10 pp.; In English
Report No.(s): AD-A492358; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A passive hydrogen maser operates so as to cause a signal frequency, fs, to satisfy a selected criterion. The frequency fs which satisfies the criterion depends on the cavity resonance frequency, fc. The derivative of fs with respect to fc for fc = fs

is called the PULLING FACTOR. Theoretically this factor can be zero with a computational criterion making use of complex signal voltage samples taken at several frequencies.
DTIC
Cavities; Hydrogen Masers; Masers; Pulling; Signal Processing

20090006472 Radio Research Labs., Tokyo, Japan
Beam Optics of the RRL Cesium Beam Primary Frequency Standard
Nakagiri, Koji; Okazawa, Haruo; Urabe, Shinji; Dec 1986; 12 pp.; In English
Report No.(s): AD-A492367; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The laboratory type cesium beam frequency standard, Cs 1, of RRL (Radio Research Laboratory) features a hexapole magnet focusing system, a 55 cm Ramsey cavity using a coaxial line-to-waveguide transducer and a digital servo system.
DTIC
Atomic Beams; Cesium; Frequency Standards

20090006561 Naval Health Research Center, Brooks AFB, TX USA
Rhesus Monkey Aversion to 94-GHz Facial Exposure
D'Andrea, J A; Cox, D; Henry, P J; Ziriax, J M; Hatcher, D J; Hurt, W D; Sep 2008; 21 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A487589; DEBL-2006-07; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Millimeter wave (MMW) source technology has advanced significantly allowing the use of 94-GHz MMWs as a non-lethal weapon. The Air Force Research Laboratory has developed such a non-lethal weapon known as the Active Denial System (ADS). The purpose of this study was to determine the threshold for behavioral aversion to 94-GHz MMW exposure in rhesus monkeys. Aversion was defined simply as an eye blink, head turn, or raising the hand to block the 94-GHz MMW beam. Six rhesus monkeys were occasionally exposed to a 94-GHz beam that was turned on for brief periods to deliver energy densities (fluence) that ranged from 0.2 J/sq cm to 2.2 J/sq cm. An infrared camera produced a series of thermographs during the exposure so that facial skin and eye temperature could be correlated with behavioral aversion. The energy density thresholds that produced these behavioral responses on 50% of the exposures and the maximum facial (and ocular) temperature changes were determined to be in the range of 0.4 J/sq cm to 1.0 J/sq cm and produce maximum temperature changes of 1 deg C to 3.2 deg C on the face or cornea of the eye. Eye blink was most sensitive to the MMW exposures. Head turn or hand raising required higher energy densities than that required to produce eye blinks. Aversion to 94-GHz MMWs begins at 0.4 J/sq cm and is a robust response at 1.0 J/sq cm. These effects occur well below the temperature rise in the skin needed to produce pain (10 deg C). These data along with human exposure data will be used to specify safe exposure levels for the ADS system.
DTIC
Exposure; Millimeter Waves; Monkeys; Weapon Systems

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*.

20090005065 NASA Kennedy Space Center, Cocoa Beach, FL, USA
Emission Control System
Parrish, Clyde F., Inventor; 17 Nov. 2005; 10 pp.; In English
Patent Info.: Filed 11 May 04; US-Patent-Appl-SN-10-845418; US 2005/0255019
Report No.(s): PB2007-109121; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005065

Methods and apparatus utilizing hydrogen peroxide are useful to reduce NOx, SOx and mercury (or other heavy metal) emissions from combustion flue gas streams. Continuous concentration of hydrogen peroxide to levels approaching or exceeding propellant-grade hydrogen peroxide facilitates increased system efficiency. In this manner, combustion flue gas streams can be treated for the removal of NOx, SOx and heavy metals, while isolating useful by-products streams of sulfuric

acid and nitric acid as well as solids for the recovery of the heavy metals.
Official Gazette of the U.S. Patent and Trademark Office
Air Pollution; Combustion; Exhaust Emission; Flue Gases; Gas Streams; Hydrogen Peroxide; Patent Applications; Pollution Control

20090005070 Sobanski (Macmillan) and Todd, LLC, Toledo, OH, USA
Conical Bearingless Motor/Generator
Kascak, Peter E., Inventor; Jansen, Ralph H., Inventor; Dever, Timothy P., Inventor; 1 Dec. 05; 11 pp.; In English
Contract(s)/Grant(s): NCC3-916; NCC3-924
Patent Info.: Filed 28 Feb. 05; US-Patent-Appl-SN-11-068509; US 2005/0264118
Report No.(s): PB2007-110609; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005070

A bearingless motor/generator comprises a rotatable part and a stationary part. The rotatable part is adapted to be rotated about an axis of rotation with respect to the stationary part. The stationary part has one or more windings for producing a drive field and a control field. The drive field is adapted to exert a torque on the rotatable part to transfer energy between the rotatable part and the stationary part. The control field is adapted to exert a force on the rotatable part to levitate the rotatable part. The force is adapted to be directed at an angle greater than 0 degree and less than 90 degrees relative to the axis of rotation of the rotatable part.
Official Gazette of the U.S. Patent and Trademark Office
Motors; Patent Applications; Bearingless Rotors

20090005113 Georgia Inst. of Tech., Atlanta, GA USA
Reusable Design Processes via Modular, Executable, Decision-Centric Templates
Panchal, Jitesh H; Fern ndez, Marco G; Paredis, Christiaan J; Mistree, Farrokh; Jan 2004; 14 pp.; In English
Contract(s)/Grant(s): F49620-03-1-0348
Report No.(s): AD-A487815; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487815

While there have been many advances with respect to reusability and scalability of product architectures over the past several decades, little progress has been made in applying the same concepts to underlying design processes. It is on this aspect of design process design that we focus in this paper. Design processes play a key role in product design and their configuration has a significant effect on both the efficiency and the effectiveness with which resources are committed. Design processes also directly influence the final design of the product under consideration. As such, more attention must be paid to the manner in which these processes are modeled so that they may be standardized, executed, analyzed, and stored, allowing for their leveraging across product lines and reducing product development times. Computer interpretability is a key consideration in making required adjustments as product considerations evolve and design requirements change from one product to the next. In this paper, we offer a fundamental step in this direction by presenting a method for modeling design processes as reusable process templates that can be captured, archived, analyzed and manipulated on a computer.
DTIC
Templates; Product Development; Standardization

20090005236 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Wear and Tear - Mechanical
Swanson, Theodore; January 2008; 11 pp.; In English; No Copyright; Avail.: CASI: A03, Hardcopy

The focus of this chapter is on the long term wear and tear, or aging, of the mechanical subsystem of a spacecraft. The mechanical subsystem is herein considered to be the primary support structure (as in a skeleton or exoskeleton) upon which all other spacecraft systems rest, and the associated mechanisms. Mechanisms are devices which have some component that moves at least once, in response to some type of passive or active control system. For the structure, aging may proceed as a gradual degradation of mechanical properties and/or function, possibly leading to complete structural failure over an extended period of time. However, over the 50 years of the Space Age such failures appear to be unusual. In contrast, failures for mechanisms are much more frequent and may have a very serious effect on mission performance. Just as on Earth, all moving devices are subject to normal (and possibly accelerated) degradation from mechanical wear due to loss or breakdown of lubricant, misalignment, temperature cycling effects, improper design/selection of materials, fatigue, and a variety of other effects. In space, such environmental factors as severe temperature swings (possibly 100's of degrees C while going in and

out of direct solar exposure), hard vacuum, micrometeoroids, wear from operation in a dusty or contaminated environment, and materials degradation from radiation can be much worse. In addition, there are some ground handling issues such as humidity, long term storage, and ground transport which may be of concern. This chapter addresses the elements of the mechanical subsystem subject to wear, and identifies possible causes. The potential impact of such degradation is addressed, albeit with the recognition that the impact of such wear often depends on when it occurs and on what specific components. Most structural elements of the mechanical system typically are conservatively designed (often to a safety factor of greater than approximately 1.25 on yield for unmanned spacecraft) but do not have backup structure due to the added mass this would impose, and also due to the fact that structural elements can be accurately modeled mathematically and in test. Critical mechanisms or devices may have backups, or alternate work-arounds, since characterization of these systems in a 1g environment is less accurate than structure, and repair in-space is often impossible.
Derived from text
Mechanical Properties; Structural Failure; Wear; Deterioration; Spacecraft Structures

20090005802 NASA, Washington, DC USA
Actuator operated microvalves
Okojie, Robert S., Inventor; October 21, 2008; 37 pp.; In English
Patent Info.: Filed August 26, 2005; US-Patent-7,438,030; US-Patent-Appl-SN-11/213,604; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005802

An actuator operated microvalve and the method of making same is disclosed and claimed. The microvalve comprises a SiC housing which includes a first lower portion and a second upper portion. The lower portion of the SiC housing includes a passageway therethrough, a microvalve seat, and a moveable SiC diaphragm. The SiC diaphragm includes a centrally located boss and radially extending corrugations which may be sinusoidally shaped. The boss of the SiC diaphragm moves and modulates in a range of positions between a closed position wherein the boss interengages said microvalve seat prohibiting communication of fluid through the passageway and a fully open position when the boss is spaced apart from the seat at its maximum permitting communication of fluid through said passageway. The actuator includes a SiC top plate affixed to the boss of the diaphragm and a first electrode and the second upper portion of the SiC housing further includes a second electrode.
Official Gazette of the U.S. Patent and Trademark Office
Actuators; Valves; Silicon Carbides

20090006180 Department of the Army, Washington, DC USA
Eccentric Mounting and Adjustment System for Belt Driven Devices
Hansen, David N, Inventor; Oct 28, 2008; 10 pp.; In English
Report No.(s): AD-D020388; PATENT-7 442 137 B2; No Copyright; Avail.: US Patent and Trademark Office
ONLINE: http://hdl.handle.net/100.2/ADD020388

An eccentric adjustment and mounting system is useful for belt engaging engine components such as alternators or water pumps. The system includes a housing fixed to the engine, a socket rotatable in pawl-and-ratchet fashion within the housing, and a socket aperture eccentrically disposed relative to the socket's axis. The aperture receives the belt engaging component, whereby rotation of the socket moves the component to adjust belt tension.
DTIC
Engine Parts; Mounting; Patents; Supports

20090006181 Department of the Army, Washington, DC USA
Tow Hitch Lunette Assembly
Lim, James G, Inventor; Oct 28, 2008; 9 pp.; In English
Report No.(s): AD-D020389; PATENT-7 441 793 B1; No Copyright; Avail.: US Patent and Trademark Office
ONLINE: http://hdl.handle.net/100.2/ADD020389

For use in a vehicular trailer hitch system, a vehicular trailer hitch lunette assembly is provided. The assembly includes at least one 'U' shaped outer laminate plate having two legs with a semi-circular region therebetween, and at least one substantially flat inner laminate plate positioned between the legs of the U-shape of the outer laminate plate to provide support, stiffness, and additional mechanical strength to the assembly. The outer laminate plate and the inner laminate plate have cooperating apertures that are traversely positioned therethrough and the apertures are aligned and sizes such that fasteners may be snugly inserted therein to mechanically couple the laminate plates together as a sandwich structure having first and

second ends. The semi-circular region of the outer laminate plate and ends of the inner laminate plate comprise an inner void at the first end of the assembly to provide a lunette shaped structure to attach to a complimentary hitch assembly that is adapted to receive the lunette shaped structure, and the second end of the assembly is shaped to mate to a corresponding housing.
DTIC
Patents; Trailers

20090006213 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
A Residual Life Indicator (RLI) for Physical Adsorption Capacity of Nuclear, Biological, and Chemical Filters. Part 3. A Novel RLI Design for Collective Protection Demonstrated Using Breakthough and Chemical Pulse Data
Friday, David; Shrewsbury, Marc; Deibert, Scott; Peterson, Gregory W; Nov 2008; 51 pp.; In English
Contract(s)/Grant(s): 5E22A; Proj-BA05PRO102
Report No.(s): AD-A491483; ECBC-TR-658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We start by simulating the condition of a fielded filter by selecting representative threat vapors and representative contaminant vapors. We assume that only contaminants that are moderately and strongly adsorbed can affect the residual life. A simulated contaminated filter is configured using contaminated carbon at the bed inlet and fresh carbon at the bed outlet. Breakthrough experiments are then completed using an organic to simulate the threat vapor. These data define 'residual life' based on relative humidity (RH), threat vapor, contaminant chemical, and the extent of bed contamination. Using a novel residual life indicator approach that employs dual satellite beds, one sampling the filter air inlet and one sampling the filter outlet, chemical pulse tests are conducted. Simulated contaminated beds are tested at different RHs. The difference between the reference bed effluent concentration profile and the contaminated bed effluent concentration profile is correlated to the residual life using a simple algorithm.
DTIC
Adsorption; Protection

20090006515 General Electric Co., Schenectady, NY USA
Electron Beam Welding to Join Gamma Titanium Aluminide Articles
Kelly, Thomas Joseph, Inventor; August 19, 2008; 6 pp.; In English
Contract(s)/Grant(s): NAS3-26385
Patent Info.: Filed November 20, 2002; US-Patent-7,413,620; US-Patent-Appl-SN-10/301,767; No Copyright; Avail.:
CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006515

A method is provided for welding two gamma titanium aluminide articles together. The method includes preheating the two articles to a welding temperature of from about 1700 F to about 2100 F, thereafter electron beam welding the two articles together at the welding temperature and in a welding vacuum to form a welded structure, and thereafter annealing the welded structure at an annealing temperature of from about 1800 F to about 2200 F, to form a joined structure.
Official Gazette of the U.S. Patent and Trademark Office
Electron Beam Welding; Titanium Aluminides

20090006592 NASA, Washington, DC USA
Torsional Magnetorheological Device
Arnold, Steven M., Inventor; Penney, Nicholas, Inventor; August 26, 2008; 14 pp.; In English
Patent Info.: Filed October 23, 2003; US-Patent-7,416,062; NASA-Case-LEW-17510-1; US-Patent-Appl-SN-10/693,853; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006592

A magnetorheological device comprising a housing having a divider within the housing is disclosed and claimed. A rotary impeller having two paddles is rotatably mounted within the housing. The rotary impeller sealingly engages the divider and the paddles in combination with the divider forms a first chamber and a second chamber. Magnetorheological fluid resides in the chambers and a passageway interconnects the first and second chambers. A coil surrounds a portion of the passageway such that when energized the magnetorheological fluid solidifies plugging the passageway. As the impeller rotates, it pushes the incompressible fluid against the divider in the housing and the plug in the passageway and retards and/or stops the motion of the impeller.
Official Gazette of the U.S. Patent and Trademark Office
Mechanical Devices; Dampers; Magnetic Materials; Seals (Stoppers); Rotors; Torsion; Rheology; Magnetorheological Fluids

20090006595 NASA, Washington, DC USA

Cable Tensiometer for Aircraft

Nunnelee, Mark, Inventor; September 16, 2008; 7 pp.; In English

Patent Info.: Filed September 4, 2007; US-Patent-7,424,832; NASA-Case-DRC-007041; US-Patent-Appl-SN-11/849,843; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006595

The invention is a cable tensiometer that can be used on aircraft for real-time, in-flight cable tension measurements. The invention can be used on any aircraft cables with high precision. The invention is extremely light-weight, hangs on the cable being tested and uses a dual bending beam design with a high mill-volt output to determine tension.

Official Gazette of the U.S. Patent and Trademark Office

Cables; Wire; Tensiometers; Cable Force Recorders; Mechanical Measurement; Aircraft Safety

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, quality control, inspection, maintainability, and standardization.

20090006539 Intellectual Assets. LLC, Lake Tahoe, NV USA

Surveillance System and Method having an Adaptive Sequential Probability Fault Detection Test

Bickford, Randall L., Inventor; Herzog, James P., Inventor; August 19, 2008; 40 pp.; In English

Contract(s)/Grant(s): NAS8-98027

Patent Info.: Filed July 24, 2006; US-Patent-7,415,382; US-Patent-Appl-SN-11/492,329; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006539

System and method providing surveillance of an asset such as a process and/or apparatus by providing training and surveillance procedures that numerically fit a probability density function to an observed residual error signal distribution that is correlative to normal asset operation and then utilizes the fitted probability density function in a dynamic statistical hypothesis test for providing improved asset surveillance.

Official Gazette of the U.S. Patent and Trademark Office

Fault Detection; Artificial Intelligence; Statistical Tests; Numerical Analysis

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*.

20090005084 California Univ., Irvine, CA, USA

Statistical and Mechanistic Fragility Analysis of Concrete Bridges

Shinozuka, M.; Banerjee, S.; Kim, S.; Sep. 10, 2007; 218 pp.; In English

Contract(s)/Grant(s): DTFH61-98-C-00094

Report No.(s): PB2008-106427; MCEER-07-0015; No Copyright; Avail.: National Technical Information Service (NTIS)

This report elaborates on the seismic performance of reinforced concrete bridges subjected to earthquake ground motion by integrating probabilistic, statistical and mechanistic aspects of bridge damageability in the form of two-parameter lognormal fragility curves. To simulate general patterns of the progressive nature of bridge damage and failure mechanisms, the study performs nonlinear time history analyses of typical California RC bridges by finite element method (FEM). The analyses demonstrate that under normal conditions, the most prominent bridge damage that is first observed after a significant earthquake is the formation of plastic hinges at the ends of bridge columns. Therefore, damage due to pounding of girders at expansion joints, unseating of bridge decks and shear failure of bridge columns are considered but not as governing failure modes in this study. Another purpose of these FEM analyses is to simulate the enhancement of bridge fragility characteristics due to seismic retrofit, primarily because neither empirical nor experimental results are available to evaluate such enhancements. In addition, these FEM analyses develop fragility curves with and without retrofit. In fact, the main purpose of these FEM analyses is to develop analytical fragility curves without retrofit that can be calibrated with empirical fragility

curves. In the process of calibration, intervals of rotational ductility values that represent states of bridge damage are adjusted to form contiguous intervals over the one-dimensional space of rotational ductility. If the rotational ductility is between upper and lower bounds in one of the intervals, the bridge is assumed to have suffered from the state of damage corresponding to the rotational ductility specified by that interval. This calibration is made for each bridge separately, although it is envisioned to perform combined calibration to derive common damage states for all types of bridges. In addition to time history analysis, nonlinear static procedure is performed to assess seismic vulnerability of the bridge and results from these two methods are in good agreement. Furthermore, the effect of ground motion directionality on bridge fragility characteristics is demonstrated, which indicates that directionality may significantly influence bridge seismic damageability.
NTIS
Concretes; Earthquakes; Finite Element Method; Statistical Analysis

20090005976 NASA Glenn Research Center, Cleveland, OH, USA
Analysis of Bonded Joints Between the Facesheet and Flange of Corrugated Composite Panels
Yarrington, Phillip W.; Collier, Craig S.; Bednarcyk, Brett A.; December 2008; 42 pp.; In English; 49th Structures, Structural Dynamics, and Materials Conference (SDM), 7-10 Apr. 2008, Schaumburg, IL, USA; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 645846.02.07.03.03.02
Report No.(s): NASA/TM-2008-215438; AIAA Paper-2008-2092; E-16608; Copyright; Avail.: CASI: A03, Hardcopy

This paper outlines a method for the stress analysis of bonded composite corrugated panel facesheet to flange joints. The method relies on the existing HyperSizer Joints software, which analyzes the bonded joint, along with a beam analogy model that provides the necessary boundary loading conditions to the joint analysis. The method is capable of predicting the full multiaxial stress and strain fields within the flange to facesheet joint and thus can determine ply-level margins and evaluate delamination. Results comparing the method to NASTRAN finite element model stress fields are provided illustrating the accuracy of the method.
Author
Bonded Joints; Stress Analysis; Laminates; Composite Structures; Finite Element Method; Stress Distribution; Stress-Strain Relationships

20090005991 NASA Glenn Research Center, Cleveland, OH, USA
A Novel Multiscale Physics Based Progressive Failure Methodology for Laminated Composite Structures
Pineda, Evan J.; Waas, Anthony M.; Bednarcyk, Brett A.; Collier, Craig S.; Yarrington, Phillip W.; December 2008; 36 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NNL07AA29C; WBS 984754.02.07.03.16.05
Report No.(s): NASA/TM-2008-215448; E-16644; Copyright; Avail.: CASI: A03, Hardcopy

A variable fidelity, multiscale, physics based finite element procedure for predicting progressive damage and failure of laminated continuous fiber reinforced composites is introduced. At every integration point in a finite element model, progressive damage is accounted for at the lamina-level using thermodynamically based Schapery Theory. Separate failure criteria are applied at either the global-scale or the microscale in two different FEM models. A micromechanics model, the Generalized Method of Cells, is used to evaluate failure criteria at the micro-level. The stress-strain behavior and observed failure mechanisms are compared with experimental results for both models.
Author
Micromechanics; Finite Element Method; Fiber Composites; Laminates; Stress-Strain Relationships; Failure; Composite Structures

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GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

20090005085 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Integrated Data Environmental Analysis using Classification Technology and Clustering of DNA Microarray
Ruivo, Heloisa Musetti; [2007]; 100 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15217-TDI/1311; Copyright; Avail.: CASI: C01, CD-ROM; A05, Hardcopy

The growing flood of data in the environmental sciences generates a bottleneck in this information extraction as well as

in its analysis and interpretation. This tendency requests the employment of computational techniques and advanced statistics analysis increasingly. In the experimental molecular biology, for instance, DNA microarrays, nowadays, one of the key technologies in gene expression studies, and they generate gigabytes of gene expression data making it one of the pioneering areas in the treatment of this vast information. The objective of this dissertation is to show the possibility of transpose computational techniques currently used in the bioinformatic, into the environmental area. Initially the accomplished applications investigated, which were the climatic component for the great drought of Amazonia in 2005. As another application, we have been identified the physiochemical variables that control the emission of greenhouse effect in hydroelectric dams. In both applications, great volumes of original data of different sources were organized as microarray experiments. The results show that bioinformatic methods of analysis can be extremely useful in the environmental area.
Author
Environmental Monitoring; Data Acquisition; Data Integration; Data Processing; Classifications; Statistical Analysis

20090005105 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Surface Fire Spread Model Based on Lumped Parameter Approach
Almeida, Rodolfo Maduro; [2008]; 113 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15261-TDI/1344; Copyright; Avail.: CASI: C01, CD-ROM; A06, Hardcopy

This work presents a new approach for a surface fire spread model applicable to wildland fire modelling. The mathematical method used in the modeling is the lumped parameter approach. In this method the thermal domain is divided in a finite number of volumes, supposed isothermal and with homogeneous properties, called nodes. To each node are attributed a temperature, a thermal capacitance and possibly internal heat generation. Each node exchanges heat with its neighbors through conductive conductances and interacts with the flames and the ambient through radiatives conductances. When the node reach the temperature of ignition, it is subject to an internal heat generation that keeps on until total consumption of the vegetal fuel. The flame over each node within the reaction zone is approximated by a parallelopiped whose surfaces emits radiation to the nodes positioned in its surrounding. Each flame has a predetermined temperature-time profile model, geometrical properties and a residence time that depend on ambient conditions. The system of differential equations, representing the net heat balance of the nodes, is numerically solved, yielding, among other results, the temporal evolution of the ame on the surface. The conductance matrix, as well as the thermal capacitances and the internal heat generation, is updated each time step. The influence of the nodal division on the re spread rate and on the computational cost is analyzed. Simulation are carried out varying the wind speed and the fuel load. It is observed that the rate of spread is directly related with the geometric properties of the ame nodes. The model shows to be flexible in situations involving propagation in surfaces with obstacles. The results are encouraging for the use of the lumped parameter approach in the the surface fire spread modelling.
Author
Flame Propagation; Forest Fires

20090005244 NASA Goddard Space Flight Center, Greenbelt, MD, USA
GFO and JASON Altimeter Engineering Assessment Report. Update: GFO--Acceptance to December 27, 2007, JASON--Acceptance to December 26, 2007. Version 1: June 2008
Conger, A. M.; Hancock, D. W.; Hayne, G. S.; Brooks, R. L.; September 2008; 192 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG06HX14C
Report No.(s): NASA/TM-2008-209984/Ver.1/Vol.10; 200802408; Copyright; Avail.: CASI: A09, Hardcopy

The purpose of this document is to present and document GEOSAT Follow-On (GFO) performance analyses and results. This is the eighth Assessment Report since the initial report. This report extends the performance assessment since acceptance to 27 December 2007. Since launch, a variety of GFO performance studies have been performed: Appendix A provides an accumulative index of those studies. We began the inclusion of analyses of the JASON altimeter after the end of the Topographic Experiment (TOPEX) mission. Prior to this, JASON and TOPEX were compared during our assessment of theTOPEX altimeter. With the end of the TOPEX mission, we developed methods to report on JASON as it relates to GFO.
Author
GEOSAT Satellites; Altimeters; Launching

20090005246 NASA Goddard Space Flight Center, Greenbelt, MD, USA
U.S. Eastern Continental Shelf Carbon Cycling (USECoS): Modeling, Data Assimilation, and Analysis
Mannino, Antonio; [2008]; 1 pp.; In English
Contract(s)/Grant(s): NNX08AO25G; No Copyright; Avail.: Other Sources; Abstract Only

Although the oceans play a major role in the uptake of fossil fuel CO2 from the atmosphere, there is much debate about the contribution from continental shelves, since many key shelf fluxes are not yet well quantified: the exchange of carbon across the land-ocean and shelf-slope interfaces, air-sea exchange of CO2, burial, and biological processes including productivity. Our goal is to quantify these carbon fluxes along the eastern U.S. coast using models quantitatively verified by comparison to observations, and to establish a framework for predicting how these fluxes may be modified as a result of climate and land use change. Our research questions build on those addressed with previous NASA funding for the USECoS (U.S. Eastern Continental Shelf Carbon Cycling) project. We have developed a coupled biogeochemical ocean circulation model configured for this study region and have extensively evaluated this model with both in situ and remotely-sensed data. Results indicate that to further reduce uncertainties in the shelf component of the global carbon cycle, future efforts must be directed towards 1) increasing the resolution of the physical model via nesting and 2) making refinements to the biogeochemical model and quantitatively evaluating these via the assimilation of biogeochemical data (in situ and remotely-sensed). These model improvements are essential for better understanding and reducing estimates of uncertainties in current and future carbon transformations and cycling in continental shelf systems. Our approach and science questions are particularly germane to the carbon cycle science goals of the NASA Earth Science Research Program as well as the U.S. Climate Change Research Program and the North American Carbon Program. Our interdisciplinary research team consists of scientists who have expertise in the physics and biogeochemistry of the U.S. eastern continental shelf, remote-sensing data analysis and data assimilative numerical models.
Author
Continental Shelves; Carbon Cycle; Carbon Dioxide; Climate Change; Ocean Currents; Ocean Models; Remote Sensing; Earth Sciences; Gas Exchange; Fossil Fuels

20090006000 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Model Effects on GLAS-Based Regional Estimates of Forest Biomass and Carbon
Oral/Visual Presentation
Nelson, Ross; November 19, 2008; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

ICESat/GLAS waveform data are used to estimate biomass and carbon on a 1.27 million sq km study area. the Province of Quebec, Canada, below treeline. The same input data sets and sampling design are used in conjunction with four different predictive models to estimate total aboveground dry forest biomass and forest carbon. The four models include nonstratified and stratified versions of a multiple linear model where either biomass or (square root of) biomass serves as the dependent variable. The use of different models in Quebec introduces differences in Provincial biomass estimates of up to 0.35 Gt (range 4.942+/-0.28 Gt to 5.29+/-0.36 Gt). The results suggest that if different predictive models are used to estimate regional carbon stocks in different epochs, e.g., y2005, y2015, one might mistakenly infer an apparent aboveground carbon 'change' of, in this case, 0.18 Gt, or approximately 7% of the aboveground carbon in Quebec, due solely to the use of different predictive models. These findings argue for model consistency in future, LiDAR-based carbon monitoring programs. Regional biomass estimates from the four GLAS models are compared to ground estimates derived from an extensive network of 16,814 ground plots located in southern Quebec. Stratified models proved to be more accurate and precise than either of the two nonstratified models tested.
Author
Biomass; Estimates; Sampling; Carbon; Forests; Ice, Cloud and Land Elevation Satellite; Waveforms; Optical Radar

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*.

20090005090 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Land Use and Land Cover Changes' Impacts on the Surface Runoff and Sediment Yield in the Xingu River Basin
Maeda, Eduardo Eiji; [2008]; 104 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15234-TDI/1321; Copyright; Avail.: CASI: C01, CD-ROM; A06, Hardcopy

This work had as objective to analyze the land use and land cover changes in the Suia-Micu river basin and to evaluate

its impacts in the surface runoff generation and sediment yield. The Suia-Micu River is located in the north part of Mato Grosso State, it is a Xingu River tributary and is inserted in the Amazon River drainage basin. Three time periods were chosen in order to perform this study, 1973, 1984 and 2005. The surface runoff modeling was performed using the Automated Geospatial Watershed Assessment tool (AGWA), and the sediment yield was modeled using the Universal Soil Loss Equation (USLE). The data necessary to run the models includes land use and land cover maps, digital elevation model, precipitation data and soil maps. The results showed that until 1984, 13% of the natural vegetation of the study area was replaced by pasture. These changes resulted in a 5.4% increase in the surface runoff annual average when comparing with 1973, and the sediment yield increase along this same period reached 0.18 t/ha.ano in some regions. In 2005, the deforestation in the drainage basin reached 40% of the entire area, causing a 23% increase in the surface runoff generation compared to 1984 and in some regions the sediment yield was 7 t/ha.ano higher than in the previous analyzed period. Hence, the tools used in this work were efficient in the evaluation of the land use/land cover changes impacts in this region, confirming the vegetation cover importance in the maintenance of the natural hydrological cycle patterns and in the soil and natural resources conservation. In addition, this study indicated several limitations of these tools for use in quantitative studies that require more accurate results. The main restrictions found were related to the acquisition of digital elevation models that are capable of correctly represent the terrain slope, and in the implementation of soil maps with appropriated scales.
Author
Land Use; Vegetation; Soil Erosion; Sediments; Drainage; River Basins; Hydrological Cycle; Earth Resources; Conservation

20090005107 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Regionalized Spatio-temporal Modelling of Water Table Depths in the Brazilian Cerrado
Manzione, Rodrigo Lilla; [2008]; 143 pp.; In English; Original contains color and black and white illustrations
Report No.(s): INPE-15154-TDI/1286; Copyright; Avail.: CASI: C01, CD-ROM; A07, Hardcopy

Water regimes governed by seasonality are sensitive to climatological disturbances and human interventions. The Brazilian Cerrados are characterized by a well pronounced dry season, from May until September. During this period, natural vegetation and agricultural crops are dependable of groundwater. The Cerrado natural vegetation is adapted to the local climate, but the cash-crops cultivated in the region not. Irrigation techniques are responsible for the maintenance of high productivities during the whole year and the availability of water resources made it possible. Nowadays, with almost all Cerrado vegetation replaced by agricultural crops, information about the spatiotemporal dynamics of the water table is important to optimize and balance the interest of economical and ecological purposes in the Brazilian agricultural frontier. The aim of this thesis is to characterize water resources in a Brazilian Cerrado area. We model the spatio-temporal variation of water table depths in the Jardim River watershed. This is a representative Cerrado area in the Brazilian Federal District, where almost all natural vegetation was replaced by agricultural crops and irrigation has substantially increased during the past years. This information is needed to monitoring the behaviour of the water levels due to land use, human interventions and climatic changes. Also, to evaluate risks associated with water levels, and to present strategies in water management. For this purpose we applied geostatistical methods and time series modelling to observed water table depths series, describing water table dynamics and accounting for uncertainty. The results presented here show how to estimate the water volume lost during a specific season and delimitation of favourable and unfavorable areas to water use, using a linear coregionalization model. We showed how to apply the PIRFICT time series model to the Cerrado situation, accounting for systematic changes in water table depths and presenting how to predict risks of extreme water levels for agriculture in the region. These results aim at contributing to improve water management, when using Cerrado areas for crop production.
Author
Water Tables; Water Depth; Water Resources; Water Management; Land Use; Risk Management; Time Series Analysis; Annual Variations

20090005966 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Earth Science Mining Web Services
Pham, Long; Lynnes, Christopher; Hegde, Mahabaleshwa; Graves, Sara; Ramachandran, Rahul; Maskey, Manil; Keiser, Ken; December 15, 2008; 1 pp.; In English; American Geophysical Union Meeting, 15-19 Dec. 2008, San Francisco, CA, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A01, Hardcopy

To allow scientists further capabilities in the area of data mining and web services, the Goddard Earth Sciences Data and Information Services Center (GES DISC) and researchers at the University of Alabama in Huntsville (UAH) have developed a system to mine data at the source without the need of network transfers. The system has been constructed by linking together several pre-existing technologies: the Simple Scalable Script-based Science Processor for Measurements (S4PM), a processing engine at he GES DISC; the Algorithm Development and Mining (ADaM) system, a data mining toolkit from UAH that can

be configured in a variety of ways to create customized mining processes; ActiveBPEL, a workflow execution engine based on BPEL (Business Process Execution Language); XBaya, a graphical workflow composer; and the EOS Clearinghouse (ECHO). XBaya is used to construct an analysis workflow at UAH using ADam components, which are also installed remotely at the GES DISC, wrapped as Web Services. The S4PM processing engine searches ECHO for data using space-time criteria, staging them to cache, allowing the ActiveBPEL engine to remotely orchestras the processing workflow within S4PM. As mining is completed, the output is placed in an FTP holding area for the end user. The goals are to give users control over the data they want to process, while mining data at the data source using the server's resources rather than transferring the full volume over the internet. These diverse technologies have been infused into a functioning, distributed system with only minor changes to the underlying technologies. The key to the infusion is the loosely coupled, Web-Services based architecture: All of the participating components are accessible (one way or another) through (Simple Object Access Protocol) SOAP-based Web Services.
Author
Data Mining; Earth Sciences; Web Services; Architecture (Computers)

20090005967 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Modern Era Retrospective Restrospective-Analysis for Research and Applications (MERRA) Data and Services at the GES DISC
Oral/Visual Presentation
Berrick, Stephen W.; Shen, Suhung; Ostrenga, Dana; December 15, 2008; 1 pp.; In English; American Geophysical Union Meeting, 15-19 Dec. 2008, San Francisco, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The Modern Era Retrospective-analysis for Research and Applications (MERRA) dataset is a NASA satellite era, 30 year (1979 - present), reanalysis using the Goddard Earth Observing System Data Assimilation System, Version 5 (GEOS-5). The project, run out of NASA's Global Modeling and Assimilation Office at Goddard Space Flight Center, provides the science and application communities with a state-of-the-art global analysis with emphasis on improved estimates of the hydrological cycle over a broad range of weather and climate time scales. MERRA products are generated as a long-term synthesis that places the NASA EOS suite of observations in a climate context. The MERRA analysis is performed at a horizontal resolution of 2/3 longitude x 1/2 latitude (540x361 global gridpoints) with observational analyses every 6 hours. The MERRA output data will include 3 dimensional state fields for every 6 hourly analysis cycle on 42 pressure levels (or 72 terrain following model coordinate levels) from the surface through the stratosphere. Several data products are specifically designed to support chemistry and stratosphere transport modeling. The 2 dimensional surface and atmospheric diagnostics (numbering 259) are being stored on the native grid at 1 hourly intervals. These include radiation and vertical integrals of the atmosphere for water and energy budget studies and also surface diagnostics where the diurnal cycle is important. The one hourly surface and near surface data product will also facilitate research on the integrated analysis of Earth system observations in the land, ocean and cryosphere. The MERRA products are archived and distributed by the Goddard Earth Sciences Data and Information Services Center (GES DISC) through its Modeling DISC Web (MDISC) portal. Multiple data access methods and services are available for MERRA data through MDISC: (1) Mirador offers a quick, comprehensive search of MERRA and all GES DISC archived data holdings, allowing searches on keywords, location names or latitude/longitude box, and date/time, with responses within a few seconds. (2) Giovanni is a GES DISC developed Web application that provides data visualization and analysis online. Giovanni features popular visualizations such as latitude-longitude maps, animations, cross sections, profiles, time series, etc. and some basic statistical analysis functions such as scatter plots and correlation coefficient maps. Users are able to download results in several different formats, including Google Earth. (3) On-the-fly parameter subsetting of data within a spatial/temporal window is provided through a simple select and click Web page. (4) MERRA data are also available via OPeNDAP, GrADS Data Server (GDS) and can be converted to netCDF on the fly.
Author
Data Systems; Earth Sciences; Information Systems; Systems Integration; Scientific Visualization

20090005969 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Semantic Web Data Discovery of Earth Science Data at NASA Goddard Earth Sciences Data and Information Services Center (GES DISC)
Oral/Visual Presentation
Hegde, Mahabaleshwara; Strub, Richard F.; Lynnes, Christopher S.; Fang, Hongliang; Teng, William; December 15, 2008; 1 pp.; In English; American Geophysical Union Conference, 15-19 Dec. 2008, San Francisco, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

Mirador is a web interface for searching Earth Science data archived at the NASA Goddard Earth Sciences Data and

Information Services Center (GES DISC). Mirador provides keyword-based search and guided navigation for providing efficient search and access to Earth Science data. Mirador employs the power of Google's universal search technology for fast metadata keyword searches, augmented by additional capabilities such as event searches (e.g., hurricanes), searches based on location gazetteer, and data services like format converters and data sub-setters. The objective of guided data navigation is to present users with multiple guided navigation in Mirador is an ontology based on the Global Change Master directory (GCMD) Directory Interchange Format (DIF). Current implementation includes the project ontology covering various instruments and model data. Additional capabilities in the pipeline include Earth Science parameter and applications ontologies.
Author
World Wide Web; Earth Sciences; Information Systems; Semantics; Metadata

20090006050 Massachusetts Inst. of Tech., Cambridge, MA USA
Seismic Tomography of the Arabian-Eurasian Collision Zone and Surrounding Areas
Toksoz, M N; Van der Hilst, Robert D; Sun, Youshun; Gulen, Levent; Kalafat, Dogan; Kuleli, Huseyin S; Li, Chang; Zhang, Haijiang; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-07-C-0001; Proj-1010
Report No.(s): AD-A487713; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487713

The objectives of this study are to determine P- and S-wave velocity structures in the crust and upper mantle and to characterize seismic wave propagation in the Arabian-Eurasian collision zone and surrounding areas, including Iran, Arabia, Eastern Turkey, and the Caucasus. The Arabian-Eurasian plate boundary is a complex tectonic zone shaped by continent-continent collision processes. In recent years the number of seismic stations has increased greatly in the region because of expanded seismic networks in Azerbaijan, Turkey, Iran, and the Gulf countries. Unfortunately, the phase readings and waveform data cannot be obtained from a single data center. We are collecting the data through cooperation with individual network operators and the countries. The travel-time tomography is carried out in three steps. First, obtain Pn and Sn velocities using local and regional arrival time data. Second, obtain the 3-D crustal P and S velocity models. Third, extend the model into the upper mantle and transition zone by combining local, regional, and teleseismic data and crust model constraints. We obtained the regional Pn velocity tomograms using 160,000 arrival times (including data from Iran) from 850 stations and 18,000 earthquakes. For Sn tomography, 75,000 phase readings were used. The Pn and Sn velocity variations agree quite well with some local differences. Pn velocities are very low under eastern Anatolia, northwest Iran, and the Lesser Caucasus. There are localized low-velocity anomalies. Velocities are low under the Iranian plateau. Pn velocities are high under the Arabian Platform, the Gulf, and the Zagros. In the north, high Pn velocities extend from the Black Sea to the Caspian and east to the Kara Kum Basin. The upper mantle tomograms show the images of the subducted Neotethys slab. The slab geometry is quite complex, reflecting the history of the changes in plate motions and collision processes.
DTIC
Boundaries; Collisions; Plates (Tectonics); Seismic Waves; Tomography

20090006067 San Diego State Univ., San Diego, CA USA
High-Resolution Seismic Velocity and Attenuation Models of the Caucasus-Caspian Region
Mellors, Robert; Gok, Rengin; Pasyanos, Michael; Skobeltsyn, Gleb; Teoman, Ugur; Godoladze, Tea; Sandvol, Eric; Sep 30, 2008; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-07-C-0007; DE-AC52-07NA27344; Proj-1010
Report No.(s): AD-A487716; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487716

The southwest edge of Eurasia is a tectonically and structurally complex region that includes the Caspian and Black Sea basins, the Caucasus Mountains, and the high plateaus south of the Caucasus. Using data from 25 broadband stations located in the region, new estimates of crustal and upper mantle thickness, velocity structure, and attenuation are being developed. Receiver functions have been determined for all stations. Depth to Moho is estimated using slant stacking of the receiver functions, forward modeling, and inversion. Moho depths along the Caspian and in the Kura Depression are in general poorly constrained using only receiver functions due to thick sedimentary basin sediments. The best fitting models suggest a low velocity upper crust with Moho depths ranging from 30 to 40 km. Crustal thicknesses increase in the Greater Caucasus with Moho depths of 40 to 50 km. Pronounced variations with azimuth of source are observed indicating 3D structural complexity and upper crustal velocities are higher than in the Kura Depression to the south. In the Lesser Caucasus, south and west of the Kura Depression, the crust is thicker (40 to 50 km) and upper crustal velocities are higher. Work is underway to refine these

models with the event-based surface wave dispersion and ambient-noise correlation measurements from continuous data. Regional phase (Lg and Pg) attenuation models as well as blockage maps for Pn and Sn are being developed. Two methods are used to estimate Q: the two-station method to estimate inter-station Q and the reversed, two-station, two-event method. The results are then inverted to create Lg and Pg Q maps. Initial results suggest substantial variations in both Pg and Lg Q in the region. A zone of higher Pg Q extends west from the Caspian between the Lesser and Greater Caucasus, and a narrow area of higher Lg Q is observed.
DTIC
Attenuation; Caucasus Mountains (U.S.S.R.); High Resolution; Models

20090006270 RAND Corp., Santa Monica, CA USA
Producing Liquid Fuels from Coal: Prospects and Policy Issues
Bartis, James T; Camm, Frank; Ortiz, David S; Jan 2008; 200 pp.; In English
Contract(s)/Grant(s): FA7014-06-C-0001
Report No.(s): AD-A491717; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491717

The increase in world oil prices since 2003 has prompted renewed interest in producing and using liquid fuels from unconventional resources, such as biomass, oil shale, and coal. This book focuses on issues and options associated with establishing a commercial coal-to-liquids (CTL) industry within the USA. The book describes the technical status, costs, and performance of methods that are available for producing liquids from coal; the key energy and environmental policy issues associated with CTL development; the impediments to early commercial experience; and the efficacy of alternative federal incentives in promoting early commercial experience. Because coal is not the only near-term option for meeting liquid-fuel needs, this book also briefly reviews the benefits and limitations of other approaches, including the development of oil shale resources, the further development of biomass resources, and increasing dependence on imported petroleum. A companion document provides a detailed description of incentive packages that the Federal Government could offer to encourage private-sector investors to pursue early CTL production experience while reducing the probability of bad outcomes and limiting the costs that might be required to motivate those investors. During the preparation of this book, the U.S. Congress and federal departments were considering alternative legislative proposals for promoting the development of unconventional fuels in the USA. This book is intended to inform those deliberations. It should also be useful to federal officials responsible for establishing civilian and defense research programs; to potential investors in early CTL production plants; and to state, tribal, and local government decision makers who are considering the costs, risks, and benefits of early CTL production plants.
DTIC
Coal; Cost Analysis; Cost Effectiveness; Economic Impact; Energy Conversion; Environmental Surveys; Liquid Fuels; Liquids; Policies

20090006621 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Aster/Terra Reflectance and Emissivity Data Applied to the Study of Quartz-Rich Soils
Breunig, Fabio Marcelo; [2008]; 184 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15214-TDI/1310; Copyright; Avail.: CASI: C01, CD-ROM; A09, Hardcopy

ASTER reflectance, emissivity and elevation data were used to study tropical soils and arenization (land degradation in areas of sandy soils) processes, in a typical agricultural region. The study area is located in Campo Verde city, in Mato Grosso State -- Brazil. The methodology was based on field work, laboratory physico-chemical soil analyses and, on qualitative and quantitative analyses of these data associated to ASTER images. The qualitative approach aimed to discuss the reflectance and emissivity spectra of different targets such as soil, green vegetation and non-photosynthetic vegetation (NPV). On the other hand, the first step of the quantitative approach was to discriminate exposed soils from the other scene components. For this purpose, a threshold was applied over the soil fraction image derived from a linear mixture model and, a normalization procedure using short wave infrared (SWIR) and thermal infrared (TIR) data was tested. Regression models of reflectance and emissivity data with physicochemical data from soil samples were elaborated and applied to the images. The soil parameters were analyzed as a function of the elevation. The sandy soils were identified through ASTER TIR ratio (band 10/14). The ASTER sensor could reproduce soil, green vegetation and NPV spectra in a consistent way. The selected methodology to discriminate exposed soil from the other scene components was effective, as shown by field inspection. Soil chemical and physical data, as a general rule, presented good correlation with reflectance and emissivity, respectively. High concentrations of soil constituents (SiO2 (clay fraction), Fe2O3, Al2O3,TiO2 and organic carbon) associated with clay and silt fractions were observed at high altitudes. Sandy soils presented larger concentrations at lower slope positions. In general, it was observed

a gradual transition from clayey to sandy soils with decreasing elevation in the toposequences. The TIR ratio showed a high spectral contrast and allowed us to estimate the sand fraction, and to identify the sandy soils.
Author
Quartz; Reflectance; Soil Science; Soils; Tropical Regions; Emissivity; Earth Observations (From Space); Remote Sensing

20090006636 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A-Train Data Depot (ATDD)
Smith, Peter M.; Kempler, Steven; Leptoukh, Gregory; Savtchenko, Andrey; Kummerer, Robert; Gopolan, Arun; December 15, 2008; 1 pp.; In English; American Geophysical Union Meeting, 15-19 Dec. 2008, San Francisco, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006636

ATDD is a web based tool which provides collocated data and display products for a number of A-train instruments Cloudsat, Calipso, OMI, AIRS, MODIS, MLS, POLDER-3, and ECWMF model data. Products provided include Clouds, Aerosols, Water Vapor, Temperatures and trace gases. All input data is online and in HDF4, HDF5 format. Display products include curtain images, horizontal strips, line plot overlays, and GE kmz files. Sample products are shown for two type of events. Hurricane event, Norbert, Oct 8, 2008 and a dust storm event over the Arabian Sea, Nov 13-14, 2008.
Derived from text
Hurricanes; Data; Data Products; Image Processing; Satellite Imagery; Web Services; On-Line Systems; Dust Storms

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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*.

20090005052 National Renewable Energy Lab., Golden, CO USA
Solar Energy: What's Next for Solar Technology
Benner, J. P.; Nov. 06, 2007; 35 pp.; In English
Contract(s)/Grant(s): DE-AC36-99-GO10337
Report No.(s): DE2007-921201; NREL/PR-520-42453; No Copyright; Avail.: National Technical Information Service (NTIS)

This presentation reviews the market growth, DOE Programs, efficiency--cost-- reliability, NREL: Industry's Partner, thin films, concentrators, silicon, and technlogies for future generations.
NTIS
Solar Energy; Technology Assessment

20090005863 California Inst. of Tech., Pasadena, CA USA
Organic fuel cell methods and apparatus
Vamos, Eugene, Inventor; Surampudi, Subbarao, Inventor; Narayanan, Sekharipuram R., Inventor; Frank, Harvey A., Inventor; Halpert, Gerald, Inventor; Olah, George A., Inventor; Prakash, G. K. Surya, Inventor; November 4, 2008; 29 pp.; In English
Patent Info.: Filed May 27, 2004; US-Patent-7,445,859; US-Patent-Appl-SN-10/857,587; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005863

A liquid organic, fuel cell is provided which employs a solid electrolyte membrane. An organic fuel, such as a methanol/water mixture, is circulated past an anode of a cell while oxygen or air is circulated past a cathode of the cell. The cell solid electrolyte membrane is preferably fabricated from Nafion.TM.. Additionally, a method for improving the performance of carbon electrode structures for use in organic fuel cells is provided wherein a high surface-area carbon particle/Teflon.TM.-binder structure is immersed within a Nafion.TM./methanol bath to impregnate the electrode with Nafion.TM.. A method for fabricating an anode for use in a organic fuel cell is described wherein metal alloys are deposited onto the electrode in an electro-deposition solution containing perfluorooctanesulfonic acid. A fuel additive containing perfluorooctanesulfonic acid for use with fuel cells employing a sulfuric acid electrolyte is also disclosed. New organic fuels,

namely, trimethoxymethane, dimethoxymethane, and trioxane are also described for use with either conventional or improved fuel cells.
Official Gazette of the U.S. Patent and Trademark Office
Cell Anodes; Cell Cathodes; Methyl Alcohol; Biochemical Fuel Cells

20090006409 Royal Armament Research and Development Establishment, Fort Halstead, UK
The Physics and Statistics of the Electrical Initiation Process in Conducting Composition Systems
Martin, J W; Apr 1965; 45 pp.; In English
Report No.(s): AD-A492034; RARDE-M-7/65; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The resistance of a random array of a mixture of conducting and explosive particles is studied using a Monte' Carlo approach and a combination of digital and analog computing. Voltage sensitivity is discussed using the maximum current concentrations in the array, electric contact theory and the hot spot theory of thermal explosion. It is considered that 2 volts is the threshold for safety in graphite devices and that above two volts there are several distinct mechanisms for energy transfer from conductor to the explosive. At 4 volts the contacts disrupt giving efficient energy transfer by impact of incandescent vapour. This is considered to be the mechanism of the fast mode of action used in Service devices.
DTIC
Electrical Properties; Explosives

20090006438 Army Research Lab., Adelphi, MD USA
A Survey of Power Source Options for a Compact Battery Charger for Soldier Applications
Gilman, S; Chu, D; Geil, B; Morgan, B; Podlesak, T; Dec 2008; 24 pp.; In English
Report No.(s): AD-A492135; ARL-TR-4693; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Typical Soldier power requirements are at the level of tens of watts of average power for missions that can last from 1 (present) to 3 (future) days. The Army's policy, going back almost to the dawn of wireless communication and extending to relatively recent times, has been to rely on primary batteries to supply those power needs for combat and 'realistic training' scenarios and to rely on rechargeable batteries mainly as a cost-savings measure for 'classroom' training.
DTIC
Battery Chargers; Surveys

20090006445 Institut de Recherche de l'Hydro-Quebec, Varennes, Quebec Canada
PTTI Applications in Power Utilities
Missout, Gilles; Dec 1986; 13 pp.; In English
Report No.(s): AD-A492226; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Electric power systems are like human being: they cannot be stopped in order for us to carry out an examination of how they work. All analyses are therefore made on the 'living fabric' as it were. In addition, power systems have a fast-moving 'life style': they can fall 'sick' (disturbance or even instability) within milliseconds and can 'lose a limb' (local power failure) or 'die' (general black- out' in a couple of seconds. In analyzing this kind of behavior, time is crucial. The operating speed of electric grids is such that events follow on each other's heels and system analysts are faced with the arduous task of distinguishing between occurrences that are very close to each other in time.
DTIC
Utilities

20090006565 Army Tank-Automotive Research and Development Command, Warren, MI USA
Army Transitions Hybrid Electric Technology to FCS Manned Ground Vehicles
Bochenek, Grace M; Hitchcock, Jennifer; Dec 2007; 5 pp.; In English
Report No.(s): AD-A490300; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490300

After 12 years of intense collaboration between government and industry partners, the Army has reached a critical milestone in developing next-generation Manned Ground Vehicles (MGVs). In August 2007, the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) began full-load integration testing of the military's first hybrid electric drive propulsion system designed for combat vehicles. This new propulsion system will drive and provide electrical power to all eight Army Future Combat Systems (FCS) MGV variants. As explained by MG Charles Cartwright, Program Manager FCS Brigade Combat Team (BCT), 'Combat vehicles need significantly more power than commercial platforms. To

meet those requirements, the Army and a robust set of industry partners have pioneered the development of advanced hybrid propulsion systems.' This work directly impacts the Army's ability to enhance force protection and more rapidly execute battlefield maneuver.
DTIC
Combat; Diesel Engines; Electric Propulsion; Hybrid Propulsion

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ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20090005082 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Use of Geoprocessing (GIS) to Assess the Representativeness of Conservation System Units in the Mato Gross State (Brazil)
deLima, Andre; [2008]; 154 pp.; In Portuguese; Original contains color illustrations
Report No.(s): INPE-15205-TDI/1305; Copyright; Avail.: CASI: C01, CD-ROM; A08, Hardcopy

According to the PRODES data for 2004, the state of Mato Grosso presented the highest deforestation rate in Legal Amazon; this environmental degradation scenarium began in the middle of 60 decade. This fact, added to the presence of a vast biodiversity, urges for immediate environmental conservation plans and actions. The establishment of a Conservation Units System (SUC) is regarded as the most viable alternative for in-situ conservation. In order to execute a study appropriate for the Mato Grosso reality (lack of data about species distribution and huge territorial extension), it is proposed to analyze the representativity of its SUC by taking the vegetation formations as unit of analysis. For that, the following cartographic materials were employed: potential vegetation map, updated land cover map (produced using MODIS sensor data), conservation units map (UC's) and indigenous lands map (TI's). These data were integrated into a Geographic Information System, thus so obtaining information about the evolution of Mato Grosso s landscape, formal (ideal protection) and effective (actual protection) SUC s representativeness, the impact of TI inclusion in the SUC's representativeness and the identification of potential areas for conservation. The results showed: the utility of MODIS sensor data for regional mapping; vegetation cover conversions about 47% for the Cerrado biome, 41% for forest formations and 46% in the transition areas, leaving only 66% of the state with natural cover; and that the SUC exhibits low representativeness (2.4% of the whole State), and does not include all the vegetation formations of the state. The lack of policing in the UC's aggravates the problem of the SUC efficiency, since there were detected conversion proportions of more than 50% for some vegetation formations inside deprotected areas. With the inclusion of TI's, the SUC increased its extension by 7 times (occupying then 16% of the state). The natural cover conversion proportion (9%) inside the TI's was lower than for the UC's (21%), but even these areas offering more representativity and protection than the UC's, the TIs do not ensure the conservation/protection of the ecosystems, as this picture tend to change with the progressive civilization of its people. In order to the UC's to become efficient, it is suggested the system's enlargement by the creation of Integral Protection UC's (considering the representativity/protection criteria), and inclusion of the TIs: for total area increase, 24 to 78% of the original area of vegetation formation are able to be preserved. However, such actions will only be truly valid if followed by policy rules capable to ensure the protection of the Conservation Units System.
Author
Geographic Information Systems; Environmental Monitoring; Environment Management; Conservation; Vegetation Growth; Mapping

20090005087 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Estimation of Atmospheric Polluting Source using Particle Swarm Optimization
daLuz, EduardoFaveroPacheco; [2008]; 86 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15227-TDI/1319; Copyright; Avail.: CASI: C01, CD-ROM; A05, Hardcopy

Atmospheric pollution is a problem of global aspect that takes scientists and world leaders to join efforts with the objective of finding mid and long term solutions to avoid future problems. One of the necessary actions involves the localization of sources and the estimation of polluting emission quantities. Actually, inverse problem techniques can be used in this process, and when this problem is taken as an optimization problem with restrictions, the use of alternatives techniques can be

considered feasible with proven robustness. This dissertation presents the results obtained by the use of a bioinspired algorithm (PSO) and compared with an exact method for localization and estimation of atmospheric polluting sources.
Author
Air Pollution; Point Sources; Algorithms; Optimization

20090005123 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Review of the National Ambient Air Quality Standards for Ozone: Policy Assessment of Scientific and Technical Information. Appendices to OAQPS Staff Paper
Jul. 2007; 246 pp.; In English
Report No.(s): PB2008-106502; EPA/452/R-07/007-APP; No Copyright; Avail.: National Technical Information Service (NTIS)

This Staff Paper, prepared by staff in the U.S. Environmental Protection Agencys (EPA) Office of Air Quality Planning and Standards (OAQPS), evaluates the policy implications of the key studies and scientific information contained in the document, Air Quality Criteria for Ozone and Related Photochemical Oxidants (USEPA, 2006; henceforth referred to as the CD), prepared by EPAs National Center for Environmental Assessment (NCEA). This document also presents and interprets results from several quantitative analyses (e.g., air quality analyses, human exposure analyses, human health risk assessments, and an environmental assessment of vegetation-related impacts) that we believe should also be considered in EPA's current review of the national ambient air quality standards (NAAQS) for ozone (O(sub 3)), and presents factors relevant to the evaluation of current primary and secondary 03 standards. Finally, this document presents staff conclusions and recommendations on a range of policy options that we believe are appropriate for the Administrator to consider concerning whether, and if so how, to revise the primary (health-based) and secondary (welfare-based) O(sub 3) NAAQS.
NTIS
Air Quality; Ambience; Graphs (Charts); Health; Ozone; Policies; Risk; Tables (Data)

20090005945 Pacific Northwest National Lab., Richland, WA, USA
Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 2006
Perkins, C. J.; Dorsey, M. C.; McKinney, S. M.; Roos, R. C.; Sep. 2007; 198 pp.; In English
Contract(s)/Grant(s): DE-AC05-76RL01830
Report No.(s): DE2007-919711; PNNL-16623; No Copyright; Avail.: Department of Energy Information Bridge

Near-facility environmental monitoring is defined as monitoring near facilities that have the potential to discharge or have discharged, stored, or disposed of radioactive or hazardous materials. Monitoring locations are associated with nuclear facilities such as the Plutonium Finishing Plant (PFP), Canister Storage Building (CSB), and the K Basins; inactive nuclear facilities such as N Reactor and the Plutonium-Uranium Extraction (PUREX) Facility; and waste storage or disposal facilities such as burial grounds, cribs, ditches, ponds, tank farms, and trenches. Much of the monitoring consists of collecting and analyzing environmental samples and methodically surveying areas near facilities. The program is also designed to evaluate acquired analytical data, determine the effectiveness of facility effluent monitoring and controls, assess the adequacy of containment at waste disposal units, and detect and monitor unusual conditions.
NTIS
Environmental Monitoring; Radioactive Materials; Pollution Monitoring

20090006143 Environmental Health Lab., McClellan AFB, CA USA
Bolling AFB Stack Emission Evaluation Bolling AFB DC
Sweigart, Marlin L; Jul 1975; 77 pp.; In English
Report No.(s): AD-A491181; EHL(M)-75M-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491181

This report presents the results of particulate emission testing done on a single oil fired steam boiler at Bolling AFB, Washington DC. Testing was done at three different heat input loadings as requested by the Washington District Commission. Particulate emissions varied from 0.055 pounds/Million British Thermal Units (lbs/MBTU) to 0.080 lbs/MBTU. The unit was found to be in compliance with District of Columbia standards which ranged from 0.072 lbs/MBTU to 0.086 lbs/MBTU Emission data are compared with Environmental Protection Agency (EPA) published emission factors for similar units.
DTIC
Boilers; Emission; Environmental Surveys; Evaluation; System Effectiveness

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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*.

20090005972 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Simulating the Fate of an Ionospheric Mass Ejection
Moore, Thomas E.; Fok, Mei-Ching H.; Shinker, Steven P.; Fedder Joel A.; December 15, 2008; 1 pp.; In English; American Geophysical Union Conference, 15-19 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We report global ion kinetic (GIK) simulations of the 24-25 Sep 1988 storm, with all relevant ionospheric outflows including polar, auroral, and plasmaspheric winds. This storm included substantial periods of northward interplanetary magnetic field, but did develop a Dst of -200nT at its peak. The solar disturbance resulted from a coronal mass ejection that reached a peak dynamic pressure at the magnetosphere of 6.2 nPa, and produced a substantial enhancement of auroral wind oxygen outflow from the dayside, which has been termed an 'ionospheric mass ejection' in an earlier paper. We use the LFM global simulation model to produce electric and magnetic fields in the outer magnetosphere, the Strangeway-Zheng outflow scalings with Delcourt ion trajectories to include ionospheric outflows, and the Fok-Obner inner magnetospheric model for the plasmaspheric and ring current response to all particle populations. We assess the combined contributions of heliospheric and geospheric plasmas to the ring current for this event.
Author
Simulation; Ionospheres; Kinetics; Plasmasphere; Geophysics; Solar Storms

20090005974 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Concerning the Occurrence Pattern of Flux Transfer Events on the Dayside Magnetopause
Sibeck, D. G.; December 14, 2008; 1 pp.; In English; 2008 Fall AGU Conference, 14-20 Dec. 2008, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

We present an analytical model for the magnetic field perturbations associated with flux transfer events (FTEs) on the dayside magnetopause as a function of the shear between the magnetosheath and magnetospheric magnetic fields and the ratio of their strengths. We assume that the events are produced by component reconnection along subsolar reconnection lines of finite length with tilts that depend upon the orientation of the interplanetary magnetic field (IMF), and show that the amplitudes of the perturbations generated during periods of southward IMF orientation greatly exceed those during periods of northward IMF orientation. As a result, even if bursts of magnetic reconnection are equally likely during periods of northward and southward IMF orientation, events occurring for southward IMF orientations dominate surveys of dayside events.
Author
Flux Transfer Events; Interplanetary Magnetic Fields; Magnetopause; Mathematical Models

20090005975 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fast Plasma Instrument for MMS: Simulation Results
Figueroa-Vinas, Adolfo; Adrian, Mark L.; Lobell, James V.; Simpson, David G.; Barrie, Alex; Winkert, George E.; Yeh, Pen-Shu; Moore, Thomas E.; December 15, 2008; 1 pp.; In English; American Geophysical Union Conference, 15-20 Dec. 2008, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Magnetospheric Multiscale (MMS) mission will study small-scale reconnection structures and their rapid motions from closely spaced platforms using instruments capable of high angular, energy, and time resolution measurements. The Dual Electron Spectrometer (DES) of the Fast Plasma Instrument (FPI) for MMS meets these demanding requirements by acquiring the electron velocity distribution functions (VDFs) for the full sky with high-resolution angular measurements every 30 ms. This will provide unprecedented access to electron scale dynamics within the reconnection diffusion region. The DES consists of eight half-top-hat energy analyzers. Each analyzer has a 6 deg. x 11.25 deg. Full-sky coverage is achieved by electrostatically stepping the FOV of each of the eight sensors through four discrete deflection look directions. Data compression and burst memory management will provide approximately 30 minutes of high time resolution data during each orbit of the four MMS spacecraft. Each spacecraft will intelligently downlink the data sequences that contain the greatest amount of temporal structure. Here we present the results of a simulation of the DES analyzer measurements, data compression and decompression, as well as ground-based analysis using as a seed re-processed Cluster/PEACE electron measurements. The Cluster/PEACE electron measurements have been reprocessed through virtual DES analyzers with their proper geometrical, energy, and timing scale factors and re-mapped via interpolation to the DES angular and energy

phase-space sampling measurements. The results of the simulated DES measurements are analyzed and the full moments of the simulated VDFs are compared with those obtained from the Cluster/PEACE spectrometer using a standard quadrature moment, a newly implemented spectral spherical harmonic method, and a singular value decomposition method. Our preliminary moment calculations show a remarkable agreement within the uncertainties of the measurements, with the results obtained by the Cluster/PEACE electron spectrometers. The data analyzed was selected because it represented a potential reconnection event as currently published.
Author
Magnetospheres; Simulation; Electron Spectroscopy; Geophysics; Plasmas (Physics)

20090006039 Norwegian Seismic Array, Kjeller, Norway; Lawrence Livermore National Lab., Livermore, CA, USA
Expanding Coherent Array Processing to Larger Apertures Using Empirical Matched Field Processing
Ringdal, Frode; Harris, David B; Kvaerna, Tormod; Gibbons, Steven J; Sep 30, 2008; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-08-C-0007; DE-FC52-06NA27324; Proj-1010
Report No.(s): AD-A487591; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487591

The objectives of this project are: (1) To investigate the limits of empirical matched field processing and other coherent array detection and parameter estimation methods as receiver aperture size increases from a few kilometers to many hundreds of kilometers. (2) To investigate techniques for extending the geographical source-region footprint over which empirical matched field processing and other coherent calibrated methods apply. Under a previous contract, we demonstrated the ability of empirical matched field processing to classify mining explosions by originating mine, using data from a single small-aperture array (ARCES) applied to mining events on the Kola Peninsula. In the current contract, we have chosen central Asia as our study region to assure programmatic relevance and to exploit the large belts of natural and man-made seismicity required for a test of our processing strategy. Data from suitable networks available for the study are from the four Kazakhstan arrays (MKAR, KKAR, ABKAR, BRVK) and the Kyrgyzstan network. Our overall approach will be to start with small apertures (the individual Kazakhstan arrays considered separately) to check the reproducibility of results we obtained for the European Arctic, then to extend the processing strategy first to a medium aperture (the Kyrgyzstan network; 200 km aperture) and then a large aperture (the four Kazakhstan arrays considered as a single coherent aperture; >1000 km). Simultaneously we will investigate methods to expand the source region footprint over which calibrations for coherent methods apply.
DTIC
Apertures; Seismology; Parameter Identification; Coherence

20090006042 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Surface Wave Dispersion Measurements and Tomography from Ambient Seismic Noise Correlation in China
Song, Xiaodong; Sun, Xinlei; Zheng, Sihua; Xu, Zhen; Yang, Yingjie; Ritzwoller, Michael H; Sep 30, 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-07-C-0006; Proj-1010
Report No.(s): AD-A487633; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487633

We perform ambient noise tomography of China using the data from the China National Seismic Network and global and PASSCAL stations. The results so far are summarized below. (1) Dispersion measurements and tomography. For most of the station pairs, we retrieve good Rayleigh waveforms from ambient noise correlations using 18 months of continuous data at all distance ranges across the entire region (over 5000 km) and for periods from 70 s down to about 8 s. We obtain Rayleigh wave group velocity dispersion measurements for periods 8 to 70 s and invert for Rayleigh dispersion maps for periods from 8 to 60 s. The dispersion maps correlate nicely with surface geology. (2) Error estimates using bootstrap analysis. A major feature of the ambient noise method is that the whole process is completely repeatable with different time segments, which make it possible to evaluate the uncertainties. We adopt a bootstrap method to quantify the errors in the Rayleigh wave group velocity dispersion measurements and the tomographic maps. Most of the pairs show similar dispersion curves between different runs and small standard deviations, indicating good data quality and convergence of the Green's function. Group velocity for a long period generally has a larger error, which is consistent with the notion that the long period needs longer time to converge. The best retrieved periods are from 10 to 30 s with the optimal period of around 15 to 20 s. Pairs with large errors do not depend on the orientations of the paths or the locations of the stations. Rather, they are associated with a few stations with large average standard errors. The likely causes are missing data and poor instrumentation (or site conditions). Where ray coverage is good, there is only a subtle difference in tomography maps between different runs, suggesting that our

solution is very stable. (3) 3D structure. We invert the Rayleigh group and phase dispersion maps for 3D shear-wave velocity structure.
DTIC
Ambience; Characterization; China; Noise (Sound); Seismic Waves; Surface Waves; Tomography; Wave Dispersion

20090006044 Southern Methodist Univ., Dallas, TX USA; Los Alamos National Lab., NM, USA
Shear Velocity Structure in NE China and Characterization of Infrasound Wave Propagation in the 1-210 Kilometer Range
Stump, Brian W; Zhou, Rong-Mao; Kim, Tae-Sung; Chen, Yun-Tai; Yang, Zhi-Xian; Herrmann, Robert B; Burlacu, Relu; Hayward, Chris; Pankow, Kristine; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-05-C-0020; Proj-1010
Report No.(s): AD-A487646; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487646

We continued the operation of the Southern Methodist University-Institute of Geophysics, China Earthquake Administration (SMU-IGPCEA) broadband seismic network through May 2008 using Program for the Array Seismic Studies of the Continental Lithosphere (PASSCAL) instrumentation. The operating network included three stations northwest of Beijing and 10 stations in Xiuyan. Lisoning Province, NE China. At the end of May, the PASSCAL instrumentation was returned to the U.S. During the 5.5-year operation, we collected approximately 600 Gb of miniSEED data. Most of the data have been archived at the Incorporated Research Institutes for Seismology (IRIS) data center. This high-quality dataset has already provided us the opportunity to study the detailed velocity structure beneath the Huailai Basin and Haicheng in NE China using both teleseismic and regional signals. We are expanding our joint inversion of teleseismic receiver functions and surface wave phase velocities for crustal shear velocity structure from the Huailai Basin to the Huabei area using data from SMU-IGPCEA broadband seismic network with additional data provided by 48 broadband seismic stations in this region.
DTIC
China; Infrasonic Frequencies; Seismic Waves; Wave Propagation

20090006045 Science Applications International Corp., San Diego, CA USA
Finite-Frequency Seismic Tomography of Body Waves and Surface Waves from Ambient Seismic Noise: Crustal and Mantle Structure Beneath Eastern Eurasia
Ren, Yong; Zhang, Wei; Yang, Ting; Shen, Yang; Yang, Xiaoping; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-05-C-0017; Proj-1010
Report No.(s): AD-A487647; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487647

To improve seismic calibration for nuclear explosion monitoring, we use 3D sensitivity kernels of finite-frequency body and surface waves to develop models of the crustal and mantle structures beneath eastern Eurasia. We have collected and processed available broadband data from both permanent stations and temporary networks in eastern Eurasia. We obtained a regional P-wave velocity model for the mantle structures down to 1,500 km beneath the eastern Eurasia. We also carried out a detailed study of the P- and S-wave velocity structures in southeastern Tibet, which led to some interesting geological findings. Our P- and S-wave velocity models reveal a low-velocity anomaly in the crust and upper mantle to ~300 km depth beneath a north-south-trending rift zone in southeastern Tibet. This low-velocity anomaly is situated above a tabular, high-dipping-angle, high-velocity anomaly that extends into the upper-mantle transition zone. These results are evidence for the delamination of the mantle lithosphere and its causal relationship to the formation of the north-south trending rift in southeastern Tibet.
DTIC
Asia; Crusts; Europe; Frequencies; Seismic Waves; Surface Waves; Tomography

20090006047 California Univ., San Diego, La Jolla, CA USA
Estimating Local and Near-Regional Velocity and Attenuation Structure from Seismic Noise
Gerstoft, Peter; Zhang, Jian; Kuperman, William A; Harmon, Nick; Sabra, Karim G; Fehler, Michael C; Taylor, Steven R; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-07-C-0005; Proj-1010
Report No.(s): AD-A487650; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487650

This paper investigates the utility of computing Time-Domain Green's Functions (TDGF) to be used for estimating

velocity and attenuations structure for the purposes of nuclear explosion monitoring over local and near-regional distances. Our objective is to extend and apply the methodology of deriving TDGF for propagation between two receivers by cross correlation of seismic noise and/or coda of earthquakes observed at the receivers and concentrates on the following four tasks: (1) The specific noise spectrum of the ocean microseism needs to be accounted for and compensated for in order to be able to measure group velocities across a wider bandwidth. (2) We are investigating methods to obtain spatial variations in attenuation using ambient noise. (3) Mean-phase velocity-dispersion curves are calculated for the TUCAN seismic array in Costa Rica and Nicaragua from ambient seismic noise using two independent methods: noise cross correlation and beamforming. (4) From a data set recorded by a small-scale array (~4 km aperture).
DTIC
Attenuation; Estimating

20090006048 Science Applications International Corp., San Diego, CA USA
Refined Local and Regional Seismic Velocity and Attenuation Models from Finite-Frequency Waveforms
Zhang, Wei; Shen, Yang; Zhao, Li; Yang, Xiaoping; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-06-C-0014; Proj-1010
Report No.(s): AD-A487651; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487651

In seismic tomography, the reference or starting models are commonly one-dimensional (1D) and the structural sensitivity kernels of seismic data are calculated without considering the finiteness of seismic waves in both time and frequency domains. These simplifications result in a theoretical limit, in addition to that from the data coverage, on the structural resolution in tomography inversions. In small-scale (such as the crustal) structural imaging, however, a higher resolution is desired, and the ID reference model is no longer adequate; therefore, accurate modeling of wave propagation in three-dimensional (3D) reference models is necessary. To address this problem, elaborate numerical methods, such as the finite-difference and spectral-element methods, have been adopted to calculate the full-wave, finite-frequency, banana-doughnut, structural sensitivity kernels of seismic data. The objective of this work is to develop refitted local and regional velocity and attenuation models for selected areas of interest (AOIs) in Eurasia. We have carried out systematic tests to validate the finite-frequency sensitivity kernels computed by a staggered-grid, finite-difference method. These teats result in corrections in the calculation of the structural sensitivity kernels as well as an important finding that anomalies in S-wave speed have a significant contribution to P-wave travel time perturbations (Zhang and Shea, 2008). Thus, current seismic tomography practices, in which P-wave travel times ate assumed to be unrelated to S-wave velocity anomalies, may lead to systematic biases in inversion results. Furthermore, the different components of the same arrival at the same receiver have different travel time and amplitude sensitivities to variations in the velocity Structure.
DTIC
Attenuation; Frequencies; Refining; Waveforms

20090006049 Boston Univ., Boston, MA USA
Seismic Source Scaling and Discrimination in Diverse Tectonic Environments
Abercrombie, Rachel E; Mayeda, Kevin; Walter, William R; Viegas, Gisela M; Murphy, Katherine; Sep 30, 2008; 11 pp.; In English
Contract(s)/Grant(s): FA8718-06-C-0024; Proj-1010
Report No.(s): AD-A487652; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487652

The objectives of this study are to improve low-magnitude (concentrating on M2.5-5) regional seismic discrimination by performing a thorough investigation of earthquake source scaling using diverse, high-quality datasets from varied tectonic regions. Local-to-regional high-frequency discrimination requires an estimate of how earthquakes scale with size. Walter and Taylor (2002) developed the Magnitude and Distance Amplitude Corrections (MDAC) method to empirically account for these effects through regional calibration. The accuracy of these corrections has a direct impact on our ability to identify clandestine explosions in the broad regional areas characterized by low seismicity. Unfortunately our knowledge at small magnitudes is poorly resolved, and source scaling remains a subject of on-going debate in the earthquake seismology community. Recently there have been a number of empirical studies suggesting scaling of micro-earthquakes is non-self-similar, yet there are an equal number of compelling studies that would suggest otherwise. It is not clear whether different studies obtain different results because they analyse different earthquakes, or because they use different methods. Even in regions that are well studied, such as test sites or areas of high seismicity, we still rely on empirical scaling relations derived from studies taken from half-way around the world at inter-plate regions. We investigate earthquake sources and scaling from different tectonic

settings, comparing direct and coda wave analysis methods that both make use of empirical Green's function (EGF) earthquakes to remove path effects. Analysis of locally recorded, direct waves from events is intuitively the simplest way of obtaining accurate source parameters, as these waves have been least affected by travel through the earth.
DTIC
Pulse Rate; Scalers; Tectonics

20090006051 San Calixto Observatory, La Paz, Bolivia
Synthetic Seismogram Study of the Eastern Central Andes
Minaya, Estela; Lazaro, Evanz; Aliaga, Percy; Gonzalez, Magaly; Cano, Wilfredo; Sep 30, 2008; 9 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-07-C-0009; Proj-1010
Report No.(s): AD-A487586; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487586

Along the South American coast, there have been several earthquakes of great magnitude--between 7.5 and 9.5 Mw, with ruptures 50 km to 950 km long, producing maximum intensities between VII and X (MM)-particularly in two seismic gaps located in southern Peru and northern Chile. In these places, two large earthquakes occurred in the 19th century, in 1868 and in 1877, establishing the possibility of the seismic gap hypothesis: earthquake hazard increases with the time since the last large earthquake of long rupture length occurred, forming a seismic gap at whose ends will occur seismic activity of small magnitude and minor rupture length (Kelleher, 1972). In 1995, 2001, and 2007, earthquakes occurred within the limits of both gaps. They were felt and had light effects in cities in western Bolivia, especially in La Paz. Of major magnitude, they occurred within the limits of gaps located in the coupling zone of the Nazca and the South American plates. The above-mentioned earthquakes were here used to generate the characteristics of the 19th-century earthquakes. The effects of such an earthquake today would be catastrophic for the city of La Paz, situated in a basin with rugged topography, abrupt slopes, a geology of slightly compacted and highly eroded soils, and a complex hydrology of surface and underground rivers. Completing the picture are expanding, disorganized demographics. The city could be highly vulnerable to an earthquake with characteristics of the 19th-century events. The EGF method (Empirical Green Function, Irikura, 1986) was applied to an earthquake in Peru on 15/08/2007 and an aftershock on 16/08/2007, registered at the LPAZ station. Numerical analyses of the synthetic and principal seismograms (short period) show a correlation for frequencies lower than Hz and predominance between 0.05 and 2.5 Hz.
DTIC
Andes Mountains (South America); Earthquakes; Mountains; Seismograms; Seismographs; South America

20090006060 Boston Coll., Chestnut Hill, MA USA
Studies of the Origin and Evolution of Ionospheric Irregularities and Their Effects on AF Systems
Valladares, C E; Sheehan, R; MacKenzie, E; Jun 30, 2008; 124 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): F19628-02-C-0087; Proj-2301
Report No.(s): AD-A490717; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490717

We conducted a comprehensive investigation of the Earth's ionosphere under quiet and disturbed magnetic conditions. During magnetic storms, we determined that two plasma processes can produce mid-latitude irregularities. One was related to the auroral oval dynamics and produced short-scale structures. The other was SED-related and generated large-scale irregularities. We also studied the characteristics of the TIDs that were generated near the northern and southern ovals during a magnetic storm, and found a pronounced inter-hemispheric asymmetry. We discovered that airglow intensity of polar cap patches can vary due to the passage of gravity waves. A numerical simulation reproduced the variability of the airglow emissions within the patches. Other studies involved analyzing in detail the preconditioning of the low-latitude ionosphere before the onset of plasma bubbles, comparing the statistics of zonal drifts as observed by different UHF scintillation systems, and understanding the electro-dynamics of the low and middle latitude ionosphere during super storms. We directed two campaigns with the Sondrestrom radar in coordination with the Qaanaaq and Ny Alesund imagers. We operated an all-sky imager at Vize Island during two winters observing a type of auroral arcs that extend equatorward from the cusp. We also supported the AFRL-SCINDA program with technical logistic and management efforts.
DTIC
Ionospheres; Ionospheric Disturbances; Magnetic Storms; Responses

20090006065 Colorado Univ., Boulder, CO USA

Crustal Structure of the Iran Region from In-Country and Ground-Truth Data

Bergman, Eric A; Engdahl, Eric R; Ritzwoller, Michael H; Myers, Stephen C; Sep 30, 2008; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-08-C-0020; DE-AC52-07NA27344; Proj-1010

Report No.(s): AD-A487579; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487579

We are investigating the crustal and upper mantle structure of the Iran region using in-country data sets of seismic phase arrival times, supplemented by ground-truth data sets developed from our previous research efforts. Other data sets from global, regional, and national bulletins in the region are being integrated as well. The in-country data sets, covering approximately the last 10 years of seismicity in the region, are being carefully reviewed for quality control, selectively re-picked, and combined with ground truth and other data sets for careful relocation of all seismic sources with magnitudes of approximately 2.5 and larger. Using these relocated sources with well-characterized uncertainties and the associated phase readings for crustal and regional phases, we perform forward modeling and tomographic inversion, under the assumption of isotropic velocities, to study the velocity structure and variability of the crust and upper mantle in this region. The resulting models and datasets will provide a well-characterized baseline for more detailed studies in the future. We are continuing efforts to discover and develop new ground truth data sets in this region. We present some of the currently available data sets for this effort, along with preliminary tomographic inversion results based on them. We present a strategy for tomography based on ray-tracing in a region for which substantial variations in crustal thickness are expected, and using datasets that have different characteristics than those normally employed for this type of study. Through relative event relocation, clusters of events have very strong constraints on relative location, depth, and origin time. For each cluster, then, there will be only a single set of free parameters addressing uncertainty in location, depth, and origin time of the cluster's hypocentroid, rather than independent parameters for each event in the cluster.

DTIC

Crusts; Earth Crust; Earth Mantle; Ground Truth; Iran; Seismic Waves; Seismology

20090006066 Science Applications International Corp., San Diego, CA USA

Wave Propagation from Complex 3D Sources Using the Representation Theorem

Stevens, Jeffry L; Xu, Heming; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-08-C-0010; Proj-1010

Report No.(s): AD-A487585; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487585

In spite of extensive prior research on the generation of seismic waves by underground nuclear explosions, it is still not possible to provide a complete explanation for the observed wavefields, particularly at regional distances. Spherically symmetric explosion models embedded in layered elastic media effectively model the P phases generated by explosions and the major characteristics of some reflected and transmitted phases. Nonlinear axisymmetric finite difference calculations of explosions, including gravity and the effect of the free surface, can model a more realistic explosion source that directly generated shear waves. These models explain more characteristics of explosion-generated seismic waves, including some aspects of regional shear phases. However, it is clear that linear and nonlinear near-source 3D effects are important in many cases. SH waves are commonly observed within a few kilometers of explosions, too close to have been generated by (simple) conversion of vertical and radial components, and often larger than those components. Furthermore, it has not been established what impact 3D effects have on discriminants and on explosion yield estimates. It is important, therefore, to be able to model and understand how 3D source and source region heterogeneity affect the seismic wavefield and what impact this has on parameters used for nuclear monitoring. In this new project, we are implementing a technique that allows us to propagate the results of near-source 3D finite difference calculations to regional and teleseismic distances, and to use the results to investigate the impact of 3D near-source effects on regional and teleseismic phases, focusing in particular on the generation of SH phases by explosion sources. Our approach is to perform 3D explosion source region calculations, and then to propagate the wavefield to local, regional and teleseismic distances using layered earth Green's functions.

DTIC

Models; Nuclear Explosions; Theorems; Wave Propagation

20090006084 URS Group, Inc., Gaithersburg, MD USA

Analyses and Simulation of 3D Scattering Due to Heterogeneous Crustal Structure and Surface Topography on Regional Phases, Magnitude Discrimination

Pitarka, Arban; Helmberger, Don V; Ni, Sidao; Sep 30, 2008; 13 pp.; In English

Contract(s)/Grant(s): FA8718-07-C-0003; Proj-1010

Report No.(s): AD-A487729; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487729

The main purpose of this study is the understanding of scattering and its effects through step-by-step numerical experiments and waveform modeling, with the goal of providing useful insights into ongoing research for the development of simple empirical models of scattering that can be used in reducing the scatter in measures of Lg and coda wave magnitude and for discrimination purposes as well. We are performing anelastic 3D finite-difference simulations of wave propagation in highly heterogeneous media for a range of source depths, receiver distances and source types. In the first stage of our study we investigated the effect of small-scale crustal heterogeneities on wave propagation scattering. During the second stage we investigated the effect of surface topography combined with crustal heterogeneities on wave propagation scattering. In our simulations of regional wave propagation we used a finite difference computer program using our computer cluster. The seismograms were calculated at up to 3.5 Hz for regional distances of up to 300 km. The topography elevation was simulated using correlated random variations along the free surface. Our simulations show that the surface topography increases the wave-path scattering effects. The combined effects of crustal heterogeneities and surface topography produce Lg, P, and S coda waves with significant energy even for explosion sources. The energy of Lg coda waves depends on the source depth. P/Lg ratios estimated at different frequencies indicate that this ratio could be a good discriminant between explosions and earthquakes when calculated at high frequencies. The wave-path scattering effects were also investigated by simulating observed high frequency source directivity effects, as well as fault zone wave trapping in highly fractured conditions from aftershocks of the Big Bear earthquake sequence.

DTIC

Crusts; Heterogeneity; Nuclear Explosions; Scattering; Seismograms; Simulation; Topography; Wave Propagation

20090006087 Weston Geophysical Corp., Lexington, MA USA

Improved Phase Characterization of Far-Regional Body Wave Arrivals in Central Asia

Ferris, Aaron; Reiter, Delaine; Stroujkova, Anastasia; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-06-C-0002; Proj-1010

Report No.(s): AD-A487737; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487737

At far-regional and near-teleseismic distances the early body-wave coda contains information that is potentially useful to monitoring seismologists. However, waveforms from this distance range are typically under-utilized because of propagation complexities that cause significant difficulties in seismogram interpretation. For example, the first approx. 20 seconds of a far-regional seismogram often include multi-pathed arrivals caused by the interaction of the wavefield with upper mantle discontinuities at 220 km, 410 km and 660 km depth. Depth phases (e.g., pP. pP410. sP, sP410, etc.) also add complexity to the early part of the seismogram since they can constructively or destructively interfere with the primary phase arrivals. Array observations from earthquakes in central Asia regularly exhibit a variety of complex phase phenomena, such as back-azimuth anomalies, emergent or late-arriving first arrivals, large amplitude secondary arrivals, and interference phenomena between upper mantle arrivals and depth phases. We have developed array-based methods to improve the characterization of primary and early coda phase arrivals observed at far-regional and near-teleseismic distances. These techniques include improved signal processing to accurately measure the delay times (r's) and slownesses (p's) of primary and secondary phases from small-aperture arrays. We use these r-p measurements to develop representative crust and mantle velocity-depth profiles and suites of synthetic seismograms through those models. Then we use the processed array beams to derive ′wavefield templates'; i.e., grouped observations with similar phase characteristics. We analyze these wavefield templates by comparing them with synthetics, looking for quantitative explanations for the phase behaviors we observe. Our approach results in a methodology that improves phase characterization and yields earth models that more accurately predict the succession of expected arrivals.

DTIC

Asia; Seismic Waves; Seismology

20090006630 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Variations of Strahl Properties with Fast and Slow Solar Wind
Vinas, Adolfo F.; Goldstein, Melvyn L.; Gurgiolo, Chris; December 15, 2008; 1 pp.; In English; American Geophysical Union Meeting, 15-20 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The interplanetary solar wind electron velocity distribution function generally shows three different populations. Two of the components, the core and halo, have been the most intensively analyzed and modeled populations using different theoretical models. The third component, the strahl, is usually seen at higher energies, is confined in pitch-angle, is highly field-aligned and skew. This population has been more difficult to identify and to model in the solar wind. In this work we make use of the high angular, energy and time resolution and three-dimensional data of the Cluster/PEACE electron spectrometer to identify and analyze this component in the ambient solar wind during high and slow speed solar wind. The moment density and fluid velocity have been computed by a semi-numerical integration method. The variations of solar wind density and drift velocity with the general build solar wind speed could provide some insight into the source, origin, and evolution of the strahl.
Author
Mathematical Models; Solar Wind Velocity; Numerical Integration; Geophysics

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification.

20090005055 Massachusetts Inst. of Tech., Lexington, MA, USA
Evaluation of Potential NEXRAD Dual Polarization Products
Smalley, D. J.; Sep. 04, 2007; 30 pp.; In English
Contract(s)/Grant(s): FA8721-05-C-0002
Report No.(s): PB2007-111537; ATC-336; No Copyright; Avail.: National Technical Information Service (NTIS)

The NEXRAD program will begin fielding a dual polarization capability in 2009. Three additional base data parameters and two additional derived parameters from the dual polarization capability will be produced to complement the traditional three radar moments. The initial use of the added data is to provide a dual-polarization-based quantitative precipitation estimate (QPE) algorithm. Other NEXRAD algorithms will have access to the new dual polarization parameters as well as the derived products. The National Severe Storms Laboratory coordinated a dual polarization product evaluation to solicit NEXRAD agency participant feedback regarding potential dual polarization products. The evaluation consisted of analyzing dual polarization data from seven weather cases. MIT Lincoln Laboratory participated in the evaluation. The evaluation opportunity was used to have early access to prototypical dual polarization data to consider the potential benefit to FAA weather systems. This report introduces the new dual polarization parameters, presents some of the relevant weather cases, and provides recommendations regarding use of the dual polarization parameters.
NTIS
Meteorological Radar; Polarization; Weather

20090005071 NASA Marshall Space Flight Center, Huntsville, AL, USA
Spatial and Temporal Varying Thresholds for Cloud Detection in GOES Imagery
Jedlovec, Gary; Hanes, Stephanie L.; LaFontaine, Frank J.; [2008]; 41 pp.; In English; Original contains color and black and white illustrations; No Copyright; Avail.: Other Sources

A new cloud detection technique has been developed and applied to GOES-12 Imager data. The bispectral composite threshold (BCT) techniques uses only the 11 micrometer and 3.9 micrometer channels, and composite imagery generated from these channels, in a four-step cloud detection procedure to produce a binary cloud mask at single pixel resolution. An innovative aspect of this algorithm is the use of twenty day composites of the 11 micrometer and the 11 - 3.9 micrometer channel difference imagery to represent spatially and temporally varying clear-sky thresholds for the bispectral cloud tests. The BCT cloud detection technique has been validated against a 'truth' dataset generated by the manual determination of the sky conditions from available satellite imagery for four seasons during 2003-2004. The day and night algorithm has been shown to determine the correct sky conditions 87.6% of the time (on average) over the eastern two-thirds of the USA and surrounding oceans. The incorrectly determined conditions arose from missing clouds 8.9% of the time or from over-determining clouds 3.5% of the time. Nearly 82% of the misses came in the presence of low clouds. Only small variations in algorithm performance occurred between day-night, land-ocean, and between seasons. The algorithm performed best in the warmer

seasons (90.9% correct during the summer versus 81.8% correct in the winter season) and during the day, when the solar illumination provides enhanced surface-atmospheric-cloud contrast in the infrared channels and least well during the winter season. The algorithm was found to slightly under-determine clouds at night and during times of low sun angle and tends to be cloud-conservative during the day, particularly in the summertime.
Author
Clouds (Meteorology); Detection; GOES Satellites; Satellite Imagery

20090005083 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Climate Simulations of the Mid-Holocene as Produced by the CPTEC Atmospheric General Circulation Model in the South America
deMelo, Maria Luciene Dias; [2007]; 204 pp.; In Portuguese; Original contains color illustrations
Report No.(s): INPE-15206-TDI/1306; Copyright; Avail.: CASI: C01, CD-ROM; A10, Hardcopy

Climate variations and change are analyzed during the Mid-Holocene (MH) for South America (SA), using the atmospheric general circulation model (AGCM) from the Center for Weather Forecasts and Climate Studies (CPTEC) with a T062L28 resolution. Simulations were made by modifying the orbital parameters and CO2 concentration, using typical MH values used by other studies on MH simulations, and with sea surface temperature (SST) data from two different groups [AMIP climatologic (HMS1) and that generated by the ocean component of the coupled ocean-atmosphere from the Institute Pierre Simon Laplace-IPSL (HMS2)]. The results were compared with simulations made by previous MH climate simulations from the Paleoclimate Modeling Intercomparison Project (PMIP) I and II and paleoclimate indicators, to understand how much the CPTEC AGCM is able to simulate changes in the SA climate during the MH. A wetter behavior was detected over Northeastern SA during almost all year long, excepting from autumn where a northward displacement of the Intertropical Convergence Zone (ITCZ) is verified, associated with a weakening of the northeast trade winds and the moisture flow from Tropical Atlantic into the Amazon region. The Amazon region was found drier except in autumn and spring in the MH. The reduction of the precipitation has an important impact in the moisture transport from the Amazon basin to Parana-Plata basin, and consequently over the South Atlantic Convergence Zone (SACZ) formation, leading to a reduction of the precipitation in the SACZ current position. The SACZ is slightly weaker during HMS1 and its existence was not detected in the experiment with IPSL TSM (HMS2). In the temperature, a signal of cooling during all over the year in the MH was verified, over SA, except in the west of the Amazon region that suggests evidences for a weak warming. Moisture flow intensification in the 850 hPa level was verified over the continent east of the Andes and South of 20 S during the MH, as consequence of the intensification and proximity of the South Atlantic Subtropical High (SASH) to the continent. These patterns, during summer in the MH, are similar to those observed in autumn and winter in the current climate. Weakening of the moisture flow from the tropical Atlantic north of 20 deg S to the East of the Andes was also verified.
Author
Climate Change; South America; Atmospheric General Circulation Models; Climate Models; Holocene Epoch

20090005086 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
Determination of Marine Wind Fields in the Campos Basin from ENVISAT/ASAR Images
dosSantosClaro, Mircea; [2007]; 115 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15218-TDI/1312; Copyright; Avail.: CASI: C01, CD-ROM; A06, Hardcopy

The knowledge of ocean surface winds is very important for oceanographic and meteorological studies as well as for practical applications. Considering the great difficulty of installation, operation and maintenance of instrumentation for the in situ measurement of marine winds, it is of high interest the development of methodologies for obtaining this variable by remote sensors. Although the wind field can be derived by the scatterometers, the spatial resolution of such data (25 km) is not adequate for applications over the coastal ocean. High-resolution wind data (500-1500 m) can be extracted from SAR images. This is possible because radar backscatter signal, after calibration into sigma-naught values, can be related to wind speed. In this context, the objective of this study was to determine the potential of the ASAR sensor, flying onboard the ENVISAT satellite, to extract high spatial resolution (approximately 1 km) wind field (10 m above the sea surface). Wind speeds fields were determined using C-Band geophysical models and the wind direction data from the atmospheric model BRAMS and QuikSCAT scatterometer. Three geophysical models were used: CMOD4, CMOD5 and CMOD-IFR2. The final accuracy of this procedure was evaluated by comparing the ASAR winds speeds with wind speeds measurements from the QuickSCAT scatterometer and the BRAMS data. The results here presented show wind speeds with a mean correlation coefficient against QuikSCAT data of 0.75 and a RMS = 2 m/s when QuikSCAT wind directions were used as input to the model. The use of BRAMS wind directions yielded a mean RMS of 2.23 m/s and r=0.37 against BRAMS wind speed data.

More accurate results were found with CMOD4 and CMOD-IFR2 models.
Author
Marine Meteorology; Ocean Surface; Wind (Meteorology); Wind Measurement; Wind Direction; Wind Velocity; Remote Sensors; Synthetic Aperture Radar; Scientific Satellites

20090005093 National Hurricane Center, Miami, FL, USA
Tropical Cyclone Report. Hurricane Katrina, 23-30 August 2005
Knabb, R. D.; Rhome, J. R.; Brown, D. P.; Dec. 20, 2005; 42 pp.; In English
Report No.(s): PB2008-104489; No Copyright; Avail.: National Technical Information Service (NTIS)

Katrina was an extraordinarily powerful and deadly hurricane that carved a wide swath of catastrophic damage and inflicted large loss of life. It was the costliest and one of the five deadliest hurricanes to ever strike the USA. Katrina first caused fatalities and damage in southern Florida as a Category 1 hurricane on the Saffir-Simpson Hurricane Scale. After reaching Category 5 intensity over the central Gulf of Mexico, Katrina weakened to Category 3 before making landfall on the northern Gulf coast. Even so, the damage and loss of life inflicted by this massive hurricane in Louisiana and Mississippi were staggering, with significant effects extending into the Florida panhandle, Georgia, and Alabama. Considering the scope of its impacts, Katrina was one of the most devastating natural disasters in USA history.
NTIS
Cyclones; Hurricanes; Storms; Tropical Storms

20090005155 NASA Goddard Space Flight Center, Greenbelt, MD, USA; Maryland Univ., College Park, MD, USA
Statistical Evaluation of Combined Daily Gauge Observations and Rainfall Satellite Estimations over Continental South America
Vila, Daniel; deGoncalves, Luis Gustavo; Toll, David L.; Rozante, Jose Roberto; [2008]; 19 pp.; In English; Copyright; Avail.: CASI: A03, Hardcopy

This paper describes a comprehensive assessment of a new high-resolution, high-quality gauge-satellite based analysis of daily precipitation over continental South America during 2004. This methodology is based on a combination of additive and multiplicative bias correction schemes in order to get the lowest bias when compared with the observed values. Inter-comparisons and cross-validations tests have been carried out for the control algorithm (TMPA real-time algorithm) and different merging schemes: additive bias correction (ADD), ratio bias correction (RAT) and TMPA research version, for different months belonging to different seasons and for different network densities. All compared merging schemes produce better results than the control algorithm, but when finer temporal (daily) and spatial scale (regional networks) gauge datasets is included in the analysis, the improvement is remarkable. The Combined Scheme (CoSch) presents consistently the best performance among the five techniques. This is also true when a degraded daily gauge network is used instead of full dataset. This technique appears a suitable tool to produce real-time, high-resolution, high-quality gauge-satellite based analyses of daily precipitation over land in regional domains.
Author
Rain; Real Time Operation; South America; Tropical Meteorology; Precipitation Measurement

20090005238 NASA, Washington, DC, USA
CEOS Precipitation Constellation
Stocker, Erich F.; Neeck, Steve; Hou, Arthur; October 30, 2007; 16 pp.; In English; CRSS/ASPRS 2007 Specialty Conference, 30-31 Oct. 2007, Ottawa, Canada; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This viewgraph presentation discusses the implementation of the Committee on Earth Observation Satellites (CEOS) precipitation constellation. The contents include: 1) Why a constellation; 2) Who is working on it; 3) Where are we; 4) Where are we going; and 5) What is the approach.
CASI
Earth Observing System (EOS); Satellite Instruments; Meteorological Satellites; Precipitation Measurement

20090005249 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Effects of Doubled CO2 on Tropical Sea-Surface Temperature (SSTs) for Onset of Deep Convection and Maximum SST-GCM Simulations Based Inferences
Sud, Y. C.; Walker, G. K.; Zhou, Y. P.; Schmidt, Gavin A.; Lau, K. M.; Cahalan, R. F.; [2008]; 13 pp.; In English; No Copyright; Avail.: CASI: A03, Hardcopy

A primary concern of CO2-induced warming is the associated rise of tropical (10S-10N) seasurface temperatures (SSTs).

GISS Model-E was used to produce two sets of simulations-one with the present-day and one with doubled CO2 in the atmosphere. The intrinsic usefulness of model guidance in the tropics was confirmed when the model simulated realistic convective coupling between SSTs and atmospheric soundings and that the simulated-data correlations between SSTs and 300 hPa moiststatic energies were found to be similar to the observed. Model predicted SST limits: (i) one for the onset of deep convection and (ii) one for maximum SST, increased in the doubled C02 case. Changes in cloud heights, cloud frequencies, and cloud mass-fractions showed that convective-cloud changes increased the SSTs, while warmer mixed-layer of the doubled CO2 contained approximately 10% more water vapor; clearly that would be conducive to more intense storms and hurricanes. Author

Convection; Sea Surface Temperature; Tropical Regions; Carbon Dioxide; Equatorial Atmosphere; Meteorology

20090005960 NASA Goddard Space Flight Center, Greenbelt, MD, USA

The NASA NEESPI Data Portal to Support Studies of Climate and Environmental Changes in Non-Boreal Europe

Shen, Suhung; Leptoukh, Gregory; Loboda, Tatiana; Csiszar, Ivan; Romanov, Peter; Gerasimov, Irina; August 23, 2008; 12 pp.; In English; NATO Advance Workshop: 'Regional Aspects of Climate-Terrestrial-Hydrologic Interactions in Eastern Europe' (NEESPI Regional Non-boreal Europe Meeting), 23028 Aug. 2008, Odessa, Ukraine; Original contains color and black and white illustrations

Contract(s)/Grant(s): NNH05ZDA001N-ACCESS; Copyright; Avail.: CASI: A03, Hardcopy

NASA NEESPI (Northern Eurasia Earth Science Partnership Initiative) data portal is a NASA funded project that focuses on collecting satellite remote sensing data, providing tools, information, and services in support of NEESPI scientific objectives (Leptoukh, et al., 2007). The data can be accessed online through anonymous ftp, through an advanced data searching and ordering system Mirador that uses keywords to find data quickly in a Google-like interface, and through the Goddard Interactive Online Visualization ANd aNalysis Infrastructure (Giovanni). The portal provides preprocessed data from different satellite sensors and numerical models to the same spatial and temporal resolution and the same projection so that the data can be used easily to perform inter-comparison or relationship studies. In addition, it provides parameter and spatially subsetted data for regional studies. Studies of regional carbon, hydrology, aerosols in non-boreal Europe and their interactions with global climate are very challenging research topics. The NASA NEESPI data portal makes many satellite data available for such studies, including information on land cover types, fire, vegetation index, aerosols, land surface temperature, soil moisture, precipitation, snow/ice, and other parameters. This paper will introduce the features and products available in the system, focusing on the online data 1 tool, Giovanni NEESPI. An example that explores different data through Giovanni NEESPI in temperate region of non-boreal Europe will be presented.

Author

Climatology; Earth Sciences; Asia; Europe; Mathematical Models; Remote Sensing

20090005973 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Polar Rain Gradients and Field-Aligned Polar Cap Potentials

Fairfield, D. H.; Wing, S.; Newell, P. T.; Ruohoniemi, J. M.; Gosling, J. T.; Skoug, R. M.; December 14, 2008; 1 pp.; In English; 2008 Fall AGU Meeting, 14-19 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

ACE SWEPAM measurements of solar wind field-aligned electrons have been compared with simultaneous measurements of polar rain electrons precipitating over the polar cap and detected by DMSP spacecraft. Such comparisons allow investigation of cross-polarcap gradients in the intensity of otherwise-steady polar rain. The generally good agreement of the distribution functions, f, from the two data sources confirms that direct entry of solar electrons along open field lines is indeed the cause of polar rain. The agreement between the data sets is typically best on the side of the polar cap with most intense polar rain but the DMSP f's in less intense regions can be brought into agreement with ACE measurements by shifting all energies by a fixed amounts that range from tens to several hundred eV. In most cases these shifts are positive which implies that field-aligned potentials of these amounts exist on polar cap field lines which tend to retard the entry of electrons and produce the observed gradients. These retarding potentials undoubtedly appear in order to prevent the entry of low-energy electrons and maintain charge quasi-neutrality that would otherwise be violated since most tailward flowing magnetosheath ions are unable to follow polar rain electrons down to the polar cap. In more limited regions near the boundary of the polar cap there is sometimes evidence for field-aligned potentials of the opposite sign that accelerate polar rain electrons. A solar electron burst is also studied and it is concluded that electrons from such bursts can enter the magnetotail and precipitate in the same manner as polar rain.

Author

Polar Caps; Rain; Solar Wind; DMSP Satellites; Polar Meteorology; Field Aligned Currents

20090006006 Army Research Lab., White Sands Missile Range, NM USA

Adding Weather to Your Simulation

Shirkey, Richard; Dec 2007; 10 pp.; In English

Report No.(s): AD-A490405; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490405

Simulations and other computer intensive models frequently use limited weather scenarios - either rudimentary in capability or static and unvarying. The Battlefield Environment Division of ARL has been addressing this problem for many years. Capabilities exist in the Tri-Service Integrated Weather Effects Decision Aid (T-IWEDA) and the Target Acquisition Weapons Software (TAWS), in approximate radiative transfer models, such as the Sky-to-Ground Ratio (SGR) model, the illumination model LUME, and in the legacy models of the Electro-Optical Atmospheric Effects Library (EOSAEL). These models will be briefly reviewed and rapid-running methodologies for implementation will be presented. A complete set of references is also included.

DTIC

Atmospherics; Computerized Simulation; Simulation; Weather

20090006069 Army Research Lab., White Sands Missile Range, NM USA

Using the Advanced Research Version of the Weather Research and Forecasting Model (WRF-ARW) to Forecast Turbulence at Small Scales

Passner, Jeffrey E; Sep 2008; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A488024; ARL-TR-4575; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA488024

The U.S. Army Research Laboratory (ARL) has an interest in high spatial and temporal resolution weather output with an emphasis on products that assist warfighter decision aids and applications in battlefield environments. This model study was done in support of the short-range Army tactical analysis/nowcasting system called the Weather Running Estimate-Nowcast (WRE-N) as well as for longer-range forecasting support. The model utilized to investigate fine-scale weather processes, the Advanced Research version of the Weather Research and Forecasting model (WRF-ARW), was run with a triple nest of 18-, 6-, and 2-km grids over a 24-h period. One of the long-term intriguing model areas of study is clear-air turbulence due to the effects of turbulence on Army Aviation aircraft and onboard sensors. This study investigates the WRF-ARW output over northeastern New Jersey during the winter season of 2006-2007. Using a combination of the Panofsky Index (PI) in the boundary layer and the Turbulence Index (TI) above the boundary layer, a small sample of 75 pilots reports was compared to 'YES/NO' turbulence forecasts over the 24-h forecast period. Results were very encouraging using both the 18- and 2-km output, with a possibility of detection over 0.70, although the testing was biased to days with a high probability of turbulence.

DTIC

Clear Air Turbulence; Forecasting; Models; Turbulence

20090006108 Naval Postgraduate School, Monterey, CA USA

Operational Forecasting Capabilities Supporting Preparatory Sustainment Battle Command

Costa, Louis A; Schamburg, Jeffrey; Sanchez, Paul; Jackson, Leroy; Jun 2007; 25 pp.; In English; Original contains color illustrations

Report No.(s): AD-A488108; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Partial contents: Problem Statement, Defining Sustainment Battle Command, The Future Force, The Model, Nearly Orthogonal Latin Hypercube (NOLH), The Design of Experiments, Results, The Way Ahead.

DTIC

Forecasting; Sustaining; Commands; Hypercube Multiprocessors

20090006204 Miami Univ., Miami, 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; Cardone, Vincent J; Cox, Andrew T; Augustus, Ellsworth H; Colonnese, Christopher P; Jan 2003; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00014-02-1-0150

Report No.(s): AD-A491421; 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
Cyclones; Forecasting; Real Time Operation; Surges; Tropical Storms

20090006411 Woods Hole Oceanographic Inst., MA USA
WHOI Hawaii Ocean Timeseries Station (WHOTS): WHOTS-4 2007 Mooring Turnaround Cruise Report
Whelan, Sean P; Plueddemann, Al; Lukas, Roger; Lord, Jeffrey; Lethaby, Paul; Snyder, Jeffrey; Smith, Jason; Bahr, Frank; Galbraith, Nan; Sabine, Chris; Jan 2008; 119 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): NA17RJ1223
Report No.(s): AD-A492041; WHOI-2008-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Woods Hole Oceanographic Institution (WHOI) Hawaii Ocean Timeseries (HOT) Site (WHOTS), 100 km north of Oahu, Hawaii, is intended to provide long-term, high-quality air-sea fluxes as a part of the NOAA Climate Observation Program. The WHOTS mooring also serves as a coordinated part of the HOT program, contributing to the goals of observing heat, fresh water and chemical fluxes at a site representative of the oligotrophic North Pacific Ocean. The approach is to maintain a surface mooring outfitted for meteorological and oceanographic measurements at a site near 22.75 N, 158 W by successive mooring turnarounds. These observations will be used to investigate air sea interaction processes related to climate variability.
DTIC
Meteorological Parameters; Mooring; Oceans

20090006570 Nevada Univ., Las Vegas, NV USA
Yucca Mountain Climate Technical Support Representative (Task ORD-FY04-012)
Sharpe, S. E.; January 2006; 3 pp.; In English
Contract(s)/Grant(s): DE-FC28-04RW12232
Report No.(s): DE2007-920644; No Copyright; Avail.: Department of Energy Information Bridge

The primary objective of Project Activity ORD-FY04-012, Yucca Mountain Climate Technical Support Representative, was to provide the Office of Civilian Radioactive Waste Management (OCRWM) with expertise on past, present, and future climate scenarios and to support the technical elements of the Yucca Mountain Project (YMP) climate program. The Climate Technical Support Representative was to explain, defend, and interpret the YMP climate program to the various audiences during Site Recommendation and License Application. This technical support representative was to support DOE management in the preparation and review of documents, and to participate in comment response for the Final Environmental Impact Statement, the Site Recommendation Hearings, the NRC Sufficiency Comments, and other forums as designated by DOE management.
NTIS
Climate; Mountains; Radioactive Wastes; Waste Management

20090006605 Science Applications International Corp., Washington, DC, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA
An Enhanced Global Precipitation Measurement (GPM) Validation Network Prototype
Schwaller, Matthew R.; Morris, K. Robert; [2009]; 2 pp.; In English; European Geosciences Union General Assembly, 19 - 24 Apr. 2009, Vienna, Austria
Contract(s)/Grant(s): NNG06HX03C; Copyright; Avail.: CASI: A01, Hardcopy

A Validation Network (VN) prototype is currently underway that compares data from the Precipitation Radar (PR) instrument on NASA's Tropical Rainfall Measuring Mission (TRMM) satellite to similar measurements from the U.S. national network of operational weather radars. This prototype is being conducted as part of the ground validation activities of NASA's Global Precipitation Measurement (GPM) mission. GPM will carry a Dual-frequency Precipitation Radar instrument (DPR) with similar characteristics to the TRMM PR. The purpose of the VN is to identify and resolve significant discrepancies between the U.S. national network of ground radar (GR) observations and satellite observations. The ultimate goal of such comparisons is to understand and resolve the first order variability and bias of precipitation retrievals in different meteorological/hydrological regimes at large scales. This paper presents a description of, and results from, an improved

algorithm for volume matching and comparison of PR and ground radar observations.
Derived from text
Precipitation Measurement; Meteorological Radar; Data Retrieval; Prototypes; TRMM Satellite; Intercalibration; Algorithms

20090006627 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Temperature Trends in the Polar Mesosphere between 2002-2007 using TIMED/SABER Data
Goldberg, Richard A.; Kutepov, Alexander A.; Pesnell, William Dean; Latteck, Ralph; Russell, James M.; December 14, 2008; 2 pp.; In English; 2008 Fall AGU Meeting, 14-19 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The TIMED Satellite was launched on December 7, 2001 to study the dynamics and energy of the mesosphere and lower thermosphere. The TIMED/SABER instrument is a limb scanning infrared radiometer designed to measure a large number of minor constituents as well as the temperature of the region. In this study, we have concentrated on the polar mesosphere, to investigate the temperature characteristics as a function of spatial and temporal considerations. We used the recently revised SABER dataset (1.07) that contains improved temperature retrievals in the Earth polar summer regions. Weekly averages are used to make comparisons between the winter and summer, as well as to study the variability in different quadrants of each hemisphere. For each year studied, the duration of polar summer based on temperature measurements compares favorably with the PMSE (Polar Mesospheric Summer Echoes) season measured by radar at the ALOMAR Observatory in Norway (69 N). The PMSE period should also define the summer period suitable for the occurrence of polar mesospheric clouds. The unusual short and relatively warm polar summer in the northern hemisphere
Author
Mesosphere; Northern Hemisphere; Polar Regions

20090006628 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Relationship of Interplanetary Shock Micro and Macro Characteristics: A Wind Study
Szabo, Adam; Koval, A; December 11, 2008; 1 pp.; In English; WING SWG and 3008 Fall (AGU) Meeting, 11-21 Dec. 2008, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

The non-linear least squared MHD fitting technique of Szabo 11 9941 has been recently further refined to provide realistic confidence regions for interplanetary shock normal directions and speeds. Analyzing Wind observed interplanetary shocks from 1995 to 200 1, macro characteristics such as shock strength, Theta Bn and Mach numbers can be compared to the details of shock micro or kinetic structures. The now commonly available very high time resolution (1 1 or 22 vectors/sec) Wind magnetic field data allows the precise characterization of shock kinetic structures, such as the size of the foot, ramp, overshoot and the duration of damped oscillations on either side of the shock. Detailed comparison of the shock micro and macro characteristics will be given. This enables the elucidation of shock kinetic features, relevant for particle energization processes, for observations where high time resolution data is not available. Moreover, establishing a quantitative relationship between the shock micro and macro structures will improve the confidence level of shock fitting techniques during disturbed solar wind conditions.
Author
Nonlinearity; Magnetic Fields; Magnetohydrodynamics; Wind Velocity; Interplanetary Shock Waves; Rates (Per Time); Wind Direction

20090006635 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Reusing Information Management Services for Recommended Decadal Study Missions to Facilitate Aerosol and Cloud Studies
Oral/Visual Presentation
Kempler, Steve; Alcott, Gary; Lynnes, Chris; Leptoukh, Greg; Vollmer, Bruce; Berrick, Steve; December 15, 2008; 1 pp.; In English; American Geophysical Union Meeting, 15-19 Dec. 2008, San Francisco, CA, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006635

NASA Earth Sciences Division (ESD) has made great investments in the development and maintenance of data management systems and information technologies, to maximize the use of NASA generated Earth science data. With information management system infrastructure in place, mature and operational, very small delta costs are required to fully support data archival, processing, and data support services required by the recommended Decadal Study missions. This presentation describes the services and capabilities of the Goddard Space Flight Center (GSFC) Earth Sciences Data and

Information Services Center (GES DISC) and the reusability for these future missions. The GES DISC has developed a series of modular, reusable data management components currently in use. They include data archive and distribution (Simple, Scalable, Script-based, Science [S4] Product Archive aka S4PA), data processing (S4 Processor for Measurements aka S4PM), data search (Mirador), data browse, visualization, and analysis (Giovanni), and data mining services. Information management system components are based on atmospheric scientist inputs. Large development and maintenance cost savings can be realized through their reuse in future missions.
Author
Aerosols; Earth Sciences; Information Management; Clouds (Meteorology); Periodic Variations; Ecosystems

20090006638 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Accurate Satellite-Derived Estimates of Tropospheric Ozone Radiative Forcing
Joiner, Joanna; Schoeberl, Mark R.; Vasilkov, Alexander P.; Oreopoulos, Lazaros; Platnick, Steven; Livesey, Nathaniel J.; Levelt, Pieternel F.; December 05, 2008; 38 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NNG06HX18C; DE-FG02-07ER64354; Copyright; Avail.: CASI: A03, Hardcopy

Estimates of the radiative forcing due to anthropogenically-produced tropospheric O3 are derived primarily from models. Here, we use tropospheric ozone and cloud data from several instruments in the A-train constellation of satellites as well as information from the GEOS-5 Data Assimilation System to accurately estimate the instantaneous radiative forcing from tropospheric O3 for January and July 2005. We improve upon previous estimates of tropospheric ozone mixing ratios from a residual approach using the NASA Earth Observing System (EOS) Aura Ozone Monitoring Instrument (OMI) and Microwave Limb Sounder (MLS) by incorporating cloud pressure information from OMI. Since we cannot distinguish between natural and anthropogenic sources with the satellite data, our estimates reflect the total forcing due to tropospheric O3. We focus specifically on the magnitude and spatial structure of the cloud effect on both the shortand long-wave radiative forcing. The estimates presented here can be used to validate present day O3 radiative forcing produced by models.
Author
Ozone; Satellite Observation; Troposphere; Earth Observing System (EOS)

20090006640 NASA Goddard Space Flight Center, Greenbelt, MD, USA
The TRMM Multi-Satellite Precipitation Analysis (TMPA)
Huffman, George J.; Adler, Robert F.; Bolvin, David T.; Nelkin, Eric J.; December 2008; 19 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Tropical Rainfall Measuring Mission (TRMM) Multi-satellite Precipitation Analysis (TMPA) is intended to provide a 'best' estimate of quasi-global precipitation from the wide variety of modern satellite-borne precipitation-related sensors. Estimates are provided at relatively fine scales (0.25degx0.25deg, 3-hourly) in both real and post-real time to accommodate a wide range of researchers. However, the errors inherent in the finest scale estimates are large. The most successful use of the TMPA data is when the analysis takes advantage of the fine-scale data to create time/space averages appropriate to the user s application. We review the conceptual basis for the TMPA, summarize the processing sequence, and focus on two new activities. First, a recent upgrade to the real-time version incorporates several additional satellite data sources and employs monthly climatological adjustments to approximate the bias characteristics of the research quality post-real-time product. Second, an upgrade of the research quality post-real-time TMPA from Version 6 to Version 7 (in beta test at press time) is designed to provide a variety of improvements that increase the list of input data sets and correct several issues. Future enhancements for the TMPA will include improved error estimation, extension to higher latitudes, and a shift to a Lagrangian time interpolation scheme.
Author
TRMM Satellite; Rain; Precipitation (Meteorology); Estimates; Climatology; Error Analysis; Lagrangian Function; Real Time Operation

20090006641 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Applications of TRMM-based Multi-Satellite Precipitation Estimation for Global Runoff Simulation: Prototyping a Global Flood Monitoring System
Hong, Yang; Adler, Robert F.; Huffman, George J.; Pierce, Harold; November 26, 2008; 36 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

Advances in flood monitoring/forecasting have been constrained by the difficulty in estimating rainfall continuously over space (catchment-, national-, continental-, or even global-scale areas) and flood-relevant time scale. With the recent

availability of satellite rainfall estimates at fine time and space resolution, this paper describes a prototype research framework for global flood monitoring by combining real-time satellite observations with a database of global terrestrial characteristics through a hydrologically relevant modeling scheme. Four major components included in the framework are (1) real-time precipitation input from NASA TRMM-based Multi-satellite Precipitation Analysis (TMPA); (2) a central geospatial database to preprocess the land surface characteristics: water divides, slopes, soils, land use, flow directions, flow accumulation, drainage network etc.; (3) a modified distributed hydrological model to convert rainfall to runoff and route the flow through the stream network in order to predict the timing and severity of the flood wave, and (4) an open-access web interface to quickly disseminate flood alerts for potential decision-making. Retrospective simulations for 1998-2006 demonstrate that the Global Flood Monitor (GFM) system performs consistently at both station and catchment levels. The GFM website (experimental version) has been running at near real-time in an effort to offer a cost-effective solution to the ultimate challenge of building natural disaster early warning systems for the data-sparse regions of the world. The interactive GFM website shows close-up maps of the flood risks overlaid on topography/population or integrated with the Google-Earth visualization tool. One additional capability, which extends forecast lead-time by assimilating QPF into the GFM, also will be implemented in the future.
Author
TRMM Satellite; Hydrology Models; Floods; Forecasting; Early Warning Systems; Rain

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*.

20090004991 Wien Univ., Austria
Comparison of Transesophageal and Transthoracic Contrast Echocardiography for Detection of a Patent Foramen Ovale
Siostrzonek, Peter; Zangeneh, Massoud; Gossinger, Heinz; Lang, Wilfried; Rosenmayr, Georg; Heinz, Gottfried; Stumpflen, Andreas; Zeiler, Karl; Schwarz, Martin; Mosslacher, Herbert; The American Journal of Cardiology; November 1991; Vol. 68, Issue 11, pp. 1247-1249; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Presence of a patent foramen ovale may indicate paradoxic embolism in patients with otherwise unexplained embolic disease. Transthoracic contrast echocardiography has been used as a simple technique for detecting patent foramen ovale. However, particularly in patients with poor transthoracic image quality, presence of a patent foramen ovale might be missed. Transesophageal contrast echocardiography provides superior visualization of the atrial septum and therefore is believed to improve diagnostic accuracy. The present study investigates the influence of image quality on the detection of a patent foramen ovale by both transthoracic and transesophageal contrast echocardiography.
Author
Echocardiography; Embolisms; Diseases; Detection; Septum

20090004992 Krupp (Fried.) G.m.b.H., Essen, Germany
Transesophageal Echocardiography and Contrast-TCD in the Detection of a Patent Foramen Ovale: Experience with 111 Patients
Klotzsch, Christof; Janben, Gerhard; Berlit, Peter; Neurology; September 1994; Vol. 44, Issue 9, pp. 1603-1606; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Patent foramen ovale (PFO) is increasingly recognized in association with cryptogenic stroke. Using transesophageal echocardiography (TEE) and transcranial Doppler sonography with ultrasonic contrast medium contrast-(TCD), we evaluated the frequency of a PFO as the fundamental condition of paradoxical embolism in 111 patients after cerebral ischemia. There was a right-left shunt in 50 patients (45%) with TEE. In 31 of 40 patients with stroke of unknown etiology, a PFO was the only detectable finding associated with cerebral ischemia. Using TEE as he 'gold standard,' the sensitivity of contrast-TCD was 91.3%, specificity 93.8%, and the overall accuracy 92.8%. contrast-TCD failed to detect a right-left shunt in four patients, but there were four other patients with negative TEE and positive contrast-TCD. We conclude that contrast-TCD is a highly sensitive method for detecting a right-left shunt. Its advantages are low cost, its ability to detect single contrast-medium embolism, and control of the Valsalva maneuver by observing the decrease of cerebral blood flow. Evidence of PFO in

cryptogenic stroke should prompt a search for a subclinical venous thrombosis as the embolic source.
Author
Echocardiography; Embolisms; Etiology; Ischemia; Blood Flow; Brain Circulation; Cerebrum

20090005041 RAND Health, Santa Monica, CA USA
Learning from Experience: The Public Health Response to West Nile Virus, SARS, Monkeypox, and Hepatitis A Outbreaks in the USA
Stoto, Michael A; Dausey, David J; Davis, Lois M; Leuschner, Kristin; Lurie, Nicole; Myers, Sarah; Olmsted, Stuart; Ricci, Karen; Ridgely, M S; Sloss, Elizabeth M; Wasserman, Jeffrey; Jan 2005; 199 pp.; In English
Report No.(s): AD-A486745; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Over the past three years, the U.S. Department of Health and Human Services (HHS) has made significant investments in state and local public health in an effort to enhance public health emergency preparedness. The RAND Corporation was contracted to work with the HHS Office of the Assistant Secretary for Public Health Emergency Preparedness (OASPHEP) to develop resources and to prepare analyses to help describe and enhance key aspects of state and local public health emergency preparedness. As part of this contract, RAND was asked to study the response of state and local health departments to recent disease outbreaks -- specifically, Severe Acute Respiratory Syndrome (SARS), monkeypox, West Nile virus, and Hepatitis A -- to address the following questions: (1) How did the public health system in the USA respond to each of these disease outbreaks? What were the roles of federal, state, and local health departments, health care providers, community organizations, and other groups, and how did they interact? (2) In what ways did recent federal investment contribute to public health preparedness? (3) What lessons does the public health response to these outbreaks have for future preparedness, particularly to address the threat of bioterrorism? What improvements are needed to public health infrastructure in the USA and in functional capabilities to address a public health emergency? (4) Was the Centers for Disease Control (CDC) guidance helpful in building capacity for health departments to respond to the outbreaks studied? Are there areas in which guidance is still needed?
DTIC
Emergencies; Hepatitis; Monkeys; Public Health; United States; Viruses

20090005074 Mayo Clinic, Rochester, MN, USA
Patent Foramen Ovale in Patients with Cerebral Infarction: A Transesophageal Echocradigraphy Study
Petty, George W.; Khandheria, Bijoy K.; Chu, Chu-Pin; Sicks, JoRean D.; Whisnant, Jack P.; (ARCH NEUROL) - Archives of Neurology; July 1997; Voume 54, No. 7, pp. 819-822; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

Patent foramen ovale was detected in 37 patients (32%). Mean age was similar in those with (60 years) and those without (64 years) PFO. Patent foramen ovale was more frequent among men (39%) than women (20%, P=.03). Patients with PFO had a lower frequency of atrial fibrillation, diabetes me!litus, hypertension, and peripheral vascular disease compared with those without PFO. There was no difference in frequency of the following characteristics in patients with PFO compared with those without PFO: pulmonary embolus, chronic obstructive pulmonary disease, pulmonary hypertension, peripheral embolism, prior cerebral infarction, nosocomial cerebral infarction, Valsalva maneuver at the time of cerebral infarction, recent surgery, or hemorrhagic transformation of cerebral infarction. Patent foramen ovale was found in 22 (40%) of 55 patients with infarcts of uncertain cause and in 15 (25%) of 61 with infarcts of known cause (cardioembolic, 21%; large vessel atherostenosis, 25%; lacune, 40%) (P=.08). When the analysis was restricted to patients who underwent Valsalva maneuver, PFO with right to left or bidirectional shunt was found in 19 (50%) of 38 patients with infarcts of uncertain cause and in 6 (20%) of 30 with infarcts of known cause (P=.Ol). Conclusion: Although PFO was over-represented in patients with infarcts of uncertain cause in our and other studies, it has a high frequency among patients with cerebral infarction of all types. The relation between PFO and stroke requires further study.
Author
Cardiovascular System; Metabolic Diseases; Pulmonary Circulation; Aeroembolism; Cerebrum; Hemorrhages; Hypertension; Infarction; Echocardiography

20090005240 NASA Johnson Space Center, Houston, TX, USA
Reliability of Strength Testing using the Advanced Resistive Exercise Device and Free Weights
English, Kirk L.; Loehr, James A.; Laughlin, Mitzi A.; Lee, Stuart M. C.; Hagan, R. Donald; [2008]; 25 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

The Advanced Resistive Exercise Device (ARED) was developed for use on the International Space Station as a

countermeasure against muscle atrophy and decreased strength. This investigation examined the reliability of one-repetition maximum (1RM) strength testing using ARED and traditional free weight (FW) exercise. Methods: Six males (180.8 +/- 4.3 cm, 83.6 +/- 6.4 kg, 36 +/- 8 y, mean +/- SD) who had not engaged in resistive exercise for at least six months volunteered to participate in this project. Subjects completed four 1RM testing sessions each for FW and ARED (eight total sessions) using a balanced, randomized, crossover design. All testing using one device was completed before progressing to the other. During each session, 1RM was measured for the squat, heel raise, and deadlift exercises. Generalizability (G) and intraclass correlation coefficients (ICC) were calculated for each exercise on each device and were used to predict the number of sessions needed to obtain a reliable 1RM measurement (G . 0.90). Interclass reliability coefficients and Pearson's correlation coefficients (R) also were calculated for the highest 1RM value (1RM9sub peak)) obtained for each exercise on each device to quantify 1RM relationships between devices.
Author
Correlation Coefficients; Physical Exercise; Muscles; Performance Tests; Muscular Strength

20090005921 Air Force Research Lab., USA
Nurses' Role in the Joint Theater Trauma System
Fecura, Jr , Stephen E; Martin, Cathy M; Martin, Kathleen D; Bolenbaucher, Rose M; Cotner-Pouncy, Tracy; Dec 2008; 5 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490480; AFRL-SA-BR-JA-2008-0019; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490480
Nurses' role within the Joint Theater Trauma System's trauma performance improvement program spans the entire trauma continuum. Nurses serve as trauma nurse coordinators at combat zone medical treatment facilities, flight nurses within the US Air Force Aeromedical Evacuation system, multidisciplinary trauma teams at overseas and stateside military and Veterans Affairs healthcare organizations, and members on trauma video teleconferences. Many of the trauma performance improvement initiatives that have occurred since the Joint Theater Trauma System inception have been led by nurses serving within the trauma continuum and resulted in successful outcomes for patients with polytrauma.
DTIC
Injuries; Medical Personnel

20090005983 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Evaluation of Quantitative Anti-F1 IgG and Anti-V IgG ELISAs for use as an in Vitro-Based Potency Assay of Plague Vaccine in Mice
Little, S F; Webster, W M; Wilhelm, H; Powell, B; Enama, J; Adamovicz, J J; Apr 1, 2008; 10 pp.; In English
Report No.(s): AD-A488116; TR-07-094; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Quantitative anti-F1 and anti-V IgG enzyme-linked immunosorbent assays (ELISAs) were developed to measure the serological response of female Swiss Webster mice after vaccination with the recombinant fusion protein, rF1-V, which is being developed as a plague vaccine. Several fundamental parameters of the ELISA were evaluated: specificity, precision, accuracy, and stability. Experimental results suggested that a potency assay based upon the serological response of female Swiss Webster mice, as measured by quantitative anti-F1 IgG and anti-V IgG ELISAs, might be used to evaluate the rF1-V fusion protein vaccine.
DTIC
Assaying; In Vitro Methods and Tests; Mice; Vaccines

20090006004 Army Medical Research and Materiel Command, Fort Detrick, MD USA
Predicting an Individual's Physiologic State without a Crystal Ball
Reifman, Jaques; Apr 5, 2008; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490361; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490361
This talk illustrates two approaches by which biomathematical models can be developed to construct individualized, i.e. subject specific, physiologic predictive algorithms. We describe, in layman's terms, the pros and cons of first-principles physiology-based algorithms and data-driven, autoregressive algorithms. We also discuss how these algorithms may be customized to predict the physiologic state of specific individuals some time into the future. We illustrate the predictive power of these approaches in the prediction of: (i) performance impairment due to total sleep, (ii) body core temperature during

physical activity, and (iii) glucose levels of type 1 and type 2 diabetes patients. In conjunction with real-time physiologic monitoring devices, such predictive algorithms may be used to optimize the timing and dosing of fatigue countermeasures, e.g. naps and caffeine, so that performance peaks and is maintained during desired times of day, minimize the occurrence of heat-related injuries, such as heat strokes, and allow for proactive glucose regulatory interventions be for glycemic levels drift from the desired range. [TATRC website, 15 Dec 2008]
DTIC
Algorithms; Crystals; Mathematical Models; Physiology; Predictions

20090006005 Army Medical Research and Materiel Command, Fort Detrick, MD USA
Monitoring Trauma Patients in the Prehospital and Hospital Environments: The Need for Better Monitors and Advanced Automation
Salinas, Jose; Apr 5, 2008; 32 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490362; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490362

Current monitoring systems used for both civilian and military patients may not provide adequate measures for reliably determining the true injury status and severity of trauma injuries. Natural physiologic compensatory mechanisms for hemorrhage found in many patients will prevent normal vital signs from changing beyond normal parameters and therefore mislead the care providers using standard of care vital sign monitors. Current monitoring systems used both in the field and in the emergency department provide some set of vital signs that are used for patient assessment. Vital signs such as blood pressure, heart rate, SpO2 have been historically used during diagnosis and treatment of trauma injuries. However, these vital signs have been shown to provide little if any value for diagnosis when a patient is compensating for a hemorrhagic injury. However new advances in digital signal processing as well as better understanding of physiological responses to trauma insults has resulted in development of a new advanced vital signs that may provide earlier and more accurate diagnosis of injury severity in trauma patients. These include heart rate variability measures as well as nonlinear dynamic systems measures such as heart rate complexity. Using a combination of these new vital signs together with standard variables may provide more sensitive measures of injury status. Advanced vital signs can also serve as inputs into decision support algorithms and systems that provide better care in an open loop fashion. Once system reliability can be validated, than a closed loop approach will allow for full automation of patient care. [TATRC website, 16 Dec 2008]
DTIC
Hemorrhages; Hospitals; Injuries; Monitors; Patients

20090006052 Department of Veterans Affairs, Washington, DC USA
Gulf War Illness and the Health of Gulf War Veterans
Binns, James H; Barlow, Carrolee; Bloom, Floyd E; Clauw, Daniel J; Golomb, Beatrice A; Graves, Joel C; Hardie, Anthony; Knox, Marguerite L; Meggs, William J; Nettleman, Mary D; Nov 2008; 465 pp.; In English
Report No.(s): AD-A490518; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490518

Gulf War illness, the multisymptom condition resulting from service in the 1990-1991 Gulf War, is the most prominent health issue affecting Gulf War veterans, but not the only one. The Congressionally- mandated Research Advisory Committee on Gulf War Veterans' Illnesses has reviewed the extensive evidence now available, including important findings from scientific research and government investigations not considered by earlier panels, to determine what is known about the health consequences of military service in the Gulf War. This evidence identifies the foremost causes of Gulf War illness, describes biological characteristics of this condition, and provides direction for future research urgently needed to improve the health of Gulf War veterans. Gulf War illness is a serious condition that affects at least one fourth of the 697,000 U.S. veterans who served in the 1990-1991 Gulf War This complex of multiple concurrent symptoms typically includes persistent memory and concentration problems, chronic headaches, widespread pain, gastrointestinal problems, and other chronic abnormalities not explained by well-established diagnoses. No effective treatments have been identified for Gulf War illness and studies indicate that few veterans have recovered over time. Gulf War illness fundamentally differs from trauma and stress-related syndromes described after other wars Studies consistently indicate that Gulf War illness is not the result of combat or other stressors and that Gulf War veterans have lower rates of posttraumatic stress disorder than veterans of other wars. No similar widespread, unexplained symptomatic illness has been identified in veterans who have served in war zones since the Gulf War, including current Middle East deployments.
DTIC
Gulfs; Health; Persian Gulf; Sicknesses; Signs and Symptoms; Warfare

20090006112 Wake Forest Univ., Winston-Salem, NC USA

Novel Carbon Nitride Nanowire (CNW) Conjugates for Breast Cancer Treatment

Carroll, David; Sep 2007; 11 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0681

Report No.(s): AD-A491041; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491041

In this program we have tested the concept that carbon nitride nanowires (CNWs)-conjugated to Herceptin can selectively target and photo-thermally ablate HER2-positive breast cancer tissues using penetrating near infrared radiation (1.06 microns). Our initial results in cell culture suggest that CNWs are far superior transducers of radiation to the SWNTs or Ag nanoshells due to their metallic nature and aspect ratio. Initial animal studies have begun.

DTIC

Breast; Cancer; Carbon Nitrides; Conjugates; Mammary Glands; Nanowires; Nitrides

20090006120 University Clinical Education and Research Associates, Honolulu, HI USA

Transformative Learning: Patterns of Psychophysiologic Response and Technology-Enabled Learning and Intervention Systems

Jerome, Leigh W; Jordan, Patricia J; Rodericks, Rebekah; Sep 1, 2008; 47 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-2-0086

Report No.(s): AD-A491080; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491080

This research project examines arousal patterns associated with physiological craving and stress. It is hypothesized that biometric data (gathered from wearable sensors) can identify and predict the arousal patterns associated with tobacco use behavior, and that patterns of cue reactivity will allow the researchers to differentiate between psychological craving and physiological arousal in smokers. Four groups of participants (non-smokers, former smokers, current smokers, deprived smokers) participated in both naturalistic and experimental sessions, including the following: (a) a 3-day naturalistic baseline, (b) a standardized elicited stress activity, and (c) a cue exposure presentation consisting of 12 validated video clips to elicit various types of arousal. Participants rated their perceived craving and arousal levels following exposure to a set of film clips. Multivariate analyses and neural networking will be used to determine psychological and physiological differences among the groups.

DTIC

Arousal; Biometrics; Cues; Drugs; Physiological Responses; Physiology; Psychophysiology; Smoke; Tobacco; Virtual Reality

20090006121 Jackson (Henry M.) Foundation, Rockville, MD USA

Gynecologic Cancer Center for Racial Disparities

Maxwell, G L; Aug 1, 2008; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-2-0065

Report No.(s): AD-A491081; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491081

There are significant health-related disparities in outcome among women in the USA with different types of gynecologic cancer. This research hypothesizes that poor outcomes among minorities with gynecologic cancer exists because of biological differences in tumors related to race and ethnicity; cultural, social, and psychological barriers to accessing care; less than optimal screening services and prevention strategies; and unequal provision of quality health care and tailored therapeutics. In this study, an analysis of the genomic and proteomic expression of gynecologic cancers will be undertaken to determine if there are molecular differences that partially account for the poor outcome among minority patients with gynecologic cancer. This analysis will be expanded in future years to include larger underserved cohorts and comprehensive epidemiological data that will facilitate more detailed genetic and epigenetic analysis. Epidemiological surveys will be used to identify demographic and behavioral differences that lead to poor outcomes. The authors will do a preliminary evaluation of the use of psychosocial intervention on decreasing morbidity among minorities. They also will develop vaccine strategies and specific antibody reagents for the detection of unique targets that are differentially expressed by African Americans and Caucasians with endometrial cancer. The incidence, severity, and overall burden of cancer in the USA vary by race, ethnicity, and other demographic factors. This project will focus on identifying the reasons underlying poor outcome among minority groups with gynecologic malignancy so that education, screening, prevention, and treatment algorithms can be tailored to high-risk populations to reduce morbidity and mortality among the underserved.

DTIC

Cancer; Epidemiology; Females; Genome; Gynecology; Minorities

20090006122 Mayo Clinic, Rochester, MN USA

Changes in Ovarian Stromal Function and Associated Symptoms in Premenopausal Women Undergoing Chemotherapy for Breast Cancer

Frost, Marlene H; Loprinzi, Charles L; Kearns, Ann E; Sloan, Jeff A; Barton, Debra L; Aug 1, 2007; 8 pp.; In English

Contract(s)/Grant(s): DAMD17-03-1-0593

Report No.(s): AD-A491082; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491082

The objective of this pilot study is to identify whether androgen levels are adversely affected by adjuvant chemotherapy for breast cancer, and whether low androgen levels are correlated with the frequency and severity of fatigue, weight gain, psychological symptoms, vasomotor symptoms, and libido. A longitudinal, descriptive design will be used with questionnaires completed and blood drawn from 20 premenopausal women at four time periods: baseline (before treatment), mid-treatment, immediate post-treatment, and 6 months later. Questionnaires include the Female Sexual Function Index, Greene Climacteric Scale, Profile of Mood States, Schwartz Fatigue Scale, and a menses diary. Data analysis will involve descriptive statistics and plots of hormone levels over time as well as t-tests to examine changes in hormone levels. Correlational analysis will be done to look at the relationship of symptoms to hormone levels. The authors have currently enrolled 20 eligible women, 18 of whom have completed all study components. If a connection between low levels of androgens and symptoms is found, androgen replacement may be a viable treatment option for breast cancer survivors.

DTIC

Body Weight; Breast; Cancer; Cardiovascular System; Chemotherapy; Females; Hormones; Males; Mammary Glands; Signs and Symptoms

20090006125 Minnesota Univ., Minneapolis, MN USA

Histone Methylation and Epigenetic Silencing in Breast Cancer

Simon, Jeffrey A; Lange, Carol A; Jul 2008; 42 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0373

Report No.(s): AD-A491094; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491094

The purpose of this research is to investigate the role of a chromatin-modifying enzyme called EZH2 in breast cancer epigenetics and to develop strategies to identify chemical inhibitors of this, enzyme. EZH2 is a histone methyltransferase which modifies lysine-27 of histone H3 an epigenetic mark which is generally linked to gene silencing and is implicated in tumor suppressor silencing during breast cancer progression. Progress on this project includes: 1) Identification of target genes that are directly silenced by EZH2 in breast cancer cells and 2) Mapping of EZH2 binding sites within the chromatin of one such target gene. This mapping defines subregions of regulatory DNA likely to contain response elements that mediate EZH2 silencing. The delimitation and characterization of an EZH2 response element is required in the plan for engineering a breast cancer cell-based bioassay to screen for EZH2 inhibitors. These inhibitors provide important drug compounds to test as part of emerging epigenetic therapies to combat cancer.

DTIC

Breast; Cancer; Mammary Glands; Methylation

20090006126 Northern California Cancer Center, Union City, CA USA

Impact of Institutional - and Individual - Level Discrimination on Medical Care and Quality of Life Among Breast Cancer Survivors

Gomez, Scarlett L; Jul 2008; 19 pp.; In English

Contract(s)/Grant(s): W81XWH-07-1-0486

Report No.(s): AD-A491114; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491114

During the past first year of this study, the research team has made significant progress in obtaining approvals from multiple IRBs; designing, refining through feedback from Community Advisory members, and translating into 2 languages the study instruments for the first phase of the study (qualitative and focus group interviews); establishing the study fieldwork protocol; and beginning to successfully recruit breast cancer patients.

DTIC

Breast; Cancer; Mammary Glands

20090006127 Michigan State Univ., East Lansing, MI USA

A Role for MEK-Interacting Protein 1 (MP1) in Hormone Responsiveness of Estrogen Receptor-Positive Breast Cancer Cells

Conrad, Susan E; Jul 2008; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0500

Report No.(s): AD-A491116; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491116

The goals of this research are to test the hypothesis that the small scaffold protein MP1 is required for ER function and proliferation of ER- positive breast cancer cells and to characterize the ER/MP1 complex. MP1 expression was inhibited in several breast cancer cell lines by transfection with MP1-targeting siRNAs. The results obtained demonstrate that MP1 is required for the survival of ER-positive MCF-7 cells but not ER-negative MDA-MB-231 cells. This suggests that the requirement for MP1 may be specific to ER-positive cells in which case it could provide a novel target for treatment of this class of breast tumor. To facilitate studying the ER/MP1 complex a Flag-MP1 gene has been cloned and reconstituted into a retrovirus vector. Cells infected with this virus efficiently express the Flag-MP1 gene for at least 9 days and stable cell lines containing this construct are currently being selected for use in characterizing a novel ER/MP1 complex.

DTIC

Blood Cells; Breast; Cancer; Estrogens; Hormones; Mammary Glands; Proteins

20090006129 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA

Quantifying the Cumulative Impact of Differences in Care on Prostate Cancer Outcomes

Fesinmeyer, Megan D; Jul 2008; 8 pp.; In English

Contract(s)/Grant(s): W81XWH-06-1-0296

Report No.(s): AD-A491121; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491121

The purpose of this training award is to undertake research focused on evaluating whether racial differences in access to and intensity of medical care for prostate cancer are a fundamental cause of the disparity in prostate cancer outcomes. This work involves first developing a computer model that determines whether population trends in obesity affect race-based disparities in prostate cancer incidence and mortality. We used NHANES data on the rising prevalence of obesity from 1980-2002 together with SEER data on prostate cancer incidence to estimate the effect of obesity on prostate cancer incidence and mortality. Our key finding is that high-grade prostate cancer incidence in 2002 was 13% higher, and high-grade prostate cancer mortality was 6% higher than would have been expected had the prevalence of obesity remained unchanged from 1980-2002. The second phase of this project involves examining how care patterns are correlated throughout all phases of cancer care, and whether race-based differences in patterns of care contribute to observed disparities in prostate cancer incidence and mortality. Exploratory analyses have revealed that obesity and smoking are both associated with prostate cancer screening. Work to be performed in Year 3 will examine race-based differences in screening behavior.

DTIC

Cancer; Prostate Gland

20090006130 Stanford Univ., Stanford, CA USA

Molecular Imaging of Ovarian Carcinoma Angiogenesis

Chen, Xiaoyuan; Mar 2008; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-06-1-0042

Report No.(s): AD-A491123; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491123

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 av Beta 3, 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. 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 av 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 av Beta 3 affinity/specificity and labeled these peptides with F-18 for PET imaging of integrin expression in vivo (Aim 1). In year 2, we have also established several ovarian cancer models with differentiated integrin levels (Aim 2). One of the dimeric RGD peptide tracer 18F-FPRGD2 with high tumor targeting efficacy and favorable in vivo kinetics has been subjected to GLP toxicity study. Exploratory IND (eIND) application is currently

underway and first-in-human studies are being planned. Further test of the optimal radiotracer in different ovarian cancer models to correlate the tracer uptake with tumor integrin expression is currently underway as a non-cost of extension (Aim 2).
DTIC
Angiogenesis; Cancer; Imaging Techniques; Ovaries

20090006131 Virginia Univ., Charlottesville, VA USA
TGFBeta Induction of PMEPA1: Role in Bone Metastasis Due to Prostate Cancer
Fournier, Pierrick G; Jan 2008; 31 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0057
Report No.(s): AD-A491127; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491127

TGFB provided by the bone microenvironment is a key factor in the development of bone metastases. Previous experiments have demonstrated that interference with TGFB signaling in cancer cells decreases the development of bone metastases. TGF BETA stimulates prostate cancer cell signaling and alters their phenotype. TGFB signaling in cancer is however complex and can lead to the activation of numerous genes. We identified PMEPA1 as the most highly unregulated gene by TGF BETA in PC3 cells. Although PMEPA1 has already been shown to be unregulated in different cancers, nothing is known about its function in cells. We have shown that the absence of PMEPA1 in prostate cancer cells decreases TGFB signaling. This result is consistent with preliminary experiments showing that the cytosolic isoform of PMEPA1 which is the most highly expressed in PC3 increases TGFB signaling. Interestingly the other isoforms of PMEPA1 which are membrane bound have an opposite effect, decreasing TGF Beta signaling. These results suggest that depending on which isoform is the most abundant in cells, PMEPA1 can provide a positive or negative feedback loop for TGFB signaling. We are in the process of stably knocking down and over expressing PMEPA1 in PC3 cells to determine the effect of PMEPA1 on bone metastases development.
DTIC
Bones; Cancer; Metastasis; Prostate Gland

20090006133 McMaster Univ., Hamilton, Ontario Canada
Enhancing Involvement in Treatment Decision Making by Women with Breast Cancer
O'Brien, MaryAnn; Jul 2008; 30 pp.; In English
Report No.(s): AD-A491137; W81XWH-05-1-0329; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Women with breast cancer desire more information about their disease, in part, to be involved in making treatment decisions (TDs). Patient involvement responds to patients desires for autonomy and addresses ethical concerns about rights to make TDs. However, several researchers have reported that patients actual experiences in TDM did not match their preferences. The study objectives are to 1) understand the meaning of involvement in TDM from the perspectives of women with early stage breast cancer (ESBC); 2) identify stages/ steps of TDM used by women and their physicians during the treatment consultation(s); and 3) identify the behaviors of women and physicians that facilitate or impede womens involvement in TDM. Methods: A qualitative approach with interviews and video-stimulated recall was used. In Phase 1, interviews with 19 women with ESBC were held to understand the concept of involvement in TDM. In Phase 2, surgical (n=6) or medical oncology (MO) consultations (n=15) with new ESBC patients were videotaped. Subsequently, women and medical oncologists or surgeons separately viewed their consultation. Interviews were taped, transcribed, and analyzed. Findings: Phase 1: Most women wanted high quality information soon after diagnosis but many felt isolated and uninformed until the surgical or the MO visit. In Phase2, most women described an iterative TDM process where they made a preliminary treatment decision prior to the consultation, often based upon experiences of family or friends. Clinicians described many behaviours used to facilitate the patients involvement in TDM. While women reported some of these behaviours, they also reported fewer or different behaviours than clinicians. Significance: The information from this study will be useful to patients and physicians for promoting patient involvement. It can be used to develop and evaluate training programs for both physicians and patients to involve patients with cancer in decisions about their care.
DTIC
Breast; Cancer; Decision Making; Females; Mammary Glands

20090006135 Wisconsin Univ., Madison, WI USA

Characterization of a SUMO Ligase that is Essential for DNA Damage-Induced NF-Kappa B Activation

Mabb, Angela M; Miyamoto, Shigeki; Mar 2008; 39 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0295

Report No.(s): AD-A491140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491140

It has been recently proposed that inhibition of NF-?B may be a therapeutic target for the treatment of ER- breast cancers. As of now, the majority of NF-?B inhibitors focus on the key signal integrating complex known as the I-B kinase (IKK) complex. Since NF-?B plays a major role in many essential physiological processes in the cell, global inhibition of NF-?B at the central IKK complex could allow for increased risk of side effects as well as the desirable effects on cancer cell death. Hence, identification of specific, novel molecular targets in the NF-?B signaling pathway may lead to the identification of more specific NF-?B inhibitors. Our hypothesis is that PIASy, a SUMO ligase, is essential for DNA damage induced NF-?B activation, however is not critical for classical activation of NF-?B, leaving the more physiological pathway intact. We reveal that PIASy is signaling at the level of NEMO SUMOylation, a posttranslational modification that we recently identified being critical for DNA damage induced activation of NF-?B. Reduction of PIASy through siRNA caused inhibition of NF-?B in response to multiple DNA damaging agents commonly used in anti-cancer therapy. We provide strong evidence that PIASy is working at the level of NEMO SUMOylation and propose that PIASy is the SUMO ligase for NEMO. Furthermore, we show that the catalytic activity of PIASy is essential for NF-?B activation and hence suggest that inhibition of PIASy may be used as a more specific inhibitor in anti-cancer therapy to treat ER- breast cancer.

DTIC

Breast; Cancer; Damage; Deoxyribonucleic Acid; Enzymes; Mammary Glands

20090006136 Johns Hopkins Univ., Baltimore, MD USA

PSMA-Activated Imaging Agents for Prostate Cancer

Denmeade, Samuel R; Feb 2008; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0072

Report No.(s): AD-A491146; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491146

In preliminary studies, a potent TG analog (12ADT) was coupled to a series of pentapeptides composed of varying combinations of Asp and Glu to create PSMA-activated prodrugs. One of these prodrugs with the sequence 12ADT-Asp-Glu*Glu*Glu*Glu was efficiently hydrolyzed by PSMA and resulted in accumulation of high levels of the cleaved product in tumor tissue compared to normal tissue. The goal of this study is to take advantage of this selective accumulation of the TG analog to make a prostate cancer specific PSMA targeted imaging agent. Specific Aims: The specific aims of the study are: (1) To synthesize and characterize the cytotoxicity of a series of Iodide labeled Asp- or Glu-containing TG analogs. (2) To synthesize iodinated PSMA prodrugs and characterize PSMA-selective activation and cytotoxicity to PSMA-producing prostate cancer cells. (3) To determine the in vivo efficacy toxicity, pharmacokinetics and biodistribution of 125-I labeled PSMA-activated prodrugs in non-tumor bearing mice and mice bearing PSMA positive tumor human prostate cancer xenografts; (4) To evaluate added therapeutic efficacy produced by 131-I labeling of the PSMA-activated prodrug in vivo against PSMA producing xenografts. Progress: Over the past year we have developed a 14-step synthesis to generate precursor phenolic TG analog. We documented the analogs ability to bind to the SERCA pump target. We then developed methods to couple the analog to the carrier peptide and confirmed cleavage by PSMA. Finally we developed methods to synthesize and purify the iodinated PSMA-activated agent. This compound is now under evaluation in vivo in biodistribution and imaging studies.

DTIC

Cancer; Imaging Techniques; Prostate Gland

20090006138 William Beaumont Hospital, Royal Oak, MI USA

On-line Adaptive Radiation Treatment of Prostate Cancer

Zhang, Tiezhi; Jan 2008; 53 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0083

Report No.(s): AD-A491155; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491155

Organ motion is a major uncertainty in prostate cancer treatment. In this project, we are developing online adaptive treatment that can compensate organ motion in daily treatments. The specific aims of this project are to develop the key

technical components for online adaptive treatment, which include parallel deformable image registration algorithm, parallel dose calculation and plan optimization algorithms.
DTIC
Cancer; On-Line Systems; Prostate Gland

20090006140 Sloan-Kettering Inst. for Cancer Research, New York, NY USA
Modifiers of the Efficacy of Risk-Reducing Salpingo-Oophorectomy for the Prevention of Breast and Ovarian Cancer in Carriers of BRCA1 and BRCA2 Mutations
Kauff, Noah D; May 2008; 19 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0375
Report No.(s): AD-A491172; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491172

The principle investigator was funded via a Physician-Scientist Training Award to participate in a comprehensive training plan to foster the transition to independent clinical breast cancer researcher. This plan included: 1) conduct of a prospective study examining modifiers of the efficacy of risk-reducing salpingo-oophorectomy (RRSO) for the prevention of breast and ovarian cancer in carriers of BRCA mutations; and 2) participation in a structured training program in research methodology, biostatistics, molecular biology, and ethics. Progress from 5/1/2007 4/30/2008 includes: a) Publication of the first prospective data examining the efficacy of RRSO for the prevention of BRCA-associated breast and gynecologic cancer when BRCA2 mutation carriers are examined separately from BRCA1 mutation carriers.(Kauff ND, et al. J Clin Oncol 2008;26:1331-7); b) Continuation of training in genetic epidemiology, outcomes analysis, and conduct of clinical research, through formal mentoring and participation in the laboratory meetings of Kenneth Offit, MD, MPH; c) Submission as Co-PI of a grant application to the Breast Cancer Alliance to model the risk for 2nd primary breast cancer in individuals with BRCA-negative familial breast cancer; and d) Submission as Co-PI a SPORE project application to evaluate the role of BRCA dysfunction in primary and secondary prevention of epithelial ovarian cancer.
DTIC
Breast; Cancer; Genes; Mammary Glands; Mutations; Ovaries; Prevention; Risk

20090006147 Loyola Univ. Chicago, Maywood, IL USA
Prostate Cancer in Nigerians, Jamaicans and U.S. Blacks
Freeman, Vincent; Mar 1, 2004; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-00-1-0029
Report No.(s): AD-A491211; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491211

The purpose of this research was to develop the infrastructure for comparative studies of prostate cancer among blacks who reside in contrasting environmental settings: West Africa, the Caribbean, and the USA. This effort addresses six areas: case recruitment, case characterization, tissue collection and storage, integrated database development, targeted laboratory expertise, and pilot research. A one-year no-cost extension was granted to submit abstracts, manuscripts, and research proposals. Key Research Accomplishments: (1) established a research infrastructure to support unified measurement of exposure and prostate cancer disease in Chicago, Illinois, and Kingston, Jamaica; (2) completed molecular studies in over 40% of subjects enrolled; (3) created a computerized database linking demographic, clinical, and pathological characteristics of each case to archived tissue specimens and results of nutritional and genetic measurements; (4) completed statistical comparisons of the demographic, clinical, and pathological characteristics of cases from Chicago, Kingston, and West Africa; (5) completed statistical comparisons of the levels of antioxidants and fatty acids in serum and prostate tissue in cases diagnosed in Chicago and Jamaica; (6) performed association studies between variants of genes involved in androgen metabolism and prostate cancer stage within and across cases from Chicago, Jamaica, and West Africa; and (5) published two manuscripts and six abstracts.
DTIC
Cancer; Epidemiology; Ghana; Jamaica; Nigeria; Prostate Gland; United States

20090006148 California Univ., Berkeley, CA USA

Regulation of hTERT Expression and Function in Newly Immortalized p53(+) Human Mammary Epithelial Cell Lines

Stampfer, Martha R; Jun 2008; 76 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0580

Report No.(s): AD-A491221; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491221

Telomerase is reactivated in almost all human breast cancers; loss of telomeric protection can lead to genomic instability. This proposal is to study telomerase reactivation and telomere protection in newly immortal, p53+ human mammary epithelial cells (HMEC), and to determine if these cells may be especially sensitive to therapies that target telomerase activity and telomere protection. Prior work showed that p53 can suppress most, but not all, telomerase expression in newly immortal p53+ HMEC lines until telomeres become extremely short, when an unknown mechanism (termed conversion) relieves this repression. We hypothesized that the observed upregulation of cyclin-dependent kinase inhibitor p57 might protect cells with critically short telomeres by inhibiting growth until there is sufficient telomerase to protect the telomeric ends. Our research in the past year supports a role of p57 in arresting growth prior to a p53-mediated DNA damage response being evoked, as well as a novel role in telomere homeostasis. Inhibition of p57 produced a result similar to inhibition of telomerase accelerated, complete growth arrest without telomerase reactivation. Unlike telomerase inhibition, p57 inhibition led to a p53- mediated DNA damage arrest. Our data support a potential role for inhibition of p57 and/or telomerase in preferentially killing newly immortal p53+ HMEC.

DTIC

Breast; Cancer; Deoxyribonucleic Acid; Epithelium; Mammary Glands; Protection

20090006149 New Mexico Univ., Albuquerque, NM USA

Prognostic Significance of Telomere Attrition in Ductal Carcinoma in Situ of the Breast

Griffith, Jeffrey K; Feb 2008; 28 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0226

Report No.(s): AD-A491224; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491224

We are using an innovative, quantitative assay for telomere DNA content (TC) developed and characterized by the PI, to test the hypothesis that TC predicts the likelihood of disease recurrence in women with ductal carcinoma in situ (DCIS). In Year One, we collaborated to determine whether TC measured in bulk DCIS tumor tissue is comparable to that measured in tumor epithelial cells purified by laser-capture microscopy. In 7/10 instances, TC in microdissected specimens was 72-112% of that in the undissected control. In Years Two and Three, we confirmed and extended these results in our own laboratory. TC in microdissected samples was compared to TC in unfractionated samples; in 10/10 instances, TC in the microdissected sample was 75-124% of that in the undissected (i.e. bulk) control. These results confirm that it is not necessary to microdissect DCIS specimens prior to TC analysis. In Years One-Three, we measured TC in 75 normal breast, 126 DCIS and 657 breast tumor specimens. In Year Two, we used a Kaplan-Meier plot and log-rank test to show that low TC predicts a shorter survival interval. TC was not associated with ethnicity, menopausal status, or the expression of several other markers, including ER, PR, p53, Ki67, and Her2. In Year Three, we demonstrated an association between TC, the extent of allelic imbalance and tumor stage. We are continuing to work with the New Mexico Tumor Registry to identify additional specimens of DCIS from women with longer follow-up to confirm and extend these results. In summary, we have shown that (i) meaningful TC measurements can be obtained with bulk DCIS tissues, (ii) TC is associated with tumor stage and (iii) TC in DCIS is associated with breast cancer-free survival.

DTIC

Breast; Cancer; Mammary Glands; Telomeres

20090006150 Texas Univ., Houston, TX USA

Specific, Reversible Cytostatic Protection of Normal Cells Against Chemotherapeutics in Breast Cancer Therapy

Mull, Benjamin B; Mar 2008; 11 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0255

Report No.(s): AD-A491228; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491228

The adverse effects of cancer chemotherapy are widely recognized. Hair loss, gastrointestinal discomfort, lethargy and anorexia are quite common. The cause for these events is the nonspecific nature of current cancer treatment agents. Cytotoxic drugs, while effective at killing proliferating tumor cells, also target normal dividing cells. It is the purpose of this study to

develop a proven in vitro strategy to protect normal dividing tissues using a cytostatic agent, UCN-01. There reversible arrest of normally dividing tissues in mice will be examined for improved tolerance of chemotherapeutics. This protective effect will also be evaluated in mice bearing orthotopically implanted breast tumors.
DTIC
Breast; Cancer; Chemotherapy; Diseases; Gastrointestinal System; Mammary Glands; Protection; Therapy

20090006152 Pittsburgh Univ., Pittsburgh, PA USA
Inflammatory Markers and Breast Cancer Risk
Diergaarde, Brenda; Jul 2008; 9 pp.; In English
Contract(s)/Grant(s): W81XWH-06-1-0533
Report No.(s): AD-A491235; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491235

Mammographic breast density is one of the strongest risk factors identified for breast cancer, and a marker of cancer risk for both breasts. To gain further insight into the role of inflammatory cytokines in the etiology of breast density, this study investigates associations between serum cytokine levels, genetic variation in cytokine genes, and breast density. This report provides information on the progress made during the second year of the grant. It should be noted that only in January 2008 Dr. Diergaarde officially became the PI of this award and that no monies could be spent until this change in PI was official. This did affect our progress this year. A study specific database was created and we have started analyzing the serum cytokine data received from Dr. Tracy s laboratory. SNPs were selected for genotyping: candidate functional SNPs were identified from the literature and databases such as SeattleSNPs; tagSNPs were selected using data from HapMap and the HaploView/Tagger program. We are currently genotyping the MAMS samples using the iPLEX Gold assay (Sequenom).
DTIC
Breast; Cancer; Mammary Glands; Markers; Risk

20090006184 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (July-September 1998)
Peake, James B; Goodman, Robert L; Hillhouse, Roger H; Newsome, Steve; Reed, Lester H; Hume, Jr , Carroll R Dotson; oderick F; Gussenhoven, Elisabeth; Garland, Frederick N; Still, Ron; Campbell, Kyle D; Austerman, Wayne R; Sep 1998; 67 pp.; In English
Report No.(s): AD-A491291; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of the AMEDD Journal is dedicated to the fitness and readiness of our soldiers. The 'MAMC Improvement Award Program' describes the Madigan Army Medical Center's incentive program to reward organizational groups within a military hospital for improving efficiency, quality of care, resource management, and other key indicators. 'Madigan Research Day Proceedings' shows the diversity and depth of ongoing scholarly activity at just one of the Army's Medical Centers. 'Women′s Healthcare Initiative Research Center' -- Women's health is emerging as a separate specialized field within medicine. This article describes the consolidation of all Women's Health initiatives into one area at MAMC to allow the best resource-sharing potential, clinically and administratively. 'The EBC: Its Use in the Military Health System' -- The military's healthcare system strives to meet the challenge of maintaining readiness while providing high-quality peacetime healthcare. One of the ways the system is accomplishing this reengineering is through the use of enrollment based capitation (EBC). This article discusses EBC and how it can improve the financial efficiency and effectiveness of healthcare delivery. 'The Cardiovascular Specialist: Skills for the Future' highlights the training and utilization of one of the AMEDD's most highly skilled enlisted specialties. Cardiovascular specialists form an integral part of the cardiology team, evaluating and treating a wide range of diseases. 'A Comparison of MMPI Profiles: Combat Zone vs Stateside Cohorts' examines the psychological and personality profiles of soldiers in and out of battle. Information such as this can one day help prevent the scourge of combat stress. 'The Economic Efficiency Factor and its Use in Service Line Evaluation' provides an in-depth description of a resource and finance tool for quantitative evaluation of health services.
DTIC
Cardiology; Females; Financial Management; Hospitals; Medical Personnel; Medical Services; Military Operations; Military Personnel; Personality Tests

20090006185 Army Medical Dept. Center and School, Fort Sam Houston, TX USA

U.S. Army Medical Department Journal (October-December 1999)

Peake, James B; De Lorenzo, Robert A; Sammarco, Domenic A; Pincus, Simon H; Wymes, Michael R; Richardson, Thomas D; Bean, James R; Campbell, Kyle D; Thompson, III, Jack F; Meyer, Robert D; Holcomb, Barbara R; Austerman, Wayne R; Dec 1999; 53 pp.; In English

Report No.(s): AD-A491292; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of the AMEDD Journal is dedicated to the combat medic of the future, the 91W Healthcare Specialist. Several articles in this issue focus on the 91W or the missions they accomplish. '91W: Force XXI Combat Medic' provides a concise overview of the 91W initiative. Many of the issues that sparked and propelled the program are outlined in this article. Commanders, leaders, and especially, soldier medics will appreciate this timely information 'Providing Echelon II CHS to a Digitized Fourth Brigade' shows a glimpse into the future combat health support in Force XXI. Using the Prairie Warrior battle simulation exercise, the article explores some of the challenges of providing care on the battlefield. 'Preparing for a Disaster' highlights the potential threat of chemical and biological warfare agents. This article is a potent reminder of the need for continual vigilance and preparedness for these and other weapons of mass destruction. 'Case Studies in Aviation Medicine: Bosnian Deployment' describes the challenges of providing fight medicine in a deployed environment. The article uses a series of case studies to highlight strategies to meet the aviators' medical needs. 'The Letterman System for Casualty Treatment and Evacuation' reviews Dr. Jonathan Letterman's efforts to preserve life and ease suffering during the American Civil War. The effectiveness of the AMEDD's evacuation system is owed, in part, to Dr. Letterman's revolutionary ideas. 'Combat Stress Control Garrison Mission: A Model for the Future' describes the dual mission of peacetime and operational mental health and the challenge of achieving both. Several potential models to achieve the optima! approach are presented and discussed. 'Setting the (Dental) Record Straight' provides a step-by-step approach to achieving excellence in dental records. 'Treating Rampant Caries: Winning the Battles, Losing the War' highlights the importance of disease prevention and treatment with regard to dental caries.

DTIC

Aerospace Medicine; Combat; Dentistry; Emergencies; Medical Personnel; Medical Services; Military Operations; Military Personnel

20090006186 Army Medical Dept. Center and School, Fort Sam Houston, TX USA

U.S. Army Medical Department Journal (April-June 1999)

Peake, James B; Perkins, James; Vangeertruyden, Peter; Applewhite, Larry; Zierhoffer, Diane; Addison, William R; Deagle, III, Edwin A; Berigan, Timothy R; Goodman, Robert L; Frank, Kirk J; Breault, Lawrence C; Austerman, Wayne R; Jun 1999; 53 pp.; In English

Report No.(s): AD-A491293; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this issue of the AMEDD Journal are several articles that provide glimpses of some of the issues facing the AMEDD in the next century. 'Experiences of a Medical Company Commander in Bosnia' provides a first-hand account of the commander of an Area Support Medical Company in Operation Joint Guard. Peacekeeping and other military operations other than war will likely figure prominently in AMEDD's future. 'Electronic Monitoring of Temperature Sensitive Pharmaceuticals' describes the process used by the U.S. Army Materiel Center Europe to ensure the proper storage and shipping of important medicines. The article highlights the success in ensuring the integrity of the anthrax vaccine supply. Defense against anthrax and other Weapons of Mass Destruction (WMD) is an important factor in the Army After Next concept. 'Case Reports: Smokeless Tobacco Cessation Therapy and Naltrexone-Related Smoking Cessation' -- Two case reports outline pharmacotherapy and psychoeducational approaches that show promise in ending nicotine addition and reducing the myriad of negative health effects of smokeless tobacco. 'Tattoos: Attitudes and Beliefs among Enlisted Personnel' reports on a survey of attitudes towards tattoos. The results have relevance to leaders and medical providers counseling young people on the potential impact of getting a tattoo. 'The Smile Center: Innovation Increases Patient Access to Care' describes the successes of the Pacific Regional Dental Command in improving the dental readiness of soldiers through improvements in appointment scheduling. Access to care remains a top concern for the AMEDD. 'The Economic Efficiency Factor Applied to the U.S. Army DENCOM' describes the use of a specific matrix to analyze staffing ratios and clinic efficiency. 'The Army Medical Department Regiment...Helping Maintain a Tradition of Caring' focuses on the heritage, goals, and responsibilities of the AMEDD Regimental System.

DTIC

Dentistry; Drugs; Health; Infectious Diseases; Military Personnel; Nicotine; Sensitivity; Tobacco; Vaccines; Warfare

20090006188 Army Medical Dept. Center and School, Fort Sam Houston, TX USA

U.S. Army Medical Department Journal (May-June 1998)

Peake, James B; Grady, Eugene P; Kavanagh, Margaret F; Walsh, James T; Moon, Jeffrey P; De Lorenzo, Robert A; Falcon, Carlos; Dowdy, William C; Logan, III, William H; Berwick, James E; Austerman, Wayne R; Jun 1998; 43 pp.; In English
Report No.(s): AD-A491295; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of the AMEDD Journal examines a number of issues that relate to combat medic training. 'Beyond MPT: Medical Training for High Profile Units' describes a unique program to augment Medical Proficiency Training in line units. 'Rheumatic Findings in Gulf War Veterans' examines the incidence of specific medical complaints in service members who served in Operation Desert Storm. Since combat medics are often the first link in medical care and are frequently closest to the point-of-injury, their observations and documentation can be critical to piecing together future medical mysteries. 'Operation Assistance: A Medical Planning Perspective' describes the Canadian experience in providing humanitarian medical assistance. Many future Army missions may involve this type of operation, and all AMEDD personnel need to be trained and ready to meet these challenges. 'TRICARE Senior Prime: The DOD Medicare Subvention Demonstration' highlights the recently authorized collaboration between the DoD and the Healthcare Finance Administration to allow the financing of Medicare-eligible retirees treated in military hospitals. 'Inpatient Burn Unit Length of Stay and Analysis of Treatment Supply Costs' reports on a retrospective study of percent body surface area burned and patient demographics to length of stay and supply costs of severely burned patients. 'Dental Management of a Patient with Osteogenesis Imperfecta' is a case report on the dental management of molar extraction in a patient with the bone-forming disease osteogenesis imperfecta. Through a continual process of evaluation and improvement in training, the AMEDD's combat medics will continue to conserve the fighting strength.

DTIC

Combat; Education; Emergencies; Medical Personnel; Persian Gulf; Rheumatic Diseases; Warfare

20090006197 Vanderbilt Univ., Nashville, TN USA

Therapy Selection by Gene Profiling

Hayward, Simon W; May 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0047
Report No.(s): AD-A491350; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The long term goal of this work is to develop a new prognostic tool with which to determine the response of a patient to a given therapy, with the view of providing the most appropriate treatments tailored to individual patients. The central hypothesis of this proposal is that a subset of the genes expressed in a prostate tumor can be used to predict response to specific therapeutic regimens. The purpose of this work is to generate predictive methods which will allow patients to be selected for specific treatment protocols. This report summarizes the progress achieved towards the specific aims, the problems encountered, data sets generated and lessons learned from the work undertaken as a part of this grant.

DTIC

Cancer; Genes; Prostate Gland; Therapy

20090006205 Children's Hospital, Boston, MA USA

Exploring the Mechanisms of Pathogenesis in Prostate Cancer Involving TMPRSS2-ERG (Or ETV1) Gene Rearrangement

Orkin, Stuart H; Jan 2008; 8 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0052
Report No.(s): AD-A491425; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recently, gene rearrangements involving ETS family transcription factors have been identified in >50% of prostate cancer cases. To address roles of these ETS factors, especially ERG, the most frequently rearranged ETS gene in prostate cancer, as well as in normal prostate development, we planned to, 1. Generate conditional knockin mouse models of prostate cancer based on the newly identified TMPRSS2- ERG (or ETV1) gene arrangements; 2 Explore roles of Erg during development as well as in normal prostate by disrupting its expression in mouse; 3. Identify downstream target genes of ERG or ETV1 in human prostate cancer cell lines carrying these gene arrangements using the ChIP-on-Chip approach. During the first year of this award, we have made significant progress in establishing systems and reagents for all three aims mentioned above. Specifically, we have successfully created conditional knockin mice expressing truncated human ERG and ETV1 (as found in patients) from the endogenous mouse Tmprss2 locus. We have generated an Erg knockdown allele in mice, which would allow us to study its roles during both embryonic development and postnatal prostate development. We have also made biotinylated ERG and ETV1 in prostate cell lines, which would allow us to identify the downstream targets of these factors

in prostate epithelial cells. Further studies using these animal and cell culture models would allow us to develop preclinical animal models, and to identify and validate novel therapeutic targets, for treating prostate cancer.
DTIC
Cancer; Pathogenesis; Prostate Gland

20090006207 Washington Univ., Saint Louis, MO USA
Elucidating Mechanisms of Farnesyltransferase Inhibitor Action and Resistance in Breast Cancer by Bioluminescence Imaging
Piwnica-Worms, David; Blumer, Ken; Jun 2008; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-07-1-0426
Report No.(s): AD-A491469; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Farnesyltransferase inhibitors (FTIs) block the post-translational processing of signaling proteins, such as Ras, that have key roles in breast cancer biology. In phase II trials, FTIs have exhibited clinical benefit toward a subset of breast cancer patients. However, FTIs have yet to be used widely in breast cancer therapy because it is not yet possible to identify patients likely to be FTI-sensitive or to use combinatorial therapy to broaden the spectrum of patients that respond to FTIs. To overcome these hurdles, mechanisms determining whether breast cancer tumors are FTI-sensitive or -resistant in vivo must be understood. Accordingly, this recently funded project is developing molecular imaging strategies that for the first time specifically detect the ability of FTIs to inhibit farnesylation in tumors of living animals. Our initial proposed imaging strategy uses chimeric transcription factors fused to the prenylation domains H-Ras or Cdc42, which localize to the nucleus upon inhibition of prenylation. When unprenylated, the fusion chimeras bind their cognate promoter, driving expression of firefly luciferase, a reporter that can be readily imaged in cells and animals with an ultrasensitive, cooled CCD camera. This strategy should offer the opportunity to visualize over time the action of FTIs and GGTIs toward specific, biologically relevant prenylation-dependent proteins in tumors of living animals.
DTIC
Animals; Bioluminescence; Breast; Cancer; Imaging Techniques; Inhibitors; Mammary Glands

20090006214 Medicine and Dentistry Univ. of New Jersey, Newark, NJ USA
A Role for Ubiquitin Binding in Bcr-Abl Transformation
Whitehead, Ian P; Jun 2008; 6 pp.; In English
Contract(s)/Grant(s): W81XWH-07-1-0437
Report No.(s): AD-A488129; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have previously identified a docking site for ubiquitin in the amino-terminus of p210 BCR/ABL. Since ubiquitin binding has been implicated in both the intra- and inter-molecular regulation of many signaling molecules this association may have important clinical consequences for chronic myelogenous leukemia. During Year 1 of this study, we have precisely mapped the binding site for ubiquitin and generated a p210 BCR/ABL mutant that is completely impaired in binding in mammalian cells. Loss of ubiquitin binding does not destabilize p210 BCR/ABL thus allowing us to directly evaluate the mutant in assays for leukemogenic activity. This mutant will provide us with a unique opportunity to directly assess the importance of the ubiquitin-p210 BCR/ABL interaction in CML. These studies will be performed in Year 2 of this study.
DTIC
Leukemias; Transformations (Mathematics)

20090006215 Army Research Inst. of Environmental Medicine, Natick, MA USA
Hidalgo Equivital(TM) Physiological Monitor Product Review and Data Summary
Cuddy, John S; Ruby, Brent C; Santee, William R; Karis, Anthony J; Dec 2008; 27 pp.; In English
Contract(s)/Grant(s): W911QY-08-P-0700
Report No.(s): AD-A491504; USARIEM-TR-T09-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Hidalgo Equivital(TM) Physiological Monitor and other sensors performance monitoring of physiological status was evaluated, and human data were collected on 12 wildland firefighters (WLFF). The devices were provided to the University of Montana Center for Work Physiology and Exercise Metabolism (WPEM) to collect data relative to energy costs and thermal strain. The Hidalgo system collected, recorded and displayed heart rate (HR), respiratory rate (RR), body position, core temperature (CT), and skin temperature (ST). CT was obtained using the VitalSense monitor with ingestible temperature pills. Other sensors were an ActiCal activity monitor and a Garmin Forerunner 301 GPS. Relative to other devices used by WPEM, the sensors performed well. Setup and data download was trouble-free, making field use of Hidalgo units practical and

feasible. Data management performed well, but it was sometimes difficult to convert to other data formats. Some telemetry pills died or read too low. CT changes little despite fluctuations in RR and HR. Those data, collected from the Hidalgo system, appear reasonable for WLFF activities.
DTIC
Biotelemetry; Medical Services; Physiology

20090006216 Army Center for Health Promotion and Preventive Medicine (Provisional), Aberdeen Proving Ground, MD USA
Causes of Nonbattle Injury Fatalities Among U.S. Army Soldiers During Operation Enduring Freedom and Operation Iraqi Freedom, 2001-2006
Clemmons, Nakia S; Hauret, Keith G; Taylor, Bonnie J; Jones, Bruce H; Jul 28, 2008; 37 pp.; In English
Report No.(s): AD-A491508; 12-HF-056SC-08; No Copyright; Avail.: Defense Technical Information Center (DTIC)
As with previous military conflicts, nonbattle injuries (NBIs) are a major cause of mortality in Operations Enduring (OEF) and Iraqi Freedom (OIF). The purpose of this retrospective analysis was to 1) describe the incidence and rate of fatal NBls in OEF and OIF from their beginning through December 2006, 2) describe the causes and circumstances of fatal NBls, and 3) compare two Army data systems that report fatal NBI incidents. This analysis included all U.S. Army Soldiers who died from nonbattle injuries while deployed for OEF (October 2001 - December 2006) or OIF (March 2003 - December 2006). An NBI fatality case was defined as any Soldier (Regular Army, Army Reserve, or Army National Guard) who died due to a nonbattle injury sustained while in a deployed status for OEF or OIF, including while on midtour leave. This investigation included nonbattle injUry fatalities resulting from 1) unintentional injury incidents, 2) intentional incidents (e.g., homicides, suicides), and 3) physical training. NBls were responsible for 21 percent of all deaths in OEF and OIF. The leading causes of fatal injury were land transport vehicle accidents (41 percent), self-inflicted wounds (18 percent), and air transportrelated accidents (18 percent). Measures have been taken to improve the rate of NBI fatalities during these deployments. More prevention strategies must be researched, implemented, and continually taught to Soldiers in theater to reduce these potentially avoidable deaths.
DTIC
Health; Injuries; Medical Services; Military Personnel

20090006221 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (April-June 2003)
Porr, Darrel R; Grau, Lester W; Jorgensen, William A; Stokes, James W; Austerman, Wayne R; Gibson, David R; Rowe, John R; Jun 2003; 41 pp.; In English
Report No.(s): AD-A491545; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This issue of the AMEDD Journal contains a diversity of articles of interest to the AMEDD community. 'Medical Support of the Sinai Multinational Force and Observers: An Update, 2001' explains the medical support for the 11-nation coalition on the peacekeeping mission in the Sinai desert. 'Stress Casualty Forecasting' discusses the impact of physical and mental stress on the conduct of military operations and how to effectively plan for and prevent these types of casualties. 'Medical Implications of High Altitude Combat' cites specific examples to describe some common types of illnesses due to altitude exposure, as well as how to diagnose and treat these conditions. 'Improving Capital Investment Strategy' explores the options available for managing Defense Health Program dollars within the AMEDD to effectively plan for capital expenditures. 'Mustering Out the Medics: AMEDD Downsizing After World War II' details the difficulties encountered by the AMEDD when confronted with the demobilizing of the AMEDD portion of the 7 million soldiers remaining in service after the surrender of Germany and Japan.
DTIC
High Altitude; Medical Services; Military Operations

20090006223 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (January-March 2000)
Peake, James B; Goodman, Petra; De Lorenzo, Robert A; LaRavia, Dennis; Thomas, Timothy L; O'Hara, Charles P; Goodman, Robert L; Mar 2000; 65 pp.; In English
Report No.(s): AD-A491562; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This issue of the AMEDD Journal contains several articles of interest. 'Proceedings of the 1999 Madigan Research Day' identifies the award-winning research abstracts of this annual Madigan Army Medical Center event. 'Personality Traits and

Types of Army Nurse Corps Officers' explores the results of a standardized personality inventory administered to company grade Army Nurse Corps Officers. 'Making the Leap to 91W: A Transition Guide for Leaders' focuses on the strategies and procedures necessary for soldiers, their leaders, and commanders to make a successful transition from the current 91B/91C Military Occupational Specialties (MOSs) to the newly approved 91W Healthcare Specialist. 'A Case Review of Cerebral Edema: High Altitude Illness' presents a case of high altitude illness complicated by brain injury. 'Combat Stress in Chechnya: 'The Equal Opportunity Disorder'' uses the 1994-1996 Russian conflict in Chechnya as a springboard for a discussion on the devastating effects combat stress can have on unit effectiveness. 'The Evolution of Managed Care within the Military Health System' reviews the history of managed care in the military and the steps being taken to lead Tricare into the new century.
DTIC
Altitude Sickness; Medical Science; Medical Services; Military Operations; Personality Tests

20090006224 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (July-September 2001)
Kiley, Kevin C; Pearn, John; Sanders, Jimmy; Austerman, Wayne R; Kovats, Kenneth; Callahan, Charles W; Krivak, Thomas C; Sep 2001; 57 pp.; In English
Report No.(s): AD-A491566; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of the AMEDD Journal explores several different aspects of leadership found in the different corps. 'Nursing Readiness: Active Duty vs Army Reserve' details the application of a readiness assessment tool for new Army Nurse Corps officers attending the Officer Basic Course. Comparative results of Active Duty and Reserve Component nurses are outlined in the areas of clinical nursing competency, operational competency, and survival skills. 'The Role of the Administrative MSC Officer' is an overview of the crucial role that administrative MSC officers will play in the changing health care industry as it relates to military health care and the future of AMEDD. 'Obstetrical Ultrasound Training: Survey of Military Residents' Experience' presents a survey designed to assess the level of obstetrical ultrasound education in military residency training programs. 'Differential Diagnosis: The Challenge of Chronic Fatigue' is the text of a presentation given to the Medical Society of London by the Surgeon General of the Australian Defence Force. The article outlines the broad spectrum of possible diagnoses in defining chronic fatigue syndromes. 'The Roots of American Military Humanitarianism' traces the beginnings of U.S. Army medical humanitarian missions back to the Lewis and Clark expedition.
DTIC
Maintainability; Medical Personnel; Medical Services; Military Operations; Ultrasonics

20090006227 Nebraska Univ., Omaha, NE USA
Estrogen-Induced Depurination of DNA: A Novel Target for Breast Cancer Prevention
Cavalieri, Ercole L; May 2008; 94 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0229
Report No.(s): AD-A491583; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The research conducted in this COE grant is based on the paradigm that estrogens can become endogenous carcinogens when their metabolism is unbalanced, favoring formation of catechol estrogen quinones and their reaction with DNA. Compelling evidence obtained in the various specific aims of this COE will be decisive for determining the risk of breast cancer by using the depurinating estrogen-DNA adducts as biomarkers. These biomarkers will also be used for evaluating the ability of specific antioxidants to prevent breast cancer initiation. Much of the research accomplished by this COE was published in a review article in BBA-Reviews in Cancer, which was co-authored by all the participants of the COE.
DTIC
Breast; Cancer; Conjugates; Deoxyribonucleic Acid; Estrogens; Health; Mammary Glands; Metabolites; Prevention; Targets

20090006228 Kentucky Univ., Lexington, KY USA
REVEAL: Reconstruction, Enhancement, Visualization, and Ergonomic Assessment for Laparoscopy
Seales, W B; Aug 2008; 32 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-2-0015
Report No.(s): AD-A491585; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this work was to develop and test new technologies, breaking down the barriers that block more surgeons from attaining and continuing to practice (without injury or pain) high levels of skill in minimally invasive surgery (MIS). This project developed new technology by concentrating on three major research thrusts: Smart Image: the project developed and evaluated new approaches for extracting, fusing, and presenting information cues from imagery and other data sources;

Configurable Display: the project developed new approaches for presenting existing data (video, CT data) and extracted cues (3D reconstruction, haptic cues, etc.) to the user within a flexible, configurable display environment; Ergonomic Assessment: the project used existing technology and built new techniques as needed to acquire crucial ergonomic data relative to key factors of patient position, technology configuration, and instrument design.
DTIC
Augmentation; Injuries; Surgery

20090006229 California State Univ., Los Angeles, CA USA
Identification of a Protein for Prostate-Specific Infection
Pang, Shen; Dec 2007; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0084
Report No.(s): AD-A491595; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this proposal, we will identify and clone a protein that can be used to generate infection-specific gene therapy vector. We expect that using this protein to modify various gene therapy vectors, we can specifically deliver cytotoxic genes into prostate cancer cells using systemic treatment, and eventually eradicate metastatic prostate cancer cells in patients. In summary, although we worked very hard to perform the studies we proposed, we failed to achieve the expected results. In our application, we actually know the risk of this project. However, if we could identify the protein that is responsible for tissue-specific gene delivery, we should be able to develop a prostate-specific. By comparing the risk and the potential achievement, you proposed this project. Now the results demonstrated that the project is more difficult than we expected. Although we did not achieve the expected results, our effort produced publishable results as shown by one published paper and one submitted manuscript.
DTIC
Cancer; Infectious Diseases; Metastasis; Prostate Gland; Proteins

20090006230 Rochester Univ., NY USA
Enhanced Ultrasound Visualization of Bracytherapy Seeds by a Novel Magnetically Induced Motion Imaging Method
McAleavey, Stephen; Apr 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0034
Report No.(s): AD-A491601; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We report our progress in developing Magnetically Induced Motion Imaging (MIMI) for unambiguous identification and localization brachytherapy seeds in ultrasound images. Coupled finite element and ultrasound imaging simulations have been performed to demonstrate that seeds are detectable with MIMI regardless of orientation to the imaging transducer and even when the seed itself is invisible in B-scans. in-vitro scans of a seed parallel and perpendicular to the transducer corroborate the simulation results.
DTIC
Images; Imaging Techniques; Magnetic Effects; Seeds; Ultrasonics

20090006232 Mount Sinai School of Medicine, New York, NY USA
ATM Heterozygosity and the Development of Radiation-Induced Erectile Dysfunction and Urinary Morbidity Following Radiotherapy for Prostate Cancer
Cesaretti, Jamie A; Feb 2008; 27 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0172
Report No.(s): AD-A491605; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The goal of this training grant project is to determine whether the prevalence of ATM carriers among prostate cancer patients treated with radiotherapy that develop erectile dysfunction and urinary morbidity is greater than the prevalence of ATM heterozygosity among patients that do not develop this complication. Regardless of the scientific outcome of the proposal the PI will be left with a vast experience in translational research from which to form new hypotheses and research strategies as he begins his career as an independent physician scientist. To assure a well-rounded experience, the school of medicine will insure that the PI will participate for the first two years of the funded period in Mount Sinai's rigorous clinical research training program. The NIH sponsored program will give the PI formal instruction in Clinical Research and Policy Evaluation, Epidemiology and Biostatistics, Basic Science for the Clinical Investigator, Cultural, Illness, and Community Health Outcomes, Behavioral Medicine, and Ethical Issues in Clinical Research. Also the PI, while at Mount Sinai, will make

significant progress in establishing collaborative relationships with well-established prostate cancer researchers and will continue this approach in order to expand the scope of the outlined proposal throughout the funding period of this grant.
DTIC
Cancer; Prostate Gland; Radiation Therapy; Urology

20090006233 New York Univ., New York, NY USA
BTG2 Antiproliferative Gene and Prostate Cancer
Walden, Paul D; Jan 2008; 16 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0216
Report No.(s): AD-A491607; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Based on our preliminary findings, the working hypothesis tested in this study was that the tumor suppressive activity of the BTG2 protein is diminished as an early event in prostate carcinogenesis due to increased proteasomal degradation, leading to compromised cell cycle regulation and increased cell invasion. During this study we showed that BTG2 protein expression is lost as an early event in prostate carcinogenesis and that prostate cancer cells degrade BTG2 at a greater rate than noncancerous prostate cells. Steady state levels of BTG2 during the cell cycle appear to regulated by changes in ubiquitination (consistent with proteasomal degradation) and not by changes in the level of the deubiquitinating enzyme USP4. BTG2 has a predominantly nuclear localization consistent with its antiproliferative function, but at 4 hours following growth stimulation of quiescent cells, BTG2 is transiently sequestered in the nucleolus coinciding with transiently reduced rates of degradation (BTG2 is synthesized at similar rates during the cell cycle). Forced expression in PC-3 prostate cancer cells (which do not normally express detectable levels of BTG2) results in increased cell attachment to gelatin, fibronectin and type I collagen substrates. Forced expression in PC-3 prostate cancer cells reduces cell invasion through an extracellular matrix.
DTIC
Cancer; Deoxyribonucleic Acid; Epithelium; Genes; Prostate Gland

20090006234 Michigan Univ., Ann Arbor, MI USA
The Role of ADAM-15 Disintegrin in E-cadherin Proteolysis in Prostate Cancer Metastasis
Day, Mark L; Feb 2008; 7 pp.; In English
Contract(s)/Grant(s): W81XWH-04-1-0244
Report No.(s): AD-A491608; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The primary goal of this proposal was to demonstrate that the membrane disintegrin, ADAM-15, could E-cadherin in prostate cancer cells, and that in this regard ADAM-15 would promote the metastatic growth of prostate cancer. The successful completion of this study has led to the confirmation of the functional role of ADAM15 in the cleavage of E-cadherin and metastatic growth of prostate cancer cells. These results justify continuing studies examining the metalloproteinase domain of ADAM15 as a direct therapeutic target for metastatic prostate cancer.
DTIC
Cancer; Metastasis; Prostate Gland; Proteins

20090006235 Michigan Univ., Ann Arbor, MI USA
Significance of Pathways Leading to RhoC Overexpression in Breast Cancer
Alford, Sharon H; Merajver, Sofia; Gruber, Stephen; Apr 2008; 20 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0395
Report No.(s): AD-A491617; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Tumor biology is a recognized determinant of tumor behavior, including growth rate, motility and metastatic potential, and therapeutic resistance. This project was funded to investigate the regulation and expression of an excellent marker for aggressive breast tumors: RhoC-GTPase. When overactive, RhoC transforms mammary epithelial cells into a highly motile and invasive phenotype. We hypothesize that RhoC overexpression may be regulated by the transcription factor NF-kappa B and that at the same time RhoC is overexpressed the tumor also acquires therapy resistance. The objective of this study is to utilize existing breast cancer cohorts with tumor tissue and treatment response data available to assess the correlation between NF-kappa B and RhoC, individually and in combination, to treatment response. The specific aims of the project are to determine 1) if RhoC and NF-kappa B are correlated; 2) if RhoC and NF-kappa B are associated, individually and in combination, with aggressive breast cancer; and 3) if NF-kappa B and RhoC are associated with therapy resistance.
DTIC
Breast; Cancer; Epidemiology; Mammary Glands

20090006236 Texas Univ., Arlington, TX USA
Non-Invasive Monitoring for Optimization of Therapeutic Drug Delivery by Biodegradable Fiber to Prostate Tumor
Popa, Dan; Feb 2008; 72 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0229
Report No.(s): AD-A491620; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Chemotherapeutic drugs delivered by systematic administration exhibit great toxicity; patients have to endure suffering from frequent injection or low dose IV treatment. Thus controlled release and of these drugs and real-time monitoring of the effects of the drug can be an better treatment modality. The Hypotheses are (1): A near-infrared (NIR) imager can non-invasively monitor the vascular oxygenation and blood volumes in prostate tumors. (2): The dynamic response of prostate tumor oxygenation to the chronic drug delivery can serve as indicator for treatment prognosis. (3): The control of drug delivery rate will have a significant impact on the treatment prognosis. The specific aims of the of the project are: (1): To design and implement a NIR spectroscopic imaging system. (2): To develop imaging of drug concentration and tumor oxygenation. (3): To control the delivery of drug using a novel implantable micropump (IDDS).(4): To study the relationship between drug release rate, tumor oxygen levels and therapeutic outcome. (5): To create appropriate cancer tumor animal models, that will guide the growth of cancer tumor in Copenhagen rats.
DTIC
Biodegradability; Biodegradation; Cancer; Chemotherapy; Drugs; Prostate Gland; Therapy; Tumors

20090006238 Jackson (Henry M.) Foundation, Rockville, MD USA
Molecular Biology and Prevention of Endometrial Cancer. Addendum
Maxwell, George L; Jul 2008; 7 pp.; In English
Contract(s)/Grant(s): DAMD17-02-1-0183
Report No.(s): AD-A491629; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Objective: To increase our understanding of the molecular aberrations associated with endometrial carcinogenesis and the biologic mechanisms underlying the protective effect of oral contraceptive (OC) therapy. Methods: 1) Oligonucleotide microarray analysis was performed on a panel of endometrial cancers. 2) A subset of adenocarcinoma cases from the International DES Registry (IDESR) was analyzed for MSI 3) A case-control study of the CASH database was performed to evaluate the relationship between progestin potency and endometrial cancer risk. 4) An analysis of endometrium samples from cymologous macaques that were exposed to long term progestins was performed. 5) A clinical trial comparing progestin versus placebo is underway that will facilitate investigation of the effects of progestin exposure on the endometrial lining. Results: 1) Different histological types of endometrial cancer have unique genomic expression patterns. 2) The poor quality DNA from the majority of IDESR samples prohibited an adequate analysis of the case set. 3) A case-control study has suggested higher progestin-potency OCs may be more protective than lower progestin potency OCs among women with a larger body habitus. 4) Macaque studies have suggested that induction of apoptosis may be a mechanism underlying the chemoprotective effects of progestin on the endometrium. 5) Regulatory hurdles have resulted in delays in initiation of the clinical trial which is now currently underway.
DTIC
Cancer; Molecular Biology; Prevention; Tumors

20090006268 Library of Congress, Washington, DC USA
Trends in U.S. Global AIDS Spending: FY2000-FY2008
Salaam-Blyther, Tiaji; Jul 16, 2008; 37 pp.; In English
Report No.(s): AD-A491666; CRS-RL33771; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491666

It is estimated that HIV/AIDS, TB, and malaria together kill more than 6 million people each year. According to the Joint United Nations Program on HIV/AIDS (UNAIDS), at the end of 2007, an estimated 33.2 million people were living with HIV/AIDS, of whom 2.5 million were newly infected, and 2.1 million died in the course of that year. More than 2 million of those living with HIV/AIDS at the end of 2007 were children, and some 290,000 of those who died of AIDS that year were under 15 years old. On each day of 2007, some 1,000 children worldwide became newly infected with HIV, due in large part to little access to drugs that prevent the transmission of HIV from mother to child. An estimated 9% of pregnant women in low- and middle-income countries were offered services to prevent HIV transmission to their newborns. UNAIDS asserts that an effective fight against the global spread of HIV/AIDS would cost $15 billion in 2006, $18 billion in 2007, and $22 billion in 2008. In FY2006, Congress provided about $3.1 billion for international HIV/AIDS programs and U.S. contributions to the Global Fund to Fight HIV/AIDS, TB, and Malaria, $4.3 billion in FY2007, and $5.7 billion in FY2008. Most recent statistics

indicate that in 2005, some $8.3 billion was spent on HIV/AIDS globally, though UNAIDS estimated that $11.6 billion was needed. About $4.3 billion of those funds were provided by donor governments. The Kaiser Family Foundation asserts that in 2005, the USA provided the largest percentage of HIV/AIDS assistance in the world, comprising some 49% of all donor spending. Although the USA is the leading provider of international HIV/AIDS assistance, some argue that it needs to give more, particularly to the Global Fund. Critics of increased AIDS spending, however, question whether the most affected region sub-Saharan Africa can absorb increased revenue flows.
DTIC
Cost Estimates; Medical Services; Parasitic Diseases; Revenue; Signs and Symptoms; Trends; Viruses

20090006271 Mayo Clinic, Rochester, MN USA
Assesment of Lymphedema Risk Following Lymph Node Dissection and Radiation Therapy for Primary Breast Cancer
Cheville, Andrea L; Sep 2008; 24 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAMD17-03-1-0622
Report No.(s): AD-A491730; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491730

Lymphedema is a common, chronic, and potentially devastating complication of primary breast cancer therapy. Radiation increases patients lymphedema risk up to 36% as conventional fields irradiate vital lymphatic tissues. Fusion imaging technologies that combine anatomical and physiological data, e.g. SPECT/CT, may identify lymphatics critical for arm drainage and allow the creation of conformal radiation treatment fields that minimize the exposure of lymph nodes (LNs) and vessels while delivering therapeutic doses to target tissues. This study uses SPECT/CT scanning to localize lymphatics critical for arm drainage, and has established the feasibility of fusing SPECT/CT images with the CT scans used for radiation planning, thereby creating the opportunity to spare essential LNs needless radiation. Further, precise quantification of the dosimetry delivered to LNs draining the arm has revealed harmful levels of incidental irradiation with tangent beam configurations and subtherapeutic exposure with 4-field configurations. Data collection is complete, however interpretation and analysis of follow up SPECT/CT scans is ongoing. Data analysis will address the hypothesis that increased arm volume correlates with high levels of radiation dosimetry delivered to the LNs draining the arm. Additionally, data analysis will determine whether the radiation dose delivered to specific LNs is inversely correlated with radiolabeled tracer uptake, a surrogate measure for functional status, on follow up scans. The proposed study realizes the BCRP goals by elucidating a novel means of refining breast cancer treatment minimize patients' risk of developing the most prevalent and dreaded complication of conventional therapy, lymphedema.
DTIC
Breast; Cancer; Dissection; Lymphatic System; Mammary Glands; Radiation Dosage; Radiation Therapy; Risk

20090006272 Pennsylvania Univ., Philadelphia, PA USA
Universal Breast Cancer Antigens as Targets Linking Early Detection and Therapeutic Vaccination
Domchek, Susan M; Sep 2008; 19 pp.; In English
Contract(s)/Grant(s): DAMD17-03-1-0619
Report No.(s): AD-A491731; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491731

Molecular targets to facilitate early detection and preventative therapy for women at high risk for breast cancer have not been characterized. Two recently characterized intracellular enzymes human telomerase reverse transcriptase (hTERT) and the cytochrome P450 isoform 1B1 (CYP1B1), each overexpressed in >90% of invasive breast cancers but rarely found in normal tissue -- may fill this gap. Such targets, if found at the earliest time of malignant transformation, may be ideally suited not only for early detection but also cancer prevention by vaccination. A growing clinical experience in advanced cancer patients has underscored the safety and feasibility of vaccination strategies. The universal expression of hTERT and CYP1B1 provide an opportunity for both early detection and cancer vaccination. Objective/Hypothesis: We hypothesize that immunologic responses can be elicited in advanced breast cancer patients using vaccines incorporating hTERT, providing a safety and feasibility platform for ultimately vaccinating women at high risk for breast cancer. Although we have not found ductal lavage a feasible strategy for the detection of tumor antigens, we have made significant progress on vaccination strategies in women with metastatic breast cancer.
DTIC
Antigens; Breast; Cancer; Detection; Mammary Glands; Targets; Therapy

20090006274 Boston Univ., Boston, MA USA

Neuropsychological Functioning in Gulf War Veterans Exposed to Pesticides and Pyridostigmine Bromide

Krengel, Maxine; Aug 2008; 83 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491742; W81XWH-04-1-0118; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491742

Gulf War (GW) veterans continue to complain of short-term memory and mood problems many years after their deployment. Suspected causes for these complaints include additive and/or synergystic effects of the varying combinations of exposures to pesticides pyridostigmine bromide (PB) low-level nerve agents and psychological trauma. Many pesticides are neurotoxicants as are PB and nerve agents. Two subsets of these chemicals organophosphates (OP) and carbamates are known to produce chronic neurological symptoms at sufficient exposure levels. It was the goal of this study to further evaluate the role of pesticides in the development of symptoms reported by GW veterans. This was accomplished by performing neuropsychological assessments with a group of military pesticide applicators. It was hypothesized that pesticide applicators with higher exposures would perform significantly worse on cognitive and neurological measures than a group of GW military personnel with very little pesticide exposure and that multiple chemical exposures (PB pesticides) would prove synergistic in terms of decreased cognitive and neurological functioning and increased physical symptoms. Study results showed that the multiple exposed group (PB pest) performed worse on information processing speed and reported increased mood complaints and health symptoms compared with the other exposure groups. The high pesticide group also performed worse on visual memory functioning.

DTIC

Bromides; Central Nervous System; Gulfs; Neurology; Persian Gulf; Pesticides; Psychology; Warfare

20090006385 Louisiana State Univ., Shreveport, LA USA

Dendritic Cell-Based Genetic Immunotherapy for Ovarian Cancer

Mathis, James M; Dec 2007; 73 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-05-1-0055

Report No.(s): AD-A491946; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Adenovirus (Ad)-mediated transduction of dendritic cells (DCs) is inefficient because of the lack of the primary Ad receptor, CAR. CD40 is a surface marker expressed by DCs that plays a crucial role in their maturation and subsequent stimulation of T cells. DC infection with Ad targeted to the CD40 results in increased gene transfer. Cells transduced with CD40-targeted Ad5-SV40-TAg vector showed increased expression of transgene and expression of co-stimulatory molecules at 48 hours post-infection compared to cells transduced with untargeted Ad5-SV40-TAg vector. We demonstrated that CD40-targeted gene transfer promotes DC maturation with induction of a complex signaling cascade accompanied by characteristic changes in cytokine production. These results demonstrate that DCs can be successfully transduced using a CD40 targeted adenoviral vector and that transduced DCs show activation.

DTIC

Cancer; Genetics; Immunology; Lymphocytes; Ovaries

20090006386 Alabama Univ., Birmingham, AL USA

Gene Therapy for Osteolytic Breast Cancer Bone Metastasis

Ponnazhagan, Selvarangan; Jun 2008; 8 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-08-1-0270

Report No.(s): AD-A491947; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Bone is the frequent metastatic site for human breast cancer resulting in significant morbidity and mortality in patients with advanced disease. Osteoprotegerin (OPG) is a decoy receptor that competes with RANK for RANKL, thus, modulating the effects of RANKL. However, during the metastatic events involving cancer and stromal cell interaction, endogenous OPG levels are markedly reduced. Thus, OPG remains an effective molecule for future therapies for bone metastasis. We sought to achieve sustained effects of OPG combining cell therapy and gene therapy approaches. The aims were to determine therapeutic effects of stable OPG expression by rAAV gene therapy in a murine model of breast cancer bone metastasis, and to determine the synergistic effects of OPG gene therapy with bisphosphonate therapy in a murine model of breast cancer bone metastasis. So far, we produced high-titer recombinant AAV vectors encoding osteoprotegerin, and tested the feasibility of MSC therapy for reducing osteolysis in bone initiated by cancer growth. Also we established a method for bone homing of

ex vivo cultured MSC by transient expression of a4 1 integrin. Continuation of the ongoing studies in to next year will provide valuable information on therapeutic effects of this therapy for breast cancer bone metastasis.
DTIC
Bones; Breast; Cancer; Gene Therapy; Mammary Glands; Metastasis; Viruses

20090006389 Woods Hole Oceanographic Inst., MA USA
Faunal Biogeography Community Structure and Genetic Connectivity of North Atlantic Seamounts
Cho, Walter W; Sep 2008; 181 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491953; MIT/WHOI-2008-15; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The mechanisms of faunal dispersal across ocean basins are key unknowns toward understanding of the modern biogeography and biodiversity of deep-sea fauna. Seamounts are considered to play a defining role in faunal evolution, acting as regional centers of speciation, 'stepping-stones' for dispersal, and/or refugia for deep-sea populations. The overarching goal of this dissertation was to examine the role of seamounts in structuring marine biodiversity and biogeography. This study focused on North Atlantic seamounts, specifically the New England seamount chain, the Corner Rise Seamounts and Muir seamount, areas damaged and threatened by deep-sea fisheries and currently a focus of conservation efforts. Videographic analyses of biological community structure revealed distinct faunal assemblages, dominated by the Porifera, Cnidaria, and Echinodermata and structured by geographic region, depth regions (with apparent taxonomic breaks at 1300 m, 2300 m, and 2600 m), and substrate type (including natural/anthropogenic and abiotic substrates and biotic substrates). Amongst these assemblages, seven highly specific coral host- invertebrate associate relationships were identified. To investigate whether or not these broad community patterns were discernible at a genetic level, the 16S mtDNA gene was utilized as a genetic 'barcode' within the Class Ophiuroidea, through which 22 putative species were identified, including four target species (Asteroschema clavigera, Ophiocreas oedipus, Ophioplinthaca abyssalis, and Ophioplinthaca chelys) for subsequent population genetic studies. Analyses of mitochondrial 16S and COI gene sequences revealed evidence for recent population expansion and estimates of recent high gene flow across all four species throughout the North Atlantic seamount region.
DTIC
Atlantic Ocean; Fisheries; Genetics; Habitats; Mitochondria; Seamounts

20090006392 Texas Univ., Dallas, TX USA
Multimodality CT/SPECT Evaluation of Micelle Drug Carriers for Treatment of Breast Tumors
Blanco, Elvin; Weinberg, Brent D; Gao, Jinming; Jul 2008; 25 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0258
Report No.(s): AD-A491966; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Polymer micelles are nanoscale drug delivery systems that have the potential to improve breast tumor treatment. Micelles can increase the half-life and solubility of drugs, as is the case with beta-lapachone (beta-lap), a novel anticancer agent which is bioactivated by the enzyme NQO1, found overexpressed in tumors. They can also be fitted with tumor-specific ligands, and can be tracked in vivo through incorporation of an imaging moiety. The ultimate goal of the study was to develop beta-lap PEG-PLA micelles as novel nanotherapeutics for the treatment of breast tumors. Quantum dots (QD) were incorporated into micelles for purposes of image trackability. Micelles were characterized using 1H-NMR, TEM, and DLS. The in vitro and in vivo antitumor efficacy of the micelles was also examined. Beta-lap micelles were found to be small in size, and showed adequate cell-killing potential in vitro. In vivo studies showed that the micelles suppressed tumor growth for ~2 months, with minimal toxicity. QDs were successfully incorporated into micelles, yielding micelles of small size that retained fluorescence. Cell lines treated in vitro with the QD-micelles demonstrated slow and continuous uptake of micelles, found accumulated in the cytoplasm. Future studies involve the addition of a cRGD ligand to the surface of micelles to increase cellular uptake and yield multifunctional micelles.
DTIC
Breast; Cancer; Chemotherapy; Mammary Glands; Micelles; Tumors

20090006394 Marine Corps Development and Education Command, Quantico, VA USA
Digitizing Marine Corps Medical Records
Uecker, S A; Borovies, J A; Feb 7, 2006; 16 pp.; In English
Report No.(s): AD-A491972; USMC-EWS-2006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

After action assessments of the Gulf War revealed several medical information gaps. Commanders found it difficult to track the status and location of casualties evacuated from the battlefield to higher intra and extra theater echelons of medical

care. Additionally, data regarding medical encounters with patients during the ground war was not preserved for fusion with individual service members medical records. Consequently, as cases of Gulf War Illness arose, health care providers had no empirical data to which they could turn in order to identify potential causes. Because of numerous Congressional and Presidential mandates directing the Department of Defense (DoD) to implement comprehensive digital medical records for service members and medical tracking systems for deployed forces, the DoD Military Health System established the Theater Medical Information Program (TMIP) acquisition program.
DTIC
Health; Medical Personnel; Medical Services; Sicknesses

20090006395 Johns Hopkins Univ., Baltimore, MD USA
Prostate Cancer Detection by Molecular Urinalysis
Pavlovich, Christian P; Chan, David Y; Apr 2008; 81 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-05-1-0167
Report No.(s): AD-A491973; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer is the most commonly diagnosed cancer and the second leading cause of cancer-related death in the USA. The goal of this training grant is to develop urinary makers for prostate cancer detection and prognostication and to train two physicians in clinical research. In this year, we continue to evaluate the feasibility of detection of prostate cancer by molecular urinalysis. We have found HGF along with IL18Bpa were most increased in the prostatic fluids of patients with extensive disease compared to those with minimal disease. IL17, GITR, and ICAM-1 were elevated in prostatic fluid specimens with significant neutrophilic inflammation into gland lumina, and IL18Bpa, IL17, GITR, and ICAM-1 were elevated in specimens with significant lymphocytic inflammation in prostatic stroma. These prostatic fluid cytokines may be useful for early cancer detection and prognostication efforts and for assessment of prostatic inflammation, particularly if they can be found not only in prostatic fluids obtained ex vivo, but in expressed prostatic secretions or urine samples from men with prostates still in situ. In this direction, we have pursued the biology and relevance of two cytokines we found in prostate cancer secretions, endoglin and IL-18Bpa. Two manuscripts pertaining to these markers have been generated, one accepted and the other submitted for publication. In addition, we have continued to refine molecular urine cytology for the diagnosis of prostate cancer, with a manuscript in preparation.
DTIC
Cancer; Prostate Gland; Urinalysis

20090006400 Mount Sinai School of Medicine, New York, NY USA
Increasing Early Detection of Prostate Cancer in African American Men through a Culturally Targeted Print Intervention
Thompson, Hayley; Jun 2008; 45 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): W81XWH-04-1-0026
Report No.(s): AD-A491996; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Prostate cancer (PCa) incidence and mortality is higher among African American (AA) men compared to all other groups. There is compelling evidence that higher mortality is due to the greater likelihood of AA men to be diagnosed with advanced-stage PCa. PCa scrnening specifically prostate-specific antigen test (PSA) and digital rectal exam (DRE) has been shown to increase early-stage diagnoses. Although several organizations recommend annual PCa screening starting at age 45 for AA men screening among AA men is low. Indeed interventions to increase screening and the early detection of PCa among AA men are critical. Although culturally targeted health interventions have been found to be effective there are no interventions that have systematically addressed culturally relevant factors in PCa screening among AA men. The primary aim of the proposed study is to develop and evaluate the impact of a culturally targeted (CT) print intervention on PCa screening participation among AA 410 men through a randomized controlled trial. The proposed research also seeks to investigate the mediational pathways (i.e. mechanisms) through which the culturally targeted print intervention impacts screening participation.
DTIC
Africa; Cancer; Detection; Human Beings; Males; Prostate Gland

20090006406 Lankenau Inst. of Medical Research, Wynnewood, PA USA

Development of a Novel Therapeutic Paradigm Utilizing a Mammary Gland-Targeted, Bin1-Knockout Mouse Model

Muller, Alexander J; Jul 2008; 64 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): X81XWH-05-1-0279

Report No.(s): AD-A492025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Evidence of loss or attenuation of the Bin 1 gene in human breast cancers has implicated Bin 1 as a tumor suppressor or negative modifier gene in mammary gland epithelial cells. We discovered that Bin 1 loss can promote tumorigenesis through an immune escape mechanism and that this correlated with the negative regulatory impact that Bin 1 can exert on the important immunomodulatory enzyme indoleamine 2,3- dioxygenase (IDO). We had also demonstrated that, in combination with certain chemotherapeutic agents, inhibitors of IDO can be employed in a non-obvious therapeutic regimen to successfully treat pre-established, autochthonous breast tumors in MMTV-Neu transgenic mice. As a result of our work on this project, we have obtained direct evidence that in the MMTV-Neu model IDO activity in plasmacytoid dendritic cells from the tumor draining lymph nodes may be more relevant than in the tumor cells themselves, a finding that appears to be of general relevance to breast cancer. Furthermore, we have found that 1-methyl-D-tryptophan (D-1MT), the presumptive IDO inhibitor which is in early phase clinical trials, may instead be directly targeting IDO2, an IDO-related enzyme that we recently discovered. Our data argue that genetic evaluation of patients for known IDO2 polymorphisms may be critically important to interpreting trial outcomes with D-1MT.

DTIC

Knockout Mice; Mammary Glands; Therapy

20090006407 State Univ. of New York, Stony Brook, NY USA

Clinically Practical Magnetic Resonance Protocol for Improved Specificity in Breast Cancer Diagnosis

Tudorica, Luminita A; Jun 2008; 13 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0513

Report No.(s): AD-A492029; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this postdoctoral training award is for the PI to be trained in every aspect of conducting a research breast cancer study in a clinical setting. This study aims to improve specificity of breast cancer detection by using a combined MRI/MRS protocol. In the past year, the final year of this award, the PI has performed the following tasks independently: renewing IRB, recruiting and consenting patients, MRI/MRS data acquisition, and data analysis. A total of 20 patients were recruited for the study in the past year. The results from these 20 subjects and previously recruited subjects (50 from the preliminary data in the grant application and 43 recruited with the support of this grant) show 100% sensitivity and 100% specificity of the combined MRI/MRS protocol.

DTIC

Breast; Cancer; Diagnosis; Imaging Techniques; Magnetic Resonance; Mammary Glands; Protocol (Computers)

20090006408 Brigham and Women's Hospital, Boston, MA USA

Reproductive and Hormonal Risk Factors for Breast Cancer in Blind Women

Lockley, Steven W; Aug 2008; 20 pp.; In English

Contract(s)/Grant(s): W81XWH-04-1-0553

Report No.(s): AD-A492031; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Epidemiological observations indicate that breast cancer risk is lower in visually impaired women compared to sighted women and that risk is inversely correlated with degree of visual impairment. A hypothesis to explain these findings is that blind people are less susceptible to suppression of melatonin by light exposure at night and therefore have higher levels of melatonin. Melatonin has oncostatic properties in vitro. In a survey of blind women, we found that blind women with no perception of light (NPL) have a reduced risk of breast cancer compared to blind women with light perception (LP) (OR = 0.45 [CI: 0.25, 0.80]). In adjusted analyses the effect was consistent, but attenuated (OR = 0.56, CI: 0.30, 1.02). When we stratified the data at age 50, we found a significantly lower risk among women over age 50 in adjusted analyses (OR = .40, CI: .22, .74). These differences could not be explained by differences in known reproductive risk factors for breast cancer. In contrast, NPL women appear to have risk factors consistent with an elevated risk, including an earlier reported menarche than LP women (NPL = 12.18 1.53 years vs. 12.46 1.57 years, P<0.01). These findings suggest that light may influence reproductive development in women and provides support for the hypothesis that light exposure at night is a risk factor for breast cancer.

DTIC

Blindness; Breast; Cancer; Defects; Females; Mammary Glands; Risk; Vision; Visual Perception

20090006412 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Monovalent Virus-Like Particle Vaccine Protects Guinea Pigs and Nonhuman Primates Against Infection with Multiple Marburg Viruses

Swenson, Dana L; Warfield, Kelly L; Larsen, Tom; Alves, D A; Coberley, Sadie S; Bavari, Sina; May 1, 2008; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A492046; TR-08-039; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Virus-like particle (VLP)-based vaccines have the advantage of being morphologically and antigenically similar to the live virus from which they are derived. Expression of the glycoprotein and VP40 matrix protein from Lake Victoria marburgvirus (MARV) results in spontaneous production of VLPs in mammalian cells. Guinea pigs vaccinated with marburgvirus (m)VLPs or inactivated MARV (iMARV) develop homologous humoral and T cell responses and are completely protected from a lethal homologous MARV challenge. To determine whether the mVLPs, based on the Musoke (aka Lake Victoria) isolate of MARV, could broadly protect against diverse isolates of MARV, guinea pigs were vaccinated with mVLPs or inactivated MARV-Musoke and challenged with MARV-Musoke, -Ravn, or -Ci67. Prior to challenge, the mVLP- and iMARV-vaccinated guinea pigs had high levels of homologous MARV-Musoke and heterologous MARV-Ravn and -Ci67 antibodies. The Musoke-based mVLPs and iMARV vaccines provided complete protection in guinea pigs against viremia, viral replication and pathological changes in tissues, and lethal disease following challenge with MARV-Musoke, -Ravn, or -Ci67. Guinea pigs vaccinated with RIBI adjuvant alone and infected with guinea pig-adapted MARV- Musoke, -Ravn, or -Ci67 had histopathologic findings similar to those seen in the nonhuman (NHP) model for MARV virus infection. Based on the strong protection observed in guinea pigs, we next vaccinated cynomolgus macaques with Musoke-based mVLPs and showed the VLP-vaccinated monkeys were broadly protected against three isolates of MARV (Musoke, Ravn, and Ci67). Thus, Musoke marburgvirus-based VLPs are effective at inducing broad heterologous immunity and protection against multiple MARV isolates.

DTIC

Guinea Pigs; Infectious Diseases; Primates; Vaccines; Viral Diseases; Viruses

20090006414 Duke Univ., Durham, NC USA

Near Infrared Spectroscopy for Improving Breast Core Needle Biopsy

Bydlon, Torre M; Sep 1, 2008; 22 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-04-1-0340

Report No.(s): AD-A492048; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The objective of the proposed research is to develop a device to reduce the frequency of breast re-excision surgery in patients with breast malignancies. The purpose of Task 2 was to build and test a fiber optic probe with two imaging channels. The fiber geometry of this probe showed that collected data was repeatable and accurate at extracting known optical properties. The purpose of Task 3 was to build a multi-channel imaging probe which was constructed with 19,200 illumination fibers and 4,200um collection fibers. The objective of Task 4 was to test the multi-channel imaging probe on tissue phantom data and partial mastectomy specimens. Tissue phantom studies revealed that data can be accurately extracted with the current imaging system and multi-channel fiber optic probe. To date partial mastectomy margins have been imaged on 43 patients and show statistically significant differences between negative and close/positive surgical margins.

DTIC

Breast; Cancer; Imaging Techniques; Infrared Spectroscopy; Mammary Glands; Measuring Instruments; Near Infrared Radiation; Needles; Spectra

20090006415 Brookhaven National Lab., Upton, NY USA

Substrate Binding Mode and Its Implication on Drug Design for Botulinum Neurotoxin A

Kumaran, Desigan; Rawat, Richa; Ahmed, S A; Swaminathan, Subramanyam; Sep 26, 2008; 10 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DEAC02-98CH10886; DAMA17-02-2-0011

Report No.(s): AD-A492050; TR-08-076; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The seven antigenically distinct serotypes of Clostridium botulinum neurotoxins, the causative agents of botulism, block the neurotransmitter release by specifically cleaving one of the three SNARE proteins and induce flaccid paralysis. The Centers for Disease Control and Prevention (CDC) has declared them as Category A biowarfare agents. The most potent among them, botulinum neurotoxin type A (BoNT/A), cleaves its substrate synaptosome-associated protein of 25 kDa (SNAP-25). An efficient drug for botulism can be developed only with the knowledge of interactions between the substrate and enzyme at the active site. Here, we report the crystal structures of catalytic domain of BoNT/A with its uncleavable

substrate peptide 197QRATKM202 and its variant 197RRATKM202 to 1.5 and 1.6 , respectively. This is the first time the structure of an uncleavable substrate bound to an active botulinum neurotoxin is reported and it has helped in unequivocally defining S1 to S5' sites. These substrate peptides make interactions with the enzyme predominantly by the residues from 160, 200, 250 and 370 loops. Most notably, the amino nitrogen and carbonyl oxygen of P1 residue (Gln197) chelate the zinc ion and replace the nucleophilic water. The P1'-Arg198, occupies the S1' site formed by Arg363, Thr220, Asp370, Thr215, Ile161 and Phe194. The S2' subsite is formed by Arg363, Asn368 and Asp370, while S3' subsite is formed by Tyr251, Leu256, Val258, Tyr366, Phe369 and Asn388. P4'-Lys201 makes hydrogen bond with Gln162. P5'-Met202 binds in the hydrophobic pocket formed by the residues from the 250 and 200 loop. These complex structures should form the basis for design of potent inhibitors for this neurotoxin.
DTIC
Clostridium Botulinum; Drugs; Substrates

20090006418 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA
Dual-Probe Real-Time PCR Assay for Detection of Variola or Other Orthopoxviruses with Dried Reagents
Aitichou, Mohamed; Saleh, Sharron; Kyusung, Park; Huggins, John; O'Guinn, Monica; Jahrling, Peter; Ibrahim, Sofi; Sep 10, 2008; 7 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): 02-4-41-091
Report No.(s): AD-A492054; TR-08-015; No Copyright; Avail.: Defense Technical Information Center (DTIC)
A real-time, multiplexed PCR assay based on dried PCR reagents was developed. Only variola virus could be specifically detected by a FAM (6-carboxyfluorescein)-labeled probe while camelpox, cowpox, monkeypox and vaccinia viruses could be detected by a TET (6-carboxytetramethylrhodamine)-labeled probe in a single PCR reaction. Approximately 25 copies of cloned variola virus DNA and 50 copies of genomic orthopoxviruses DNA could be detected with high reproducibility. The assay exhibited a dynamic range of seven orders of magnitude with a correlation coefficient value greater than 0.97. The sensitivity and specificity of the assay, as determined from 100 samples that contained nucleic acids from a multitude of bacterial and viral species were 96% for variola and 98% for orthopoxviruses, respectively. The limit of detection, sensitivity and specificity of the assay were comparable to standard real-time PCR assays with wet reagents. Employing a multiplexed format in this assay allows simultaneous discrimination of the variola virus from other closely-related orthopoxviruses. Furthermore, the implementation of dried reagents in real-time PCR assays is an important step towards simplifying such assays and allowing their use in areas where cold storage is not easily accessible.
DTIC
Assaying; Bioassay; Drying; Reagents; Real Time Operation

20090006419 Army Research Inst. of Environmental Medicine, Natick, MA USA
Reliability and Validity of a Prototype Fluid Intake Monitor
Tharion, William J; Karis, Anthony J; Hoyt, Reed W; Jan 2009; 41 pp.; In English
Report No.(s): AD-A492057; USARIEM-TR-T09-04; No Copyright; Avail.: Defense Technical Information Center (DTIC)
The Fluid Intake Monitor (FIM) measures fluid consumed from a bladder hydration system. Bench and field tests were performed to assess reliability and validity of the FIM, Fluid volumes of FIM were compared to scale-weighed volumes of water. Bench Test Results: an absolute percent error existed ($p < 0.001$) between sips, with the FIM significantly overestimating the first sip ($p < 0.01$) compared to the subsequent nine sips. A significant intraclass reliability coefficient (ICC) = 0.83 was achieved for trials 2 through 10. There was no difference in mean sip volume measured using the FIM vs. the scale (25.7 + 10.7 ml vs. 25.6 + 8.7 ml, respectively). Field Test Results: of 31 trials, 4 trials under-measured water consumption in excess of 15% (29.4% to 47.1%), and two trials over-measured water consumption in excess of 15% (15.5% and 16.6%). These units were neither reliable nor valid for use in the field. Software and hardware modifications identified should significantly improve FIM performance.
DTIC
Hydration; Prototypes; Reliability

20090006447 Naval Postgraduate School, Monterey, CA USA
Emerging Issues in Healthcare Simulation
Sanchez, Susan M; Ogazon, Tom; Ferrin, David M; Sepulveda, Jose A; Ward, Timothy J; Joines, J A; Barton, R R; Kang, K; Fishwick, P A; Dec 2000; 6 pp.; In English
Report No.(s): AD-A492248; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Despite the size and importance of the health care industry, simulation is less prevalent in health care than in other fields

such as manufacturing, logistics, and military applications. Yet simulation clearly has the potential to play a role in health care decision-making at many levels. The purpose of this panel is to discuss some of the issues that practioners must be aware of in order to tap the potential of simulation in the health care arena. The panelists have extensive experience in health care and the use of simulation in that environment. They have provided statements outlining several key issues for achieving success in current and future health care simulation projects. These will serve as the starting point for discussion at the conference. DTIC

Medical Services; Simulation

20090006460 Eidgenoessische Technische Hochschule, Lausanne, Switzerland

Interaction of Inorganic Nanoparticles With Cell Membranes

Hofmann, Heinrich; Oct 20, 2008; 16 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8655-07-M-4007

Report No.(s): AD-A492294; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The discussion regarding toxic effects of nanoparticles, especially for people exposed to the particles during manufacturing, use of nanomaterials or because the particles have entered the biosphere at the end of the life cycle, show that there is very little information regarding the interaction of these particles with living systems. On the other hand, the same knowledge is necessary to develop nanosized particles for biomedical applications. In this project we tried to start of a successful cooperation combining the unique knowledge of the participating research groups in the field of colloidal and biological behaviour of nanoparticles. Questions regarding the colloidal behavior of particles in biological liquids (blood, body liquid, and media for cell cultures) as well as concerning the up-take mechanism and the behavior of the particles inside the cells are the subject of the project. During this work, we have discovered, that superparamagnetic particles specifically target to organelles show very specific protein adsorption which enables us understand better the pathway of our particles through the membrane and inside the cell. Combined with investigation regarding the protein absorption and their influence on the colloidal stability we have now the tools to investigate and perhaps to understand better the behaviour of nanoparticles in living systems.

DTIC

Biochemistry; Biomedical Data; Medical Science; Membranes; Nanoparticles; Toxicology

20090006552 Oregon Health and Science Univ., Beaverton, OR USA

Role of Hyaluronan in Schwannoma Growth

Sherman, Larry S; Jun 2008; 7 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W81XWH-07-1-0423

Report No.(s): AD-A487150; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487150

Schwannomas are benign peripheral nerve tumors that occur in individuals with neurofibromatosis 2 and schwannomatosis. Although schwannomas occur due to mutations in the neurofibromatosis 2 gene, which encodes the merlin tumor suppressor protein, recent studies indicate that schwannoma growth may depend in part on signaling by the erbB2 receptor tyrosine kinase. We previously found that erbB2 signaling depended on interactions between erbB2 and the CD44 transmembrane glycoprotein. CD44 is the receptor for hyaluronan, a glycosaminoglycan found in most extracellular matrices. Here, we found that schwannomas contain 2-3 fold higher levels of a high molecular weight form of hyaluronan compared to normal human peripheral nerve tissue. This elevated hyaluornan is due in part to increased transcription of the hyaluronan synthase gene, HAS2. Elevated hyaluronan correlated with increased phosphorylated (e.g. active) erbB2. These data support the hypothesis that hyaluronan may contribute to schwannoma growth.

DTIC

Cells (Biology); Genetics; Peripheral Nervous System; Tumor Suppressor Proteins

20090006562 Massachusetts Inst. of Tech., Cambridge, MA USA

P and S Wave Velocity Structure of the Crust and Upper Mantle Under China and Surrounding Areas From Body and Surface Wave Tomography

Toksoez, M N; Sun, Youshun; Mar 31, 2008; 110 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8718-04-C-0018; Proj-1010

Report No.(s): AD-A487595; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have used a combination of travel-time and surface wave tomography to obtain compressional and shear wave

velocity distributions in the crust and upper mantle under China and surrounding areas. We first determined 3-D P- and S-wave velocity structures for the crust and uppermost mantle using local and regional arrival time data. Travel-time data from the Annual Bulletin of Chinese Earthquakes (ABCE) and the International Seismological Centre (ISC/EHB) were used. We then extended the model deeper into the mantle through the upper mantle transition zone using ISC/EHB data for P and PP phases combined with the ABCE data. We also used surface wave data from broadband stations to determine the S-velocity structure. Multi-mode surface wave tomography was employed for the whole region of China and surrounding areas and ambient noise interferometry was used in Tibet.
DTIC
China; Crusts; P Waves; S Waves; Seismic Waves; Surface Waves; Tomography

20090006631 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Malaria Modeling and Surveillance in Thailand and Indonesia
Kiang, Richard; Adimi, Farida; Soebiyanto, Radina; September 29, 2008; 6 pp.; In English; ICTM2008, 29 Sep. - 3 Oct. 2008, Jeju, Korea, Republic of; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006631

This viewgraph presentation reviews the modeling of malaria transmission in Thailand and Indonesia to assist in the understanding and reducing the incidence of the deadly disease. Satellite observations are being integrated into this work, and this is described herein.
CASI
Indonesia; Parasitic Diseases; Satellite Observation; Thailand; Meteorological Parameters

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*.

20090004998 NASA Johnson Space Center, Houston, TX, USA
Human Adaptation to Space: Space Physiology and Countermeasures
Oral/Visual Presentation
Fogarty, Jennifer; [2009]; 19 pp.; In English; NASA Human Health and Performance Technology, 15 Jan. 2009, Houston, TX, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090004998

This viewgraph presentation reviews human physiological responses to spaceflight, and the countermeasures taken to prevent adverse effects of manned space flight. The topics include: 1) Human Spaceflight Experience; 2) Human Response to Spaceflight; 3) ISS Expeditions 1-16; 4) Countermeasure; and 5) Biomedical Data;
CASI
Aerospace Medicine; Human Tolerances; Manned Space Flight; Physiological Responses; Space Adaptation Syndrome; International Space Station

20090005021 NASA Glenn Research Center, Cleveland, OH, USA
Estimating the Need for Medical Intervention due to Sleep Disruption on the International Space Station
Myers, Jerry G.; Lewandowski, Beth E.; Brooker, John E.; Hurst, S. R.; Mallis, Melissa M.; Caldwell, J. Lynn; September 29, 2008; 32 pp.; In English; Original contains color and black and white illustrations
Contract(s)/Grant(s): WBS 444543.01.02.01
Report No.(s): E-16856; Paper ID:1499; Copyright; Avail.: CASI: A03, Hardcopy

During ISS and shuttle missions, difficulties with sleep affect more than half of all US crews. Mitigation strategies to help astronauts cope with the challenges of disrupted sleep patterns can negatively impact both mission planning and vehicle design. The methods for addressing known detrimental impacts for some mission scenarios may have a substantial impact on vehicle specific consumable mass or volume or on the mission timeline. As part of the Integrated Medical Model (IMM) task, NASA Glenn Research Center is leading the development of a Monte Carlo based forecasting tool designed to determine the consumables required to address risks related to sleep disruption. The model currently focuses on the International Space Station and uses an algorithm that assembles representative mission schedules and feeds this into a well validated model that

predicts relative levels of performance, and need for sleep (SAFTE Model, IBR Inc). Correlation of the resulting output to self-diagnosed needs for hypnotics, stimulants, and other pharmaceutical countermeasures, allows prediction of pharmaceutical use and the uncertainty of the specified prediction. This paper outlines a conceptual model for determining a rate of pharmaceutical utilization that can be used in the IMM model for comparison and optimization of mitigation methods with respect to all other significant medical needs and interventions.
Author
International Space Station; Sleep; Space Shuttle Missions; Aerospace Medicine; Human Factors Engineering

20090005073 Air Force Research Lab., Brooks AFB, TX, USA; Texas Univ., San Antonio, TX, USA
Relating Venous Gas Emboli (VGE) Scores to Altitude Decompression Sickness (DCS) Symptoms
Pilmanis, A. A.; Kannan, N.; Krause, K. M.; Webb, J. T.; Aviation, Space, and Environmental Medicine; April 1999; Volume 70, No. 4, pp. 364; In English; Copyright; Avail.: Other Sources

Purpose. It is generally accepted that DCS symptoms are caused by gas bubbles in tissues. However, current technology of bubble detection only permits monitoring of circulating bubbles, primarily intracardiac. Since the majority of DCS symptoms appear to be caused by extravascular bubbles, it has been suggested that current bubble detection techniques target bubbles that are of importance in only a minority of DCS cases. The purpose of this study is to determine the relationships between measured VGE and DCS symptoms in human subjects exposed to altitude. Methods. The AFRL DCS Research Database contains records on 2044 subject-exposures to simulated altitudes in a hypobaric chamber. VGE monitoring was accomplished using Doppler/Echo Imaging techniques. The Spencer Scale was used to score the VGE. Reporting of DCS symptoms by the subject was the primary end-point of the exposures. Results: The Mantel- Haenzel test indicated a strong correlation between DCS and bubble grade (p-value =0.001). Conclusions. A positive correlation between increasing VGE scores and DCS symptoms, does not imply causatinn. If all non-zero VGE grades are considered, 45.9% of the cases had VGE, but no DCS symptoms. Conversely, almost 1 in 5 subject-exposures resulted in DCS with NO VGE detected. VGE scores are not . good predictors of altitude DCS symptoms and field use of bubble detection for DCS prevention is not supported by this study.
Author
Decompression Sickness; Altitude; Aeroembolism; Circulation; Exposure; Hypobaric Atmospheres; Signs and Symptoms

20090005182 NASA Johnson Space Center, Houston, TX, USA
Nutrition and Nutrient Supply and Bone: Effects on the Physiological Changes in Microgravity (and Simulation Models) their Role as Potential Countermeasures
Zwart, Sara R.; Smith, Scott M.; Larina, Irina; Baecker, Natalie; Heer, Martina A.; [2009]; 17 pp.; In English; No Copyright; Avail.: Other Sources

Ground-based data alone clearly show that optimal nutrition can be beneficial to bone. An excess or deficiency of a single nutrient can cause bone loss to occur. During spaceflight, it is not likely that optimal nutrition alone can mitigate weightless-induced bone loss; however, it is clear that deficiencies or excesses of certain nutrients can exacerbate bone loss. While genetic factors are largely responsible for bone mass variability of humans on Earth (1), some of the variability can be influenced by other factors, including nutritional intake and exercise. For humans in space, additional variables exist that promote bone resorption with no concomitant increase in bone formation. In this review, we discuss the mechanism of bone loss during spaceflight, along with prospects for the effectiveness of non-nutritional and nutritional countermeasures that have been proposed to mitigate spaceflight-induced bone loss.
Author
Nutrition; Spacecrews; Weightlessness; Bone Demineralization; Bones; Countermeasures; Genetics; Physical Exercise

20090006146 Army Research Inst. of Environmental Medicine, Natick, MA USA
Soldier Protection Demonstration III - Field Testing and Analysis of Personal Cooling Systems for Heat Mitigation
Goodman, Daniel A; Diaz, Jorge; Cadarette, Bruce S; Sawka, Michael N; Nov 2008; 24 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491205; USARIEM-TN-09-01; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA491205

Wearing body armor increases physiologic strain in Soldiers operating in warm and hot environments. This increased heat strain is due to inhibited air circulation to the torso and increased insulation. Microclimate cooling systems (MCCS) are used to mitigate these problems in a number of situations for the mounted Soldier, such as helicopter flight crew or armored vehicle

crew. The U.S. Army is actively pursuing candidate MCCS that can be used by the dismounted Soldier. The Product Manager for Soldier Survivability (PM-SSV) requested the Soldier Battle Lab (SBL) of the U.S. Army Infantry Center, Ft. Benning, conduct a Soldier Protection Demonstration. The principal focus was to collect user input evaluations of commercially available lightweight MCCS worn during routine dismounted activities. There were six critical operational issues addressed: 1) Does the system affect the Soldier's core body temperature? 2) Does the system affect a Soldier's ability to fight? 3) Does the system affect Soldier protection? 4) Is the system suitable to wear in an operational environment? 5) Is the system compatible with current weapons and equipment? and 6) Does the system affect Soldier mobility? Two candidate personal cooling systems (PCS) were selected for the demonstration based on the main parameter of being lightweight. The demonstration was conducted in the desert at Ft. Irwin, CA, during daytime hours in late August 2007. Soldiers were divided among three, 4-5 member teams, and each team was scheduled to test a different randomly assigned PCS configuration each day. The volunteers completed five events each day. These events were compatibility testing, individual movement technique on an obstacle course, a road march, a vehicle patrol, and a live fire exercise.
DTIC
Armor; Body Temperature; Cooling Systems; Field Tests; Protection

20090006153 Army Research Inst. of Environmental Medicine, Natick, MA USA
Thermoregulatory Model to Predict Physiological Status from Ambient Environment and Heart Rate
Yokota, Miyo; Berglund, Larry; Cheuvront, Samuel; Santee, William; Latzka, William; Montain, Scott; Kolka, Margaret; Moran, Daniel; Sep 2008; 8 pp.; In English
Report No.(s): AD-A491238; M06-30; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491238

A real-time thermoregulatory model was developed for predicting real-time physiological responses of workers engaged in various tasks for prolonged time. The unique feature of the present model is primarily on metabolic activity inputs derived from minimum non-invasive measures (i.e., heart rate and ambient temperature). In addition, it utilizes individual anthropological characteristics (height, weight, and clothing) as an input to estimate core temperatures (Tc). The model was validated using data from five laboratory studies (n = 63) with varied environments, clothing, and heat acclimation status. Overall, Tc predictions using this simplified model, corresponded well with measured values (root mean square deviation: 0.05-0.31 deg C).
DTIC
Heart Rate; Physiological Effects; Physiology; Temperature Control; Thermoregulation

20090006483 Naval Postgraduate School, Monterey, CA USA
Fatigue and its Effect on Performance in Military Environments
Miller, N L; Matsangas, P; Shattuck, L G; Jan 2007; 20 pp.; In English
Report No.(s): AD-A487169; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487169

'Saddam Hussein and his sons must leave Iraq within 48 hours. Their refusal to do so will result in military conflict (President George W. Bush, 17 March 2003). My fellow citizens, at this hour, American and coalition forces are in the early stages of military operations to disarm Iraq, to free its people and to defend the world from grave danger. On my orders, coalition forces have begun striking selected targets of military importance to undermine Saddam Hussein's ability to wage war. These are opening stages of what will be a broad and concerted campaign (President George W. Bush, Address to the Nation, 19 March 2003).' With these words, US President George W. Bush announced to the citizens of the USA that Operation Iraqi Freedom had begun. The campaign commenced with the US Air Force bombing Baghdad and other strategic targets. Shortly thereafter, on Thursday, March 20, US and Allied Coalition Ground Forces crossed the Kuwaiti Iraqi border and began their attack north to Baghdad and other key locations. over the next few days, Coalition aircraft flew between 1500 and 2000 sorties per day, warships launched 500 cruise missiles, and ground troops traveled hundreds of kilometers often meeting fierce resistance along the way. Coalition forces pressed on day and night with little rest. According to the 3rd Infantry Division After Action report (AAr), a senior leader noted that he slept for about half an hour at the assault position and really did not rest again until 24 March. The troops did not rest either. The AAr also stated that another leader recalled that at one point [his] battalion moved only to discover that it had left a battery asleep by the side of the road. reporters embedded with the ground forces and military analysts provided vivid descriptions of the impact of prolonged wakefulness on performance.
DTIC
Human Performance; Fatigue (Biology); Wakefulness

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*.

20090005043 Air Force Research Lab., Rome, NY USA
Synthesizing Disparate Experiences in Episodic Planning
Ford, Anthony J; Lawton, James H; Jun 2008; 46 pp.; In English; Original contains color illustrations
Report No.(s): AD-A486977; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Many decisions are actually made by synthesizing previous experience. Often, this involves many different experiences coming together to form a feasible solution. This paper presents a statistical model for predicting the outcome of solutions based on multiple experiences. In edge organizations, such as emergency first responders, it often requires the expertise of more than one person to form an approach to a complex problem. Unfortunately, each planner only has access to his or her own memories. We propose to use an artificial intelligence decision aide to help bridge this gap, by reasoning over distributed collections of previous experiences. The key research questions that we address include: How can an artificial reasoner form a plan based on several disparate experiences from different sources? How can we gauge the potential efficacy of such a plan? How can we trust this plan if a clear line cannot be drawn to one author? We will also discuss such critical issues as analogies in planning with disparate experiences, civil-military planning by analogy, trust, provenance, and organizational issues in planning.
DTIC
Command and Control; Decision Theory

20090005099 NASA Johnson Space Center, Houston, TX, USA
Solid State Light Evaluation in the U.S. Lab Mockup
Maida, James c.; Bowen, Charles K.; Wheelwright, Chuck; January 09, 2009; 23 pp.; In English; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

This document constitutes the publication of work performed by the Space Human Factors Laboratory (mail code SF5 at the time) at the Johnson Space Center (JSC) in the months of June and July of 2000. At that time, the Space Human Factors Laboratory was part of the Space Human Factors Branch in the Flight Projects Division of the Space and Life Directorate. This report was originally to be a document for internal consumption only at JSC as it was seen to be only preliminary work for the further development of solid state illumination for general lighting on future space vehicles and the International Space Station (ISS). Due to funding constraints, immediate follow-on efforts were delayed and the need for publication of this document was overcome by other events. However, in recent years and with the development and deployment of a solid state light luminaire prototype on ISS, the time was overdue for publishing this information for general distribution and reference. Solid state lights (SSLs) are being developed to potentially replace the general luminaire assemblies (GLAs) currently in service in the International Space Station (ISS) and included in designs of modules for the ISS. The SSLs consist of arrays of light emitting diodes (LEDs), small solid state electronic devices that produce visible light in proportion to the electrical current flowing through them. Recent progressive advances in electrical power-to-light conversion efficiency in LED technology have allowed the consideration of LEDs as replacements for incandescent and fluorescent light sources in many circumstances, and their inherent advantages in ruggedness, reliability, and life expectancy make them attractive for applications in spacecraft. One potential area of application for the SSLs in the U.S. Laboratory Module of the ISS. This study addresses the suitability of the SSLs as replacements for the GLAs in this application.
Derived from text
International Space Station; Light Sources; Solid State Devices; Human Factors Engineering; Light Adaptation

20090005232 NASA Langley Research Center, Hampton, VA, USA
Method and Apparatus for Performance Optimization through Physical Perturbation of Task Elements
Prinzel, Lawrence J., III, Inventor; Pope, Alan T., Inventor; Palsson, Olafur S., Inventor; Turner, Marsha J., Inventor; 16 Mar. 2006; 20 pp.; In English
Patent Info.: Filed Filed 13 May 05; US-Patent-Appl-SN-11-129 756; US 2006/0057549
Report No.(s): PB2008-101196; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005232

The invention is an apparatus and method of biofeedback training for attaining a physiological state optimally consistent with the successful performance of a task, wherein the probability of successfully completing the task is made is inversely

proportional to a physiological difference value, computed as the absolute value of the difference between at least one physiological signal optimally consistent with the successful performance of the task and at least one corresponding measured physiological signal of a trainee performing the task. The probability of successfully completing the task is made inversely proportional to the physiological difference value by making one or more measurable physical attributes of the environment in which the task is performed, and upon which completion of the task depends, vary in inverse proportion to the physiological difference value.
Author
Biofeedback; Education; Physiology; Human Performance; Physiological Factors

20090005934 Military Academy, West Point, NY USA
Soldier as a System Value Analysis
Carlson, Melanie; Kewley, Robert H; Sep 2008; 26 pp.; In English
Report No.(s): AD-A489365; DSE-TR-0804; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489365

PEO Soldier has the challenge of integrating and equipping the Soldier as a System. However, some elements of the system remain consistently under-funded such as those that protect Soldiers from adverse environmental conditions, provide for health and comfort needs, support ergonomic requirements and ensure the ability of the Soldier to operate effectively in any environment for extended periods of time. At issue is the ability to quantify the impact of products that support the human component on Soldier effectiveness and capabilities. The intent of the Soldier as a System is to replace haphazard fielding efforts with an approach that treats the Soldier just like the other complex combat assets in the Army arsenal. The development of an assessment framework required the extraction of key functions and values of the system, a component of the decision analysis concepts applied to this problem, including value focused thinking. This concept will help PEO Soldier demonstrate the importance and value of programs that focus on the human component of the Soldier, particularly in adverse conditions.
DTIC
Human Factors Engineering; Systems Analysis

20090006054 Assistant Secretary of the Army (Acquisition, Logistics and Technology), Fort Belvoir, VA USA
Lessons Learned from Product Manager (PM) Infantry Combat Vehicle (ICV) Using Soldier Evaluation in the Design Phase
Cline, Todd; Jun 2008; 5 pp.; In English
Report No.(s): AD-A490527; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490527

In September 2007, the PM for the Manned Ground Vehicle (MGV) XM1206 Infantry Combat Vehicle (ICV), Future Combat Systems (Brigade Combat Team) (FCS(BCT)) conducted an ingress and egress demonstration to optimize squad configuration and verify ICV platform design characteristics. The demonstration was conducted using Soldiers from the Army Evaluation Task Force and a vehicle mock-up of the ICV mission module area. Demonstrations using mock-ups or prototypes often prove to be cost-effective ways to focus on certain requirements and bring valuable data and a unique real-world perspective to the design team. Mock-up demonstrations also assist PMs in prioritizing limited resources to important system areas. PM ICV is using the systems engineering approach with this valuable Soldier feedback to incorporate design changes while balancing any cost, schedule, and performance impacts. The objectives of this demonstration were to evaluate ICV mission module seating configuration and evaluate the time it took Soldiers for ingress/egress via ramp and door. The mock-up was constructed with the ability to reconfigure to different seating arrangements, as well as different ramp and door configurations.
DTIC
Combat; Feedback; Human Factors Engineering; Lessons Learned; Organizations; Personnel

20090006124 Dayton Univ. Research Inst., Urdi, OH USA
Improving Function Allocation for Integrated Systems Design
Beevis, David; Essens, Peter; Schuffel, Herke; Jun 1996; 337 pp.; In English
Contract(s)/Grant(s): SPO900-94-D-0001
Report No.(s): AD-A491093; CSERIAC-SOAR-96-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491093

This book is a compilation of the 17 papers presented during the November 1994 workshop on Function Allocation at the

TNO Human Factors Research Institute, Soesterberg, The Netherlands. The workshop was sponsored by the Research Study Group 14 (RSG 14) of NATO Defense Research Group Panel 8, which in an earlier review of human engineering analysis techniques, had concluded that function allocation was the weakest of the techniques reviewed. The present workshop identified and examined central issues and techniques in function allocation (e.g., two-stage and iterative function allocation processes, reverse engineering, flexible allocation, and adaptive allocation), discussed methods for evaluating function allocation decisions, and described state-of-the-art applications of function allocation techniques.
DTIC
Allocations; Decision Making; Human Factors Engineering; Man Machine Systems; Systems Engineering; Systems Integration

20090006430 Klein Associates, Inc., Fairborn, OH USA
Naturalistic Decision Making: Implications for Design
Klein, Gary; Apr 1993; 192 pp.; In English
Contract(s)/Grant(s): DLA900-88-0393
Report No.(s): AD-A492114; CSERIAC93-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)
Recent years have witnessed strong progress in understanding how people make decisions in operational settings. The emerging field of Naturalistic Decision Making (NDM) is at a point to afford system developers (including design engineers, human factors engineers, ergonomics specialists) different tools and methods for designing interfaces/systems that will better support decision making in those settings. Decision requirements can be identified from the early conceptual design phase through redesign. The NDM framework attempts to describe the way in which people handle difficult conditions within the context of the overall setting or task. This SOAR describes various decision strategies used by individuals and teams to assess a situation, diagnose a problem, and select a course of action. The impact of stress upon these strategies is also considered. To help understand what people are thinking as they perform difficult tasks, the procedures for conducting Cognitive Task Analyses to examine design requirements are also examined.
DTIC
Decision Making; Human-Computer Interface

20090006436 Dayton Univ. Research Inst., Urdi, OH USA
Behind Human Error: Cognitive Systems, Computers and Hindsight
Woods, David D; Johannesen, Leila J; Cook, Richard I; Sarter, Nadine B; Dec 1994; 277 pp.; In English
Contract(s)/Grant(s): DLA900-88-0393
Report No.(s): AD-A492127; CSERIAC-SOAR-94-01; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This report goes beyond a characterization of human error as a causal factor of accidents. It discusses the larger system within which practitioners operate and show how 'blunt end' factors such as organizational processes and technology design impact the cognition and behavior of those at the 'sharp end.' Examples from various domains are used to illustrate deficiencies in computerized devices, which can lead to breakdowns in interaction. such as mode error. Reasons are presented for why these deficiencies as 'latent failures' can exist without giving rise to accidents. Also discussed is the role of outcome knowledge in the attribution of error.
DTIC
Cognition; Computer Techniques; Computers; Errors; Human-Computer Interface

20090006564 Army Medical Research and Materiel Command, Fort Detrick, MD USA
Setting the Stage: TATRC's Portfolio
Lai, Eva; Apr 5, 2008; 12 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490295; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490295
The intent of this talk is to provide a brief overview on TATRC and in particular its Biomonitoring Technologies portfolio, leading into a brief highlight on how the various technologies and/or concepts that will be presented in today's three sessions flow from one environment to the next. [TATRC website, 12 Dec 2008]
DTIC
Medical Science; Research and Development; Websites

59
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*.

20090005000 Bureau of Labor Statistics, Washington, DC, USA
Estimating Components of Variance of Price Change from a Scanner-Based Sample
Leaver, S. G.; Larson, W. E.; January 2003; 8 pp.; In English
Report No.(s): PB2008-106633; No Copyright; Avail.: National Technical Information Service (NTIS)

In this paper we present estimates of components of variance of price change for cereal for several publication areas. Components of variance for 1-, 6-, and 12-month lags were computed using a weighted restricted maximum likelihood estimation method. Estimates are contrasted among publication areas using two different random effects models, and findings are discussed with respect to approaches to sample design. In section one the official CPI and scanner-based geometric price index estimators are described. Section two presents the random effects model fitted to our data and the construction of components of variance estimators for the scanner index series. Section three presents computational results and compares estimates of the components over time and across cities. Sources of price change variability are identified and discussed. Conclusions are given in section four.
NTIS
Consumers; Cost Analysis; Estimating

20090005001 Bureau of Labor Statistics, Washington, DC, USA
Graphical Method for Assessing the Results of Fuzzy Clustering
Bobbitt, P.; January 2003; 8 pp.; In English
Report No.(s): PB2008-106631; No Copyright; Avail.: National Technical Information Service (NTIS)

In one sense, statistics is practice of summarizing data by reducing the dimensionality of a data set in a sensible way. One way in which the dimensionality of a data set can be reduced is to classify the n items in a dataset into k clusters. One such method of classification is known as the kmeans clustering algorithm. In this algorithm the statistician uses a measure of distance between the items to define items in a dataset as similar, and then classifies that item as having membership to one of k clusters.
NTIS
Cluster Analysis; Classifications

20090005023 British Columbia Univ., Vancouver, British Columbia, Canada
Simulation Model of Urban Disaster Recovery and Resilience: Implementation for the 1994 Northridge Earthquake
Miles, S. B.; Chang, S. E.; Sep. 07, 2007; 134 pp.; In English
Contract(s)/Grant(s): NSF-EEC9701471
Report No.(s): PB2008-106426; MCEER-07-0014; No Copyright; Avail.: National Technical Information Service (NTIS)

This technical report describes a computer-based model of urban disaster recovery. The model simulates the recovery dynamics of households, businesses, neighborhoods, and the community as a whole following a disaster. The model was applied to the City of Los Angeles for the 1994 North-ridge earthquake, using detailed data on the conditions and effects of the earthquake for testing and calibration purposes. Results indicated favorable performance in certain aspects of the model and identified areas where further refinements are needed. Examples of 'what-if' explorations are provided to illustrate the types of analyses that can be conducted with this model. The report concludes with a discussion of potential applications, advances, limitations, and priorities for further research. The first-generation of this model was described in a previous MCEER report, 'Urban Disaster Recovery: A Framework and Simulation Model'.
NTIS
Computer Techniques; Disasters; Earthquakes; Simulation

20090005044 Environmental Protection Agency, Washington, DC, USA
Toxics Release Inventory (TRI) Public Data Release eReport, 2005
Mar. 2007; 250 pp.; In English
Report No.(s): PB2008-106584; No Copyright; Avail.: National Technical Information Service (NTIS)

The USA (U.S.) Environmental Protection Agency (EPA) Toxics Release Inventory (TRI) program collects information

on the disposal or other releases and other waste management activities for over 650 chemicals from industrial sources in all 50 states and the U.S. territories. The information has been collected annually since 1987. For 2005, the latest year for which data are available, disposal or other releases of TRI chemicals totaled almost 4.34 billion pounds from almost 23,500 U.S. facilities submitting over 89,300 chemical forms. The time period covered for this year's data release is January 1 to December 31, 2005. These 2005 data were reported to EPA by July 1, 2005, and were released to the public in March 2007. Data for previous years back to 1988 are also available.
NTIS
Charts; Data Bases; Environment Protection; Graphs (Charts); Inventories

20090005068 Peabody (Nixon), LLP, Rochester, NY, USA
Target Identification and Location System and a Method Thereof
McKeown, Donald M., Inventor; Richardson, Michael J., Inventor; 17 Nov. 05; 13 pp.; In English
Patent Info.: Filed 1 Feb. 05; US-Patent-Appl-SN-11-048605; US 2005/0253928
Report No.(s): PB2007-109106; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005068

A system and method of identifying and locating one or more targets includes capturing one or more frames and recording position data for each of the frames. Each of the frames comprises a plurality of at least three different types of infrared image data. Each of the targets is identified and a location is provided based on the three different types of captured infrared image data in each of the frames and the recorded position data.
Official Gazette of the U.S. Patent and Trademark Office
Patent Applications; Position (Location); Targets

20090005088 Sandia National Labs., Albuquerque, NM USA
Verification and Verification of RADTRAN 5.5
Osborn, D. M.; Weiner, R. F.; Mills, G. S.; Hamp, S. C.; Feb. 2005; 260 pp.; In English
Contract(s)/Grant(s): DE-AC04-94AL85000
Report No.(s): PB2008-106428; SAND-2005-1274; No Copyright; Avail.: CASI: A12, Hardcopy

This document contains a description of the verification and validation process used for the RADTRAN 5.5 code. The verification and validation process ensured the proper calculational models and mathematical and numerical methods were used in the RADTRAN 5.5 code for the determination of risk and consequence assessments. The differences between RADTRAN 5 and RADTRAN 5.5 are the addition of tables, an expanded isotope library, and the additional User-Defined meteorological option for accident dispersion.
NTIS
Computer Programs; Numerical Analysis

20090005089 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Energy-Conserving Semi-Discretizations and Spurious Numerical Reflections
Frank, J. E.; Reich, S.; Feb. 2006; 22 pp.; In English
Report No.(s): PB2008-106429; MAS-E0608; Copyright; Avail.: National Technical Information Service (NTIS)

We consider energy-conserving semi-discretizations of linear wave equations on nonuniform grids. Specifically we study explicit and implicit skew-adjoint finite difference methods, based on the assumption of an underlying smooth mapping from a uniform grid, applied to the first and second order wave equations. Our interest is in internal reflection of energy at abrupt variations in grid spacing. We show that all node-centered finite difference schemes suffer from reflections. Cell-centered finite difference schemes for the first order wave equation do not have reflections if the numerical dispersion relation is monotone. Runge-Kutta-based spatial semi-discretizations are also considered and these never give reflections. Furthermore, for higher order wave equations, even finite difference schemes with compact stencils and monotone dispersion relations may give reflections due to coupling of physically significant dispersion branches. Again RK schemes avoid this. Finally, we note that all schemes which avoid internal reflections are implicit.
NTIS
Conservation; Linear Equations; Wave Equations

20090005091 Center for Mathematics and Computer Science, Amsterdam, Netherlands
Algorithm 850: Real Parabolic Cylinder Functions U(a,x) V(a,x)
Gil, A.; Segura, J.; Temme, N. M.; Apr. 2006; 14 pp.; In English
Report No.(s): PB2008-106430; MAS-R0609; Copyright; Avail.: National Technical Information Service (NTIS)

Fortran 90 programs for the computation of real parabolic cylinder functions are presented. The code computes the functions U(a, x), V(a, x) and their derivatives for real a and x(x greater than or equal to 0). The code also computes scaled functions. The range of computation for scaled PCFs is practically unrestricted. The aimed relative accuracy for scaled functions is better than 5 10(sup minus 14). Exceptions to this accuracy are the evaluation of the functions near their zeros and the error caused by the evaluation of trigonometric functions of large arguments when 'a' is greater than x. The routines always give values for which the Wronskian relation for scaled functions is verified with a relative accuracy better than 5 10(sup minus 14). The accuracy of the unscaled functions is also better than 5 10(sup minus 14) for moderate values of x and a (except close to the zeros), while for large x and a the error is dominated by exponential and trigonometric function evaluations. For IEEE standard double precision arithmetic, the accuracy is better than 5 10(sup minus 13) in the computable range of unscaled PCFs (except close to the zeros).
NTIS
Algorithms; Applications Programs (Computers); FORTRAN

20090005128 Bureau of Labor Statistics, Washington, DC, USA
Improvements to the Food at Home, Shelter, and Prescription Drug Indexes in the U.S. Consumer Price Index
Armknecht, P. A.; Moulton, B. R.; Stewart, K. J.; Feb. 1995; 25 pp.; In English
Report No.(s): PB2008-105404; BLS/WP-263; No Copyright; Avail.: CASI: A03, Hardcopy

While the U.S. Consumer Price Index (CPI), as a Laspeyres-type index, attempts to measure the average change in the prices paid by urban consumers for a fixed market basket of goods and services, new samples for most item categories are routinely introduced over time to keep the CPI sample representative of consumer spending patterns. This paper will describe methodological changes being implemented in January 1995 to the food at home, shelter, and prescription drug components of the U.S. Consumer Price Index (CPI). These changes reflect improvements designed to make the CPI more representative of price changes experienced by consumers.
NTIS
Consumers; Cost Analysis; Drugs; Shelters

20090005129 Bureau of Labor Statistics, Washington, DC, USA
Diagnostics for Evaluation of Superpopulation Models for Variance Estimation Under Systematic Sampling
Cho, M. J.; Eltinge, J. L.; January 2001; 7 pp.; In English
Report No.(s): PB2008-105407; No Copyright; Avail.: CASI: A02, Hardcopy

Under systematic sampling with multiple random starts, one may use variance estimators based, respectively, on (1) a relatively simple design based approach; or (2) specific superpopulation models. Variance estimators derived from (1) generally will be approximately design unbiased, but may be somewhat unstable if the number of random starts is small or moderate. In addition, the performance of estimators based on (2) will depend on the extent to which the underlying finite population is consistent with the assumed superpopulation model. This paper considers diagnostics for the comparison of estimators from (1) and (2), with special emphasis on (a) exploratory analysis of the underlying finite population; (b) variance estimator bias; (c) variance estimator stability; and (d) coverage rates and widths of associated confidence intervals. Some of the proposed methods are applied to sample data from the U.S. Bureau of Labor Statistics.
NTIS
Sampling; Estimating; Populations

20090005130 Bureau of Labor Statistics, Washington, DC, USA
Interarea Price Comparisons for Heterogeneous Goods and Several Levels of Commodity Aggregation
Kokoski, M. F.; Moulton, B. R.; Zieschang, K. D.; Sep. 1996; 60 pp.; In English
Report No.(s): PB2008-105408; BLS/WP-291; No Copyright; Avail.: CASI: A04, Hardcopy

We derive a general form of Tornqvist multilateral (transitive) place to place index numbers and a new variant of regression methodology for imposing transitivity while minimally adjusting the initial system of bilateral index comparisons. We show that when several levels of item aggregation are to be published in a system of Tornqvist interarea parities, the adjusted, transitive Tornqvist parities at each level of aggregation preserve the aggregation rule in the unadjusted data. Finally,

the method incorporates characteristics-based, hedonic quality adjustment as an integral feature. We apply the method to a subset of commodity price and expenditure data for the 44 areas of the USA covered by the Consumer Price Index. In closing, we also discuss an application of the method that makes time series and geographical comparisons consistent with one another, and note that it permits decentralization of calculation in a way that may have distinct advantages for compiling international price comparisons.
NTIS
Commodities; Heterogeneity; Cost Analysis

20090005149 Bureau of Labor Statistics, Washington, DC, USA; University of Southern California, Los Angeles, CA USA
Strength of Occupation Indicators as a Proxy for Skill
Levenson, A.; Zoghi, C.; Mar. 2007; 39 pp.; In English
Report No.(s): PB2008-105414; BLS/WP-404; No Copyright; Avail.: National Technical Information Service (NTIS)

Labor economists have long used occupation indicators as a proxy for unobserved skills that a worker possesses. In this paper, we consider whether inter-occupational wage differentials that are unexplained by measured human capital are indeed due to differences in often-unmeasured skill. Using the National Compensation Survey, a large, nationally- representative dataset on jobs and ten different components of requisite skill, we compare the effects on residual wage variation of including occupation indicators and including additional skills measures. We find that although skills do vary across 3-digit occupations, occupation indicators decrease wage residuals by far more than can be explained by skill differentials. This indicates that controlling for occupation does not equate to controlling for skill alone, but also for some other factors to a great extent. Additionally, we find that there is considerable within occupation variation in skills, and that the amount of variation is not constant across skill levels. As a result, including occupation indicators in a wage model introduces heteroskedasticity that must be accounted for. We suggest that greater caution be applied when using and interpreting occupation indicators as controls in wage regressions.
NTIS
Labor; Occupation; Wage Surveys

20090005166 Bureau of Labor Statistics, Washington, DC, USA
Evaluation of Proposed County-Level Interval Publication of ES-202 Employment Data
Apr. 23, 2004; 12 pp.; In English
Report No.(s): PB2008-106210; No Copyright; Avail.: CASI: A03, Hardcopy

According to the proposed changes to ES-202 publication policy for aggregate employment data where suppressed cells are published in pre-determined ranges, we found replacing primary and complementary suppression cells selected under current methodology with pre-determined ranges could narrow the intruder estimation of individual establishment employment levels in the cells that may pose confidentiality exposure risks. Current theoretical knowledge and techniques for selecting complementary suppression cells do not provide a direct solution. Neither any solution such that the information loss due to range publication is minimized while satisfying confidentiality protection rules exists. In this research, we evaluate a heuristically feasible method using currently available complementary suppression cell selection software Disclosure Analysis (DiAna) and list our findings by applying the heuristic to a subset of a ES-202 data set.
NTIS
Heuristic Methods; Policies; Protection

20090005171 Bureau of Labor Statistics, Washington, DC, USA
Decision Criteria for Using Automated Coding in Survey Processing
Gillman, D. W.; January 2008; 6 pp.; In English
Report No.(s): PB2008-106214; No Copyright; Avail.: CASI: A02, Hardcopy

Some survey data are classified into pre-specified categories during a process known as coding. If a computer assigns codes without human interaction, then this is called automated coding. Manual coding, computer-assisted manual coding, and interactive coding all require some level of human interaction. The decision to employ automated coding in survey processing is not simple. There are many options and expenses to consider. Some of these are as follows: (1) who develops the software; (2) what is an acceptable error rate; (3) how will errors be controlled; (4) what percent of the cases must the automated coder classify; (5) how much maintenance will a production system require; and (6) what new resources must be developed to build an automated coder. These criteria and others are described in this paper. A cost model is developed along with a description

of the interactions between the criteria. Finally, some examples are given to show how the model might be employed by a survey organization.
NTIS
Coding; Surveys

20090005172 Bureau of Labor Statistics, Washington, DC, USA
Comparison of Variance Estimation Techniques for a Price Index with Dependent Weights
Toftness, R. W.; January 2008; 7 pp.; In English
Report No.(s): PB2008-106215; No Copyright; Avail.: CASI: A02, Hardcopy

We present an economic approach to variance estimation of price indexes, applied to import and export trade. Instead of generating weights and price changes independently, we generate one total share value for each period for each industry, using a Gamma model of log trade dollar values, and then we calculate base period weights and quantities based on the Fisher model. To generate price changes, a spike at 0% is estimated; then positive and negative price changes are modeled separately, with the model chosen depending on the industry. The variance estimation methods explored are: the Ratio Biased, the Taylor Linearized, the Stratified Randomly Grouped, and the Stratified Jackknife.
NTIS
Cost Analysis; Economics; Estimating; International Trade

20090005192 Bureau of Labor Statistics, Washington, DC, USA
Estimation of Variance Components for the U.S. Consumer Price Index: A Comparative Study
Shoemaker, O. J.; January 2001; 6 pp.; In English
Report No.(s): PB2008-105415; No Copyright; Avail.: CASI: A02, Hardcopy

For every new sample for the commodities and services (C and S) component of the U.S. Consumer Price Index (CPI), the Bureau of Labor Statistics attempts to produce a C and S sample design that allocates outlets and quotes in an optimal fashion. This item-outlet optimization C and S sample design requires the estimation of components of variance for the three factors in the design: non-certainty primary sampling units (PSUs), item-strata and outlets. The fourth component of variance is the error term. To produce these components of variance, a Random Effects model is chosen, with the independent random variable for the model an individual price change. Weighted Restricted Maximum Likelihood (REML) estimates are used to calculate the variance components. This paper compares an earlier set of variance components obtained from 1993-96 CPI data with an updated set of variance components obtained from 1997-2000 CPI data. We compare and critique the methodologies used as well as the empirical results obtained.
NTIS
Consumers; Cost Analysis; Sampling

20090005193 Bureau of Labor Statistics, Washington, DC, USA
Estimating Variance in the National Compensation Survey, Using Balanced Repeated Replication
Guciardo, C. J.; January 2008; 6 pp.; In English
Report No.(s): PB2008-105416; No Copyright; Avail.: CASI: A02, Hardcopy

The National Compensation Survey (NCS) currently uses Taylor series linearization to estimate variances of mean wages and total employment. Since Taylor series estimators depend on the form (ratio or total) of a parameter, they can become quite complex for certain other NCS parameters, such as pay relatives. Pay relatives are indexes relating locality to national pay: cells are weighted by national employment and hours. Consequently, future NCS variance estimation will be done using Fay's variation of balanced repeated replication (BRR). This paper presents BRR formulas and discusses how variance strata and PSUs are defined for different parameters. For means and totals, BRR is straightforward, except that locality and national estimates require different variance PSUs, variance strata, and Hadamard matrices. BRR is more complex for pay relatives, however, because they are functions of both locality and national parameters. Half-samples are defined using a hybrid Hadamard matrix that references both locality and national variance strata.
NTIS
Estimating; Linearization; Taylor Series

20090005195 Bureau of Labor Statistics, Washington, DC, USA

Retrospective Assignment of Permanent Random Numbers for Ohlsson's Exponential Sampling Overlap Maximization Procedure for Designs with More Than One Sample Unit per Stratum

Ernst, L. R.; January 2008; 6 pp.; In English

Report No.(s): PB2008-105418; No Copyright; Avail.: CASI: A02, Hardcopy

Until recently, all of the procedures developed for maximizing the overlap of sample units for two or more stratified designs with the samples selected sequentially, destroyed the independence of sampling from stratum to stratum for all but the first sample selected, unless the stratifications were identical or variable sample sizes were allowed. This independence is needed to guarantee the validity of the usual variance estimation procedures. Ohlsson (1996, 1999, 2000) has developed a simple overlap procedure, applicable to a wide variety of designs, that preserves this independence. This procedure, which he calls exponential sampling, uses transformed permanent random numbers (PRNs) to select each sample. For situations where exponential sampling has not been used to select the first sample, Ohlsson (1996) has developed a method, for one sample unit per stratum designs only, for retrospectively assigning the PRNs after the initial sample has been drawn and then selecting subsequent samples using these PRNs and exponential sampling. In this paper we generalize this result of Ohlsson by demonstrating how to retrospectively assign PRNs for designs of more than one unit per stratum.

NTIS

Random Numbers; Sampling; Strata

20090005234 NASA Goddard Space Flight Center, Greenbelt, MD USA

Split-Remerge Method for Eliminating Processing Window Artifacts in Recursive Hierarchical Segmentation

Tilton, James C., Inventor; 9 Mar. 06; 41 pp.; In English

Patent Info.: Filed Filed 30 Sep. 05; US-Patent-Appl-SN-11-251 530; US 2006/0050984

Report No.(s): PB2008-101722; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005234

A method, computer readable storage, and apparatus for implementing recursive segmentation of data with spatial characteristics into regions including splitting-remerging of pixels with contagious region designations and a user controlled parameter for providing a preference for merging adjacent regions to eliminate window artifacts.

Author

Image Processing; Segments; Recursive Functions; Data Processing; Windows (Computer Programs)

20090006032 Environmental Protection Agency, Washington, DC, USA

Data Quality Assessment: A Reviewer's Guide (EPA QA/G-9R)

Feb. 2006; 62 pp.; In English

Report No.(s): PB2009-102259; EPA/240/B-06/002; No Copyright; Avail.: CASI: A04, Hardcopy

This document is the 2006 version of the 'Data Quality Assessment: A Reviewers Guide' which provides general guidance to organizations on assessing data quality criteria and performance specifications for decision making. The Environmental Protection Agency (EPA) has developed a process for performing the Data Quality Assessment (DQA) Process for project managers and planners to determine whether the type, quantity, and quality of data needed to support Agency decisions have been achieved. This guidance is the culmination of experiences in the design and statistical analyses of environmental data in different Program Offices at the EPA. Many elements of prior guidance, statistics, and scientific planning have been incorporated into this document. This document is intended to be a 'living document' that will be updated periodically to incorporate new topics and revisions or refinements to existing procedures.

NTIS

Environmental Quality; Data Processing

20090006531 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Electronic Warfare for Cyber Warriors

Rauch, Daniel E; Jun 2008; 31 pp.; In English; Original contains color illustrations

Report No.(s): AD-A487250; AFIT/ICW/ENG/08-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487250

This research paper provides complete course content for the AFIT EENG 509, Electronic Warfare class. It is intended as a replacement for the existing course and designed for Intermediate Developmental Education (IDE) students in the Cyber Warfare degree program. This course provides relevant academic courseware and study material to give cyber warriors an

academic and operational perspective on electronic warfare and its integration in the cyber domain.
DTIC
Education; Electronic Warfare

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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.

20090005047 Cornell Univ., Ithaca, NY USA
CASTOR: Widely Distributed Scalable Infospaces
Birman, Ken; Nov 2008; 227 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-06-2-0060; Proj-ICED
Report No.(s): AD-A490941; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Cornell University Castor project was funded over a two-year period to create new technical options aimed at demanding event-notification settings. Applications of this type are common in warfighting and other DoD settings but currently are limited by inadequate scalability, reliability and poor performance. Castor accomplished all goals originally stated in the SOW and in fact went beyond expectations. The team delivered a wide range of cutting-edge solutions, some of which are finding rapid uptake by major AF technology vendors. Our work has received keen interest from the very highest levels of industry, including CTO-level staff at the Air Force itself as well as Intel, Microsoft, Amazon, Red Hat, Cisco and we are collaborating closely with these and other vendors, including IBM and Raytheon. The final status report summarizes accomplishments and includes copies of some of the major publications by our group. Much of the software we developed is available for download from Cornell, as is a video demonstration of the Live Objects technology, which was briefed to the AF CTO, Mr. Kent Werner, in Spring 2008.
DTIC
Software Development Tools; Information Systems

20090005078 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil
A Methodology based on Statistics Models and Neural Networks to the Software Project Development Effort Estimation
deBarcelosTronto, Iris Fabiana; [2007]; 161 pp.; In Portuguese; Original contains color and black and white illustrations
Report No.(s): INPE-15144-TDI/1276; Copyright; Avail.: CASI: C01, CD-ROM; A08, Hardcopy

Software effort estimation is an important part of software development work and provides essential input to project feasibility analyses, bidding, budgeting and planning. The consequences of inaccurate estimates can be severe. Optimistic estimates may cause significant losses while the pessimistic estimates may lead to loss of existing and future contracts. Unfortunately, it is common for software development projects to overrun their effort estimates, typically because the estimates are too optimistic. This thesis presents a methodology based on statistical and neural networks methods to provide more accurate effort estimates in a simpler way. The goal of this research is to contribute to reduce estimation error in software development projects by better understanding the different software effort estimation models and techniques that include: artificial neural networks, case-based reasoning techniques, regression-based models, and techniques for integrating analysis of residuals, analysis of variance and regression-based models. Several case studies have been conducted. The results show all the proposed models lead to realistic estimations, however, neural networks based models emerge as a very easy tool for local models calibration processes due to its simpler implementation. The case studies show all the models are sensitive to the available data, thus requiring recalibration processes every since new project data area gathered to the database
Author
Computer Programming; Cost Analysis; Neural Nets; Project Management; Software Engineering; Statistical Analysis; Cost Estimates; Estimating

20090005117 Naval Postgraduate School, Monterey, CA USA
Visual Meta-Programming Notation
Auguston, Mikhail; Jan 2001; 13 pp.; In English
Report No.(s): AD-A488019; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA488019

This paper describes a draft of visual notation for meta-programming. The main suggestions of this work include

specialized data structures (lists, tuples, trees), data item associations that provide for creation of arbitrary graphs, visualization of data structures and data flows, graphical notation for pattern matching (list, tuple, and tree patterns, graphical notation for context free grammars, streams), encapsulation means for hierarchical rules design, two-dimensional data-flow diagrams for rules, visual control constructs for conditionals and iteration, default mapping results to reduce real-estate requirements for diagrams, and dynamic data attributes. Two-dimensional data flow diagrams improve readability of a meta-program. The abstract syntax type definitions for common programming languages and related default mappings (parsing and de-parsing) provide for a pracically feasible reuse of those components.
DTIC
Programming Languages; Grammars; Data Bases

20090005831 Program Executive Officer Simulation Training and Implementation, Orlando, FL USA
Army Simulation Program Balances Agile and Traditional Methods With Success
Surdu, John; Parsons, Doug J; Apr 2006; 6 pp.; In English
Report No.(s): AD-A488195; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The One Semi-Automated Forces (OneSAF) Objective System is the next generation simulation system planned to provide the U.S. Army with an entity-level simulation to serve three modeling and simulation domains. Software development of the OneSAF application has been conducted in a highly robust systems engineering environment based on commercial and government best practices. The OneSAF program has tailored techniques of Extreme Programming (XP) and other agile methods into a development environment that has resulted in several industry awards, most recently the National Training Systems Association Cross Function Award for the Integrated Product Team. These externally certified Capability Maturity Model Integration Level 5 processes are credited with successful program execution. This article will discuss which XP and other agile techniques were used, which were not, and why.
DTIC
Computer Programming; Simulation; Software Engineering

20090005936 Carnegie-Mellon Univ., Pittsburgh, PA USA
Developing a Complete and Effective ACT-R Architecture
Anderson, John R; Lebiere, Christian; Jan 2008; 40 pp.; In English
Contract(s)/Grant(s): FA8650-05-C-7254; Proj-DRPA
Report No.(s): AD-A487480; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Carnegie Mellon University team focused on extending their current cognitive architecture, ACT-R, to show how visual imagery, language, emotion and meta-cognition affect learning, memory, and reasoning. The architectural modules are associated with the processes of the basal ganglia, anterior cingulate, amygdala, and the motor, occipital, prefrontal, and parietal cortices.
DTIC
Algorithms; Cognition; Neurology

20090005965 NASA Goddard Space Flight Center, Greenbelt, MD, USA
cFE/CFS (Core Flight Executive/Core Flight System)
Oral/Visual Presentation
Wildermann, Charles P.; November 13, 2008; 10 pp.; In English; Flight Software Workshop 2008, 13-14 Nov. 2008, Laurel, MD, USA; Original contains color illustrations; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005965

This viewgraph presentation describes in detail the requirements and goals of the Core Flight Executive (cFE) and the Core Flight System (CFS). The Core Flight Software System is a mission independent, platform-independent, Flight Software (FSW) environment integrating a reusable core flight executive (cFE). The CFS goals include: 1) Reduce time to deploy high quality flight software; 2) Reduce project schedule and cost uncertainty; 3) Directly facilitate formalized software reuse; 4) Enable collaboration across organizations; 5) Simplify sustaining engineering (AKA. FSW maintenance); 6) Scale from small instruments to System of Systems; 7) Platform for advanced concepts and prototyping; and 7) Common standards and tools across the branch and NASA wide.
Derived from text
Software Engineering; Space Flight; Computer Programs; Flight Control; Systems Integration; Operating Systems (Computers)

20090005968 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Provenance in Data Interoperability for Multi-Sensor Intercomparison
Oral/Visual Presentation
Lynnes, Chris; Leptoukh, Greg; Berrick, Steve; Shen, Suhung; Prados, Ana; Fox, Peter; Yang, Wenli; Min, Min; Holloway, Dan; Enloe, Yonsook; December 15, 2008; 1 pp.; In English; American Geophysical Union Meeting, 15-19 Dec. 2008, San Francisco, CA, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

As our inventory of Earth science data sets grows, the ability to compare, merge and fuse multiple datasets grows in importance. This requires a deeper data interoperability than we have now. Efforts such as Open Geospatial Consortium and OPeNDAP (Open-source Project for a Network Data Access Protocol) have broken down format barriers to interoperability; the next challenge is the semantic aspects of the data. Consider the issues when satellite data are merged, cross-calibrated, validated, inter-compared and fused. We must match up data sets that are related, yet different in significant ways: the phenomenon being measured, measurement technique, location in space-time or quality of the measurements. If subtle distinctions between similar measurements are not clear to the user, results can be meaningless or lead to an incorrect interpretation of the data. Most of these distinctions trace to how the data came to be: sensors, processing and quality assessment. For example, monthly averages of satellite-based aerosol measurements often show significant discrepancies, which might be due to differences in spatio- temporal aggregation, sampling issues, sensor biases, algorithm differences or calibration issues. Provenance information must be captured in a semantic framework that allows data inter-use tools to incorporate it and aid in the intervention of comparison or merged products. Semantic web technology allows us to encode our knowledge of measurement characteristics, phenomena measured, space-time representation, and data quality attributes in a well-structured, machine-readable ontology and rulesets. An analysis tool can use this knowledge to show users the provenance-related distrintions between two variables, advising on options for further data processing and analysis. An additional problem for workflows distributed across heterogeneous systems is retrieval and transport of provenance. Provenance may be either embedded within the data payload, or transmitted from server to client in an out-of-band mechanism. The out of band mechanism is more flexible in the richness of provenance information that can be accomodated, but it relies on a persistent framework and can be difficult for legacy clients to use. We are prototyping the embedded model, incorporating provenance within metadata objects in the data payload. Thus, it always remains with the data. The downside is a limit to the size of provenance metadata that we can include, an issue that will eventually need resolution to encompass the richness of provenance information required for daata intercomparison and merging.
Author
Interoperability; Earth Sciences; Metadata; Multisensor Applications; Computer Networks

20090005988 Center for Naval Analyses, Alexandria, VA USA
EINSTein Goes to War: A Primer on Ground Combat Models
Fredlake, Christopher P; Wang, Kai; Sep 2008; 71 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00014-05-D-0500; Proj-RO148
Report No.(s): AD-A488178; CIM-D0018865.A1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this CNA Information Memorandum (CIM), we present a primer on ground combat models with a brief history of combat modeling, a survey of some recent models used by the Department of Defense (DoD). Because many DoD combat models use Lanchester-type equations in their attrition calculations; we discuss examples of Lanchester-type equations and their limitations. The second part of the report focuses on a multiagent-based model, EINSTein (or Enhanced ISAAC Neural Simulation Toolkit, ISAAC refers to Irreducible Semi-Autonomous Adaptive Combat). We review a few recent CNA studies using EINSTein to show how EINSTein can be used to examine small-unit ground combat. To get interested readers started with using EINSTein, we show a brief tutorial on setting up and using the program to explore some basic ground combat scenarios.
DTIC
Combat; Simulation

20090006041 Office of the Assistant Secretary of Defense Networks and Information Integration, Washington, DC USA
Systems Engineering for the Global Information Grid: An Approach at the Enterprise Level
Kern, Patrick M; Oct 2007; 4 pp.; In English
Report No.(s): AD-A487616; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487616

Because the numerous USA Department of Defense (DoD) and Intelligence Community (IC) networks were originally built to serve many different constituencies, making the Global Information Grid (GIG) a reality requires solving

interoperability and performance issues at the enterprise level. This will be accomplished through the use of systems engineering a discipline whose techniques manage the complexity of systems from abstraction to decomposition. The GIG Technical Foundation (GTF) addresses a number of systems engineering challenges involving focus, evolution, coverage, and applicability.
DTIC
Interoperability; Systems Engineering; Telecommunication

20090006083 Army Research Lab., Adelphi, MD USA
The ARL RaprEdt Tool -- A Graphical Editor for Creating Real-Time Application Representative (RAPR) Files
Nguyen, Binh Q; Sep 2008; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488021; ARL-TR-4600; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA488021

The U.S. Army Research Laboratory (ARL) designed and developed a tool called the ARL Real-time Application Representative (RaprEdt) tool to support the emulation of communication scenarios by providing a method for rapidly creating critical files that are required for using the RAPR Version 1.0, a product of the U.S. Naval Research Laboratory (NRL). This report documents the functional behavior of the ARL RaprEdt tool and describes its graphical user interfaces (GUIs).
DTIC
Communication Networks; Editing; Graphical User Interface; Real Time Operation

20090006093 Army Research Lab., Adelphi, MD USA
pyGFC - A Python Extension to the C++ Geodesy Foundation Classes
Nguyen, Binh Q; Sep 2008; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488020; ARL-TR-4623; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA488020

This report describes the results of the development of the pyGFC module, including the multi-step procedure and the implemented computer code. The pyGFC module is a Python extension to the C++ Geodesy Foundation Class, which has been used in the range model of the Mobile Ad-hoc Network (MANET) Emulation (MANE) software system that enables the dynamic connectivity of a MANET system in the Wireless Emulation Laboratory of the U.S. Army Research Laboratory (ARL). The pyGFC module was created to support the visualization of network topologies using the ARL Topodef tool, a graphical design and animation tool for custom-designing and editing a mobility scenario to create specific network topologies.
DTIC
C (Programming Language); C++ (Programming Language); Geodesy

20090006105 Michigan State Univ., East Lansing, MI USA
Revising Distributed UNITY Programs is NP-Complete
Bonakdarpour, Borzoo; Kulkarni, Sandeep S; Jan 2008; 14 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0744
Report No.(s): AD-A488092; MSU-CE-TR-08-24; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We focus on automated revision techniques for adding Unity properties to distributed programs. We show that unlike centralized programs where multiple safety properties and one progress property can be added in polynomial-time, addition of a safety or a progress Unity property to distributed programs is significantly more difficult. Precisely, we show that such addition is NP-complete in the size of the given program's state space. We also propose an efficient symbolic heuristic for addition of a leads-to property to distributed programs, which has applications in automated program synthesis.
DTIC
Computer Programming; Polynomials; Automatic Control; Distributed Processing

20090006107 West Desert Test Center, Dugway Proving Ground, UT USA
A New M&S Tool to Supplant Decontamination Testing: The Decontamination Efficacy Prediction Model (DEPM)
Carter, Leonard N; Hayes, Ted; Dec 13, 2006; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490988; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490988

What is the Decontamination Efficacy Prediction Model (DEPM)? *The DEPM is a software tool design to simulate the

decontamination of material items. *It provides a 'Virtual Chamber' to subject simulated items to the four key phases: ^Contamination, ^Aging, ^Decontamination, ^Residual Hazard.
DTIC
Decontamination; Mathematical Models; Simulation

20090006117 Carnegie-Mellon Univ., Pittsburgh, PA USA
File System Virtual Appliances: Third-Party File System Implementations Without the Pain
Abd-El-Malek, Michael; Wachs, Matthew; Cipar, James; Ganger, Gregory R; Gibson, Garth A; Reiter, Michael K; May 2008; 24 pp.; In English
Contract(s)/Grant(s): DAAD19-02-1-0389
Report No.(s): AD-A491071; CMU-PDL-08-106; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491071

File system virtual appliances (FSVAs) address a major headache faced by third-party FS developers: OS version compatibility. By packaging their FS implementation in a VM, separate from the VM that runs user applications, they can avoid the need to provide an FS port for every kernel version and OS distribution. A small FS-agnostic proxy maintained by the core OS developers, connects the FSVA to whatever kernel version the user chooses. Evaluation of prototype FSVA support in Linux, using Xen as the VM platform, demonstrates that this separation can be efficient and maintain desired OS and virtualization features. Using three existing file systems and a cooperative caching extension as a case study, we demonstrate that the FSVA architecture can insulate FS implementations from user OS differences that would otherwise require explicit porting changes.
DTIC
Pain

20090006118 Army Tank-Automotive Research and Development Command, Warren, MI USA
Soldier/Hardware-in-the-loop Simulation-based Combat Vehicle Duty Cycle Measurement: Duty Cycle Experiment 2
Brudnak, Mark; Mar 25, 2007; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491077; TARDEC-17007-RC; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491077

Duty Cycle: Definition *A military vehicle's duty cycle is specific to the mission and platform type but is a design- and configuration-independent representation of events and circumstances which affect power consumption. *Such events and circumstances encompass (1) vehicle operation along the course such as speed, grade, turning, turret/gun activity, and gun firing plus (2) external scenario components that affect power consumption like incoming rounds, ambient temperature, and soil conditions. *The event inputs can be distance based when the vehicle is moving or time based when the vehicle is stationary, or even triggered with some other state condition.
DTIC
Combat; Distributed Interactive Simulation; Simulation

20090006132 Marine Corps Development and Education Command, Quantico, VA USA
Basic Expeditionary Airfield Resource (BEAR) Requirements Analysis Tool (BRAT)
Hunt, Andrew W; Jan 2008; 31 pp.; In English
Report No.(s): AD-A491134; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491134

The analytical community in the Air Force is recognizing the need for high quality logistics inputs into detailed operational analysis. As such, there is a need for logistics tools used to formulate those inputs.
DTIC
Airports; Spreadsheets

20090006134 Indiana Univ.-Purdue Univ., Indianapolis, IN USA
Modeling QoS Parameters in Component-Based Systems
Gopalakrishna, Praveen; Aug 2004; 102 pp.; In English
Report No.(s): AD-A491138; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491138

Current trends in the software development are focused on creating systems by integrating previously developed software

components. This approach aids in the reusability of the code and helps to reduce the cost of software development. In addition to the functionality a component offers, it may contain the necessary code for measuring how well the functionality will be achieved during the execution. This gives rise to the notion of quality of service (QoS) offered by a component -- latency, throughput, capacity, precision, etc., are a few examples of QoS parameters. Many applications, such as multi-media, emphasize and require a certain level of the QoS offered by components. Thus, it is critical to model the QoS, at an appropriate level of an abstraction, during the modeling of component-based systems. Such a modeling will not only assist the component developers but also emphasize the need for integrating the QoS during the development and implementation phases of the software design. In this thesis, an approach based on a unified framework (UniFrame) is proposed to model the QoS parameters in component-based systems. The approach involves QoS concepts relevant for specifying QoS, a UML profile for representing the concepts, integrating the QoS specification with the functional specification and mapping the specification manually onto the code of the component.
DTIC
Computer Programming; Computer Programs; Software Engineering

20090006183 Imagination Engines, Inc., Saint Charles , MO USA
Operational Test Command (OTC) Analytic Simulation and Instrumentation Suite (OASIS) Brings Live Players to the Modeling Architecture for Technology, Research, and EXperimentation (MATREX) and Other Benefits of MATREX-OASIS Teaming
Smith, Gary M; Snively, Keith D; Smith, Jimmie S; Butler, Lori A; Dec 2007; 26 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491275; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In February 2007, the Program Manager for Modeling Architecture for Technology and Research EXperimentation, (MATREX) a Research, Development and Engineering Command (RDECOM) effort contacted the US Army Operational Test Command (USAOTC) to determine and explore potential partnering and teaming opportunities. Specifically, whether or not there was a way to incorporate a richer live integration into the MATREX federation. Finally, guided by the requirements of their customers, USAOTC decided in 2005 to pursue linking these systems together through the MATREX Federation Object Model (FOM) and run-time infrastructure (RTI) to create a true system of systems (SoS) test capability under a program called OASIS Integration. Both organizations were also linked through the Cross Command Collaboration Effort (3CE), which seeks to leverage and enable cross-command connectivity, collaborative requirements determination, common hardware, software solutions, and collaboration tools that are derived from common analytic requirements for test, evaluation, and analysis. The MATREX and USAOTC Modeling and Simulation (M&S) technologists met to discuss each programs' capabilities, requirements, and plans. Several areas were identified as holding potential benefit to both organizations. This paper identifies these and other benefits of this cooperative effort. While OTC and RDECOM obviously benefit by this partnering and teaming, other commands and programs will realize benefits to their efforts as well.
DTIC
Distributed Interactive Simulation; Interoperability; Oases; Simulation

20090006261 309th Software Maintenance Group (SMXG), Hill AFB, UT USA
Designing in UML with the Team Software Process
Webb, David R; Lipkin, Ilya; Samurin-Shraer, Evgeniy; Mar 2006; 6 pp.; In English
Report No.(s): AD-A489123; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA489123

The Team Software Process (trademark) (TSP (trademark)) is a good project management tool that enforces a disciplined approach to software engineering, drastically improving cost and schedule performance and the production of quality products. One of the ways TSP improves product quality is through an emphasis on design. A heavy design emphasis is also the hallmark of the newer programming environments. This article examines how modern design techniques can be used on a TSP project.
DTIC
Computer Programming; Project Management; Quality Control; Software Engineering

20090006263 Carnegie-Mellon Univ., Pittsburgh, PA USA

Correctness of the Read/Conditional-Write and Query/Update Protocols

Abd-El-Malek, Michael; Ganger, Gregory R; Goodson, Garth R; Reiter, Michael K; Wylie, Jay J; Sep 2005; 37 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0389; FA8750-04-01-0238

Report No.(s): AD-A490223; CMU-PDL-05-107; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490223

The Read/Conditional-Write (R/CW) protocol provides linearizable reads and conditional-writes of individual objects. A client's conditional-write of an object succeeds only if the object has not been conditionally written since it was last read by the client. In this sense, R/CW semantics are similar to those of a compare-and-swap register. If a conditional-write does not succeed, it aborts. The R/CW protocol supports multi-object reads and conditional-writes; such operations are strictly serializable. A variant of the R/CW protocol, the Query/Update (Q/U) protocol, provides an operations-based interface to clients: clients invoke query and update methods on objects rather than reading and writing objects in their entirety. The R/CW and Q/U protocols are correct in the asynchronous timing model and tolerate Byzantine failures of clients and servers.

DTIC

Client Server Systems; Computer Systems Design; Computers; Distributed Processing; Fault Tolerance; Protocol (Computers)

20090006264 Carnegie-Mellon Univ., Pittsburgh, PA USA

Improving Small File Performance in Object-Based Storage

Hendricks, James; Sambasivan, Raja R; Sinnamohideen, Shafeeq; Ganger, Gregory R; May 2006; 22 pp.; In English

Contract(s)/Grant(s): F49620-01-1-0433; DAAD19-02-1-0389

Report No.(s): AD-A490224; CMU-PDL-06-104; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490224

This paper proposes architectural refinements, server-driven metadata prefetching, and namespace flattening for improving the efficiency of small file workloads in object-based storage systems. Server-driven metadata prefetching consists of having the metadata server provide information and capabilities for multiple objects, rather than just one, in response to each lookup. Doing so allows clients to access the contents of many small files for each metadata server interaction, reducing access latency and metadata server load. Namespace flattening encodes the directory hierarchy into object IDs such that namespace locality translates to object ID similarity. Doing so exposes namespace relationships among objects (e.g., as hints to storage devices), improves locality in metadata indices, and enables use of ranges for exploiting them. Trace-driven simulations and experiments with a prototype implementation show significant performance benefits for small file workloads.

DTIC

Client Server Systems; Computer Storage Devices; Data Storage; Metadata

20090006279 Wireless \@ Virginia Tech., Blacksburg, VA USA

Trade Study of Implementation of Software Defined Radio (SDR): Fundamental Limitations and Future Prospects

Bostian, Charles W; Reed, Jeffrey H; Nealy, J R; Ge, Feng; Mays, Julia; Neel, James; Dec 9, 2008; 124 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): W31P4Q-07-C-0210; ARPA ORDER-AF89-00

Report No.(s): AD-A491778; 430304; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491778

Software Defined Radio (SDR) technology is commonly advocated for waveform and frequency-agile radios. It works well for simple signals and limited bandwidths, less so for complex broadband waveforms. Whether these difficulties reflect theoretical limits or design choices was unknown since few quantified limits exist. Using literature surveys and analysis this report explores fundamental limits to SDR bandwidth and waveform complexity, design trade-offs, closeness of current technology to these limits, and future trends. For fixed front ends, SDR bandwidth is limited by analog-to-digital converter (ADC) bandwidth, dynamic range, and aperture jitter. The last dominates ADC fabrication limitations and GSM-like dynamic range for 2.5 GHz digitized bandwidths is theoretically impossible - not a fabrication limitation. Flexible front-ends are important as 2nd-order products limit practical instantaneous bandwidth to less than an octave. Increasing parallelism should improve processor performance until 2025, reaching a limit of 15 nanowatts per million multiply-and-accumulate operations per second. Multicore processors will alleviate latency.

DTIC

Radio Equipment; Radio Transmission; Software Development Tools

20090006284 Electronic Systems Center, Hanscom AFB, MA USA

Results of SEI Independent Research and Development Projects

de Niz, Dio; Eagles, Sherman; Feiler, Peter H; Goodenough, John; Hanason, Joergen; Jones, Paul; Kazman, Rick; Klein, Mark; Lee, Insup; Moreno, Gabriel; Dec 2008; 66 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8721-05-C-0003

Report No.(s): AD-A491814; CMU/SEI-2008-TR-025; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491814

The Software Engineering Institute (SEI) annually undertakes several independent research and development (IRAD) projects. These projects serve to (1) support feasibility studies investigating whether further work by the SEI would be of potential benefit and (2) support further exploratory work to determine whether there is sufficient value in eventually funding the feasibility study work as an SEI initiative Projects are chosen based on their potential to mature and/or transition software engineering practices develop information that will help in deciding whether further work is worth funding and set new directions for SEI work This report describes the IRAD projects that were conducted during fiscal year 2008 (October 2007 through September 2008).

DTIC

Architecture (Computers); Computer Programming; Research; Software Engineering

20090006290 Defence Science and Technology Organisation, Victoria, Australia

Evaluation of the C* Model for Addressing Short Fatigue Crack Growth

Walker, K F; Hu, W; Oct 2008; 56 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491888; DSTO-TR-2185; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491888

The C* model has been proposed to account for the breakdown of K-similitude which occurs for short cracks. The model is based on the concept that crack growth rate is dependent not only on the stress intensity factor range, but also on crack length. This report evaluates the C* model using experimental data from the open literature. For comparison, two other models, the El Haddad model and the FASTRAN model, were also evaluated for their capability in dealing with the same problem. The objective of the evaluation was to assess the performance of the C* model compared with the other two models in treating short and long crack growth in a unified manner, and to illustrate their merits and shortcomings. For the cases tested, the C* model was found to be ineffective in resolving the issue of breakdown of similitude for short cracks, and was of less practical use than the other models.

DTIC

Computer Programs; Crack Propagation; Fatigue (Materials); Fatigue Life

20090006292 Army Research Lab., Aberdeen Proving Ground, MD USA

IChart: A Graphical Tool to View and Manipulate Force Management Structure Databases

Brundick, Frederick S; Hartwig, Jr , George W; Chamberlain, Samuel C; Sep 2008; 64 pp.; In English

Contract(s)/Grant(s): Proj-8TVOVC

Report No.(s): AD-A491913; ARL-TR-4610; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491913

Maintaining a high-resolution force structure that may be shared among various organizations is a difficult task. One approach is to design databases which store Global Force Management (GFM) data in the form of time-based tree graphs, using enterprise identifiers (EIDs) as unique surrogate keys. This report is the manual, users' guide, and general documentation for the IChart application, which is intended to be a guide and demonstration of the utility of the GFM Force Structure Construct, to include EIDs and time-based tree graphs. IChart is written in Java and communicates with a MySQL database server. A glossary is included to explain common object-oriented programming and database terms and concepts.

DTIC

Data Bases; Manipulators

20090006376 Carnegie-Mellon Univ., Pittsburgh, PA USA

Routing, Disjoint Paths, and Classification

Zhou, Shuheng; Aug 2006; 203 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0389

Report No.(s): AD-A490548; CMU-PDL-06-109; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this thesis, the authors study two classes of problems: routing and classification. Routing problems include those that

concern the tradeoff between routing table size and short-path forwarding (Part I), and the classic Edge Disjoint Paths problem (Part II). Both have applications in communications networks, especially in overlay networks, and in large and high-speed networks, such as optical networks. The third part of this thesis concerns a type of classification problem that is motivated by a computational biology problem, where it is desirable that a small amount of genotype data from each individual is sufficient to classify individuals according to their populations of origin.
DTIC
Classifications; Communication Networks; Genetics; Problem Solving

20090006404 Naval Research Lab., Monterey, CA USA
Applying Infinite State Model Checking and Other Analysis Techniques to Tabular Requirements Specifications of Safety-Critical Systems
Bultan, Tevfik; Heitmeyer, Constance; Jan 2006; 38 pp.; In English
Contract(s)/Grant(s): NSF-CCF-0341365; CCF-0614002
Report No.(s): AD-A492019; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Although it is most often applied to finite state models, in recent years, symbolic model checking has been extended to infinite state models using symbolic representations that encode infinite sets. This paper investigates the application of an infinite state symbolic model checker called Action Language Verifier (ALV) to formal requirements specifications of safety-critical systems represented in the SCR 'Software Cost Reduction' tabular notation. After reviewing the SCR method and tools, the Action Language for representing state machine models, and the ALV infinite state model checker, the paper presents experimental results of formally analyzing two SCR specifications using ALV. The application of ALV to verify or falsify 'by generating counterexample behaviors' the state and transition invariants of SCR specifications and to check Disjointness and Coverage properties is described. The results of formal analysis with ALV are then compared with the results of formal analysis using techniques that have been integrated into the SCR toolset. Based on the experimental results, strengths and weaknesses of infinite state model checking with respect to other formal analysis approaches such as explicit and finite state model checking and theorem proving are discussed.
DTIC
Computer Programs; Safety; Specifications

20090006458 Indiana Univ.-Purdue Univ., Indianapolis, IN USA
The Uniframe Mobile Agent Based Resource Discovery Service
Gandhamaneni, Jayasree; Jun 28, 2004; 252 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0746
Report No.(s): AD-A492290; TR-CIS-1122-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The development of a Distributed Computing System (DCS) using geographically scattered heterogeneous software components is a growing trend. The UniFrame paradigm provides an approach for automatic or semi-automatic creation of a DCS by seamless integration of software components taking into account both functional and non-functional (such as QoS) requirements. UniFrame uses the UniFrame Resource Discovery Service (URDS) for dynamic discovery and selection of components that are deployed on the network. The entities involved in the URDS uses request-reply based communication to accomplish their tasks. These discovery entities periodically discover newt registered components from the native registries. They require certain amount of network resources to effectively discover components. Also, the native registries may decide to offer differentiated services to different discovery entities based on pre- determined policies. The UniFrame Mobile Agent based Resource Discovery Service (MURDS) project addresses the issues related to network resource consumption and heterogeneous policies by replacing the request-reply based communication in the URDS with the mobile agent-based communication. A prototype is designed and experimented with to validate the inclusion of mobile agents in the URDS architecture. The results obtained indicate that the mobile agent-based communication is comprehensive enough to reduce network resource consumption and to interoperate with the native registries that offer differentiated service to different discovery entities.
DTIC
Computer Programs; Distributed Processing; Geography

20090006459 Indiana Univ.-Purdue Univ., Indianapolis, IN USA

Uniframe Resource Discovery Service Monitoring and Management System

Reddy, Srikanth; Apr 7, 2005; 194 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0746

Report No.(s): AD-A492292; TR-CIS-0411-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Application development and deployment is moving from centralized sequential systems towards parallel and Distributed Computing Systems (DCS), and there has been a growing trend of developing software systems using a Component-based Software Development (CBSD) approach. UniFrame is one such approach providing a seamless framework for constructing a DCS by semi-automatic integration of heterogeneous distributed software components. UniFrame Resource Discovery Service (URDS) is the constituent of UniFrame, responsible for discovering software components. Since URDS consists of many concurrent processes, understanding its execution behavior is a major challenge. Such a discovery service requires a framework that provides information about the execution behavior of the software system. The research of this project designs and implements such a monitoring framework, UniFrame Resource Discovery Service - Monitoring and Management System (URDSMMS) for the URDS. The monitoring framework includes the tasks of collecting dynamic behavioral data, interpretation of this data, and display of the processed information. A user interface was also developed for easy operation of the monitoring system. To ascertain the benefits of this monitoring system, an experimental analysis using the prototype has also been performed.

DTIC

Computer Programs; Distributed Processing; Management Planning; Management Systems

20090006463 Indiana Univ.-Purdue Univ., Indianapolis, IN USA

Glue Generation Framework in Uniframe for the CORBA-Java/RMI Interoperability

Tammala, Kalpana; May 25, 2004; 171 pp.; In English

Contract(s)/Grant(s): N00014-01-1-0746

Report No.(s): AD-A492304; TR-CIS-0302-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Software realization of a Distributed Computing System (DCS) is typically achieved by integrating independently created and deployed components with one another to form a coalition of distributed software components. The UniFrame approach provides a seamless framework for achieving a DCS by automatic or semi-automatic integration of heterogeneous distributed components white taking into account their QoS (Quality of Service). Any integration of heterogeneous components raises interesting challenges, such as tackling differences in Syntax/Signature, Semantic, Protocol and the underlying component model. This project addresses the heterogeneity related to the underlying component models employed by Java RMI and CORBA. It proposes a framework to generate Glue code for interoperating between Java RMI and CORBA components. The Glue Generation architecture uses pre-defined code generation templates. The research also experiments with various choices for the placement of the generated glue code. A prototype is designed and experimented with to validate the Glue Generation architecture. The results obtained indicate that the Glue Generation architecture is comprehensive enough to enable the Java RMI and CORBA interoperability.

DTIC

Architecture (Computers); Computer Programs; Distributed Processing; Glues; Interoperability

20090006464 RAND Corp., Santa Monica, CA USA

The RAND SLAM Program

Klerman, Jacob A; Ordowich, Christopher; Bullock, Arthur M; Hickey, Scot; Jan 2008; 190 pp.; In English

Contract(s)/Grant(s): W74V8H-06-C-0002

Report No.(s): AD-A492306; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report describes the RAND SLAM program. The RAND SLAM program allows an analyst to explore the trade-offs inherent in military force structure decisions. More specifically, the program allows an analyst to examine trade-offs among cost, stress, and risk when the requirement for deployed forces varies over time. The RAND SLAM program's unique features allow an analyst to study the effects of varying military requirements on force structure decisions. Optimal force structures can vary dramatically depending on the nature of the threat. For this reason, the RAND SLAM program models contingencies stochastically, acknowledging that military requirements vary unpredictably over time and allowing an analyst to study the implications. The report contains a number of illustrative analyses focusing on the force structure of the U.S. Army. Many of the analyses that have been performed in support of force structure decisions have been very narrowly focused. The power of the RAND SLAM program is that it allows an analyst to perform many different types of analysis under almost any set of assumptions. The program's primary focus is allowing an analyst to determine the lowest-cost force structure for a given

requirement and stress level. However, the program can also perform many other types of analyses, such as determining the effect of different requirements on stress levels for a given force structure. The RAND SLAM program was designed to provide as much flexibility as possible. The user determines both the unit of analysis and the time resolution for each set of simulation runs. The program is capable of utilizing any unit of analysis -- individual, company, battalion, brigade, etc. -- and modeling any time resolution -- days, months, quarters, years, etc. The RAND SLAM program allows the user to move beyond the typical analysis of finding the optimal active-reserve mix. The user can create new types of forces and examine their attractiveness under varying assumptions.
DTIC
Computer Programs; Cost Effectiveness; Risk; Supersonic Low Altitude Missile

20090006469 Indiana Univ.-Purdue Univ., Indianapolis, IN USA
An Access Control Model for the Uniframe Framework
Crespi, Alexander M; May 2005; 305 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0746
Report No.(s): AD-A492318; TR-CIS-0411-05; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Component-based software development, while offering a potential solution for the creation of complex distributed systems, requires a framework for specifying component properties such that the behaviors of a system may be analyzed before composition and verified during operation With much energy expended on verifying security properties of software systems, a means of composing a system's security characteristics from the properties of individual components would aid in the creation of more secure systems In this thesis, a framework for characterizing the access control properties of distributed software components along with a compositional model for predicting system characteristics are presented The proposed framework will address the following issues: a) development of a means of specifying access control properties for individual components and integrated systems, b) extension of the UniFrame Resource Discovery Service to facilitate searching for components with required access control properties, and c) the creation of composition models for predicting the system behavior with respect to access control properties and access control policies. Component and system specifications are based on logic programming and Temporal Logic of Action in order to provide a means for model-checking and verification A simple student information system case study is used as the context for describing and testing this access control framework.
DTIC
Access Control; Computer Programming; Software Engineering

20090006470 Alabama Univ., Birmingham, AL USA
Formal Methods for Quality of Service Analysis in Component-Based Distributed Computing
Yang, Chunmin; Bryant, Barrett R; Burt, Carol C; Raje, Rajeev R; Olson, Andrew M; Auguston, Mikhail; Dec 2003; 10 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): DAAD19-00-1-0350; N00014-01-1-0746
Report No.(s): AD-A492337; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Component-Based Software Architecture is a promising solution for distributed computing. To develop high quality software, analysis of non-functional aspects of the software properties (also called Quality of Service or QoS) is very important. The UniFrame research project proposes a Unified Component Meta-Model Framework (UniFrame) that includes QoS contracts. A classification of QoS parameters, both static and dynamic, relevant to component-based distributed computing is proposed and represented formally using Two-Level Grammar (TLG), an object-oriented formal specification language. TLG may be transformed into both a UML model, augmented with OCL constraints, and executable code in the Java programming language. This may be regarded as standardized code for implementation of the distributed application with dynamic measurement of the QoS aspects incorporated. The approach is consistent with OMG's Model Driven Architecture (MDA) in that QoS properties may be specified at the Platform Independent Model (PIM) level and then carried down to the Platform Specific Model (PSM) level in implementation.
DTIC
Distributed Processing; Grammars

20090006550 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Developing a Reference Framework for Cybercraft Trust Evaluation

Hunt, Shannon E; Mar 2008; 98 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-08-198

Report No.(s): AD-A487127; AFIT/GCS/ENG/08-11; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487127

It should be no surprise that Department of Defense (DoD) and U.S. Air Force (USAF) networks are the target of constant attack. As a result, network defense remains a high priority for cyber warriors. On the technical side, trust issues for a comprehensive end-to-end network defense solution are abundant and involve multiple layers of complexity. The Air Force Research Labs (AFRL) is currently investigating the feasibility of a holistic approach to network defense, called Cybercraft. We envision Cybercraft to be trusted computer entities that cooperate with other Cybercraft to provide autonomous and responsive network defense services. A top research goal related to Cybercraft centers around how we may examine and ultimately prove features related to this root of trust. In this work, we investigate use-case scenarios for Cybercraft operation with a view towards analyzing and expressing trust requirements inherent in the environment. Based on a limited subset of functional requirements for Cybercraft in terms of their role, we consider how current trust models may be used to answer various questions of trust between components. We characterize generic model components that assist in answering questions regarding Cybercraft trust and pose relevant comparison criteria as evaluation points for various (existing) trust models. The contribution of this research is a framework for comparing trust models that are applicable to similar network-based architectures. Ultimately, we provide a reference evaluation framework for how (current and future) trust models may be developed or integrated into the Cybercraft architecture.

DTIC

Security; Computer Networks; Architecture (Computers)

62
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.

20090005114 Air Force Materiel Command, Wright-Patterson AFB, OH USA

Cyber Warfare: Protecting Military Systems

Alford, Lionel D; Jan 2000; 22 pp.; In English; Original contains color illustrations

Report No.(s): AD-A487951; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487951

Software is a key component in nearly every critical system used by the Department of Defense. Attacking the software in a system-cyber warfare- is a revolutionary method of pursuing war. This article describes various cyber warfare approaches and suggests methods to counter them.

DTIC

Computer Programs; Military Operations; Warfare

20090005923 Air Force Research Lab., Rome, NY USA

Distributed Episodic Exploratory Planning (Deep)

Carozzoni, Joseph A; Lawton, James H; DeStefano, Chad; Ford, Anthony J; Hudack, Jeffrey W; Lachevet, Kurt K; Staskevich, Gennady R; Oct 2008; 44 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): Proj-558S

Report No.(s): AD-A490293; AFRL-RI-RS-TR-2008-279; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490293

This report describes an overview and the progress to date of the Distributed Episodic Exploratory Planning (DEEP) project. DEEP is a mixed-initiative decision support system that utilizes past experiences to suggest courses of action for new situations. It has been designed as a distributed multi-agent system, using agents to maintain and exploit the experiences of individual commanders as well as to transform suggested past plans into potential solutions for new problems. The system is

mixed-initiative in the sense that a commander, through his or her agent, can view and modify the contents of the shared repository as needed. The agents interact through a common knowledge repository, represented by a blackboard in the initial architecture. The blackboard architecture is well suited for dealing with ill-defined, complex situations such as warfare.
DTIC
Analogies; Decision Support Systems

20090005948 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Evolution of Web Services in EOSDIS: Search and Order Metadata Registry (ECHO)
Mitchell, Andrew; Ramapriyan, Hampapuram; Lowe, Dawn; [2009]; 2 pp.; In English; No Copyright; Avail.: CASI: A01, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005948

During 2005 through 2008, NASA defined and implemented a major evolutionary change in it Earth Observing system Data and Information System (EOSDIS) to modernize its capabilities. This implementation was based on a vision for 2015 developed during 2005. The EOSDIS 2015 Vision emphasizes increased end-to-end data system efficiency and operability; increased data usability; improved support for end users; and decreased operations costs. One key feature of the Evolution plan was achieving higher operational maturity (ingest, reconciliation, search and order, performance, error handling) for the NASA s Earth Observing System Clearinghouse (ECHO). The ECHO system is an operational metadata registry through which the scientific community can easily discover and exchange NASA's Earth science data and services. ECHO contains metadata for 2,726 data collections comprising over 87 million individual data granules and 34 million browse images, consisting of NASA s EOSDIS Data Centers and the USA Geological Survey's Landsat Project holdings. ECHO is a middleware component based on a Service Oriented Architecture (SOA). The system is comprised of a set of infrastructure services that enable the fundamental SOA functions: publish, discover, and access Earth science resources. It also provides additional services such as user management, data access control, and order management. The ECHO system has a data registry and a services registry. The data registry enables organizations to publish EOS and other Earth-science related data holdings to a common metadata model. These holdings are described through metadata in terms of datasets (types of data) and granules (specific data items of those types). ECHO also supports browse images, which provide a visual representation of the data. The published metadata can be mapped to and from existing standards (e.g., FGDC, ISO 19115). With ECHO, users can find the metadata stored in the data registry and then access the data either directly online or through a brokered order to the data archive organization. ECHO stores metadata from a variety of science disciplines and domains, including Climate Variability and Change, Carbon Cycle and Ecosystems, Earth Surface and Interior, Atmospheric Composition, Weather, and Water and Energy Cycle. ECHO also has a services registry for community-developed search services and data services. ECHO provides a platform for the publication, discovery, understanding and access to NASA s Earth Observation resources (data, service and clients). In their native state, these data, service and client resources are not necessarily targeted for use beyond their original mission. However, with the proper interoperability mechanisms, users of these resources can expand their value, by accessing, combining and applying them in unforeseen ways.
Derived from text
EOS Data and Information System; Metadata; Web Services; Ecosystems; Earth Sciences

20090005986 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
A Multilayer Graph Approach to Correlating Network Events with Operational Mission Impact
Shaw, Al; Mills, Robert; Mullins, Barry; Hopkinson, Kenneth; Jul 1, 2008; 29 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488162; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Often called the 'holy grail' of network management is the problem of how to provide automated support in detecting computer network outages and degradations. Current methods for this type of problem are mostly manual in nature. Network Management Services technologies allow increased visibility and control but cannot relate network status to mission capabilities as the information is simply not present in the network. Goal of research presented is to create a framework for establishing traceability between systems, processes, and operational tasks and missions.
DTIC
Communication Networks; Computer Networks; Correlation; Interlayers; Systems Management

20090006091 Army Research Lab., Adelphi, MD USA

Design Approaches for Stealthy Probing Mechanisms in Battlefield Networks

Ganesh, Shriram; Natu, Maitreya; Sethi, Adarshpal; Hardy, Rommie; Gopaul, Richard; Sep 2008; 12 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011

Report No.(s): AD-A487967; ARL-RP-0227; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487967

Various approaches have been proposed in the past for monitoring a network to diagnose failures and performance bottlenecks. One such approach for efficient and effective monitoring is probing. Probes such as ICMP pings are an effective tool for detecting network nodes that have been compromised by an attacker who tries to delay or drop traffic passing through the captured node. However, an intelligent attacker may evade detection by giving preferential treatment to probe traffic. This is usually possible because probe packets have a different format from regular application packets and easily distinguishable. Hence, it is important to probe in a stealthy manner so as to avoid identification of probes by an attacker and to ensure the collection of accurate system health statistics. In this report, we review design approaches for generating stealthy probes and describe various possible mechanisms that can be used for such a design. These approaches are evaluated according to the design criteria and we identify what may be feasible solutions for stealthy probing in battlefield ad-hoc wireless networks. DTIC

Communication Networks; Stamping

20090006239 California Univ., Davis, CA USA

A Survey of Dynamic Spectrum Access: Signal Processing and Networking Perspectives

Zhao, Qing; Swami, Ananthram; Apr 2007; 5 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): DAAD19-01-2-0011

Report No.(s): AD-A491642; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this paper, we provide a survey of dynamic spectrum access techniques. Various approaches envisioned for dynamic spectrum access are broadly categorized under three models: dynamic exclusive use model, open sharing model, and hierarchical access model. Based on this taxonomy, we provide an overview of the technical challenges and recent advances under each model.

DTIC

Electromagnetic Spectra; Signal Processing; Spectra; Spectrum Analysis; Surveys

20090006262 Carnegie-Mellon Univ., Pittsburgh, PA USA

On Hierarchical Routing in Doubling Metrics

Gupta, Anupam; Maggs, Bruce M; Zhou, Shuheng; Dec 2004; 26 pp.; In English

Contract(s)/Grant(s): DAAD19-02-1-0389

Report No.(s): AD-A490222; CMU-PDL-04-106; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA490222

This paper studies the problem of routing in doubling metrics, and shows how to perform hierarchical routing in such metrics with small stretch and compact routing tables (i.e., with a small amount of routing information stored at each vertex). DTIC

Computer Networks; Distributed Processing; Packet Switching

20090006275 Los Alamos National Lab., NM USA

Preventing Bandwidth Abuse at the Router through Sending Rate Estimate-based Active Queue Management

Ramaswamy, Venkatesh; Cuellar, Leticia; Eidenbenz, Stephan; Hengartner, Nicolas; Jun 2007; 7 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491757; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491757

We propose a rigorous mathematical interpretation of a novel family of Active Queue Management schemes, called Sending Rate Estimate based Queue Management (SREQM) scheme, that aims to provide fair bandwidth allocation to all the flows in a router by estimating the flow sending rates, while maintaining only minimal per-flow state information. We propose an optimized implementation of SREQM, called Fair Sending Rate Estimate based Queue Management (FSREQM) scheme,

and show through comparative simulation that FRESQM is the only scheme among those tested that successfully prevents bandwidth abuse while maintaining high link utilization.
DTIC
Bandwidth; Internets; Protocol (Computers)

20090006281 Massachusetts Inst. of Tech., Cambridge, MA USA
A Network Management Architecture for Robust Packet Routing in Optical Access Networks
Medard, Muriel; Lumetta, Steven; Li, Liuyang; Mar 5, 2001; 36 pp.; In English
Contract(s)/Grant(s): MDA972-99-1-0005
Report No.(s): AD-A491806; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491806

We describe an architecture for optical local area network (LAN) or metropolitan area network (MAN) access. The architecture allows for bandwidth sharing within a wavelength and is robust to both link and node failures. The architecture can be utilized with an arbitrary, link-redundant mesh network 'node-redundancy is necessary only to handle all node failures', and assumes neither the use of a star topology nor the ability to embed such a topology within the physical mesh. Reservation of bandwidth is performed in a centralized fashion at a 'replicated' head end node, simplifying the implementation of complex sharing policies relative to implementation on a distributed set of routers. Unlike a router, however, the head end does not take any action on individual packets and, in particular, does not buffer packets. The architecture thus avoids the difficulties of processing packets in the optical domain while allowing for packetized shared access of wavelengths. In this paper, we describe the route construction scheme and prove its ability to recover from single link and single node failures, outline a flexible medium access protocol and discuss the implications for implementing specific policies, and propose a simple implementation of the recovery protocol in terms of state machines for per-link devices.
DTIC
Local Area Networks; Optical Properties

20090006390 Aptima, Inc., Washington , DC USA
Maritime Domain Awareness (MDA) Process Engineering Workshop, 15-17 January 2008
Freeman, Jared; Heacox, Nancy; MacKinnon, Douglas J; Jan 18, 2008; 48 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N00039-07-WRFN-M21
Report No.(s): AD-A491955; NPS-IS-08-007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This document reports findings from an MDA Process Engineering Workshop (PEW) hosted by the Naval Postgraduate School 15-17 January 2008. The objectives of the PEW were to: * Refine, extend, and validate a process model of Maritime Domain Awareness * Define attributes of the activities that constitute MDA, specifically information requirements, processing activities, products, and resource (time, manning) requirements * Specify which MDA activities may benefit from Spiral 1 technologies, and develop concepts for assessing that utility * Identify barriers to fielding MDA Spiral 1 technologies Representatives of the following organizations participated in the PEW: ASN RDA, C3F, COTF, Dept. of the Under Secretary of the Navy, DISA, HFE LLC, JITIC, METRON, MIFCLANT, MIFCPAC, NAVCENT, NAVNETWARCOM, NCIS, NORTHCOM, NPS, NRL, NWDC, ONI, OPNAV, PMW 120, and SPAWAR. Also participating were subject matter experts (SMEs) from several of the MDA Spiral 1 technologies, domain experts (gray beards), representatives from the Trident Warrior 2008 (TW08) operational experiment where many of the MDA Spiral 1 technologies will be assessed, and members of the assessment team (NPS, Aptima, Pacific Sciences & Engineering, WBB Inc.).
DTIC
Product Development; Systems Engineering

20090006448 Naval Postgraduate School, Monterey, CA USA
A Network Layer Protocol for UANs to Address Propagation Delay Induced Performance Limitations
Xie, Geoffrey G; Gibson, John H; Nov 2001; 9 pp.; In English
Report No.(s): AD-A492249; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper provides a description of a novel network layer protocol for underwater acoustic networking (UAN) that provides a mechanism for network control and management enabling the implementation of responsive, self-configuring, adaptable, and scalable networks whose performance are predictable. The protocol draws from the demonstrated efficiencies of multi-protocol labeled switching, dynamic source routing, and multi-constraint based resource allocation schemes. The paper describes the expected benefits of establishing full duplex functionality between network nodes and presents some of

the preliminary simulation findings regarding the viability of autonomously determining the network topology utilizing the full duplex node connections.
DTIC
Protocol (Computers); Topology

20090006467 Indiana Univ.-Purdue Univ., Indianapolis, IN USA
The Uniframe .Net Web Service Discovery Service
Berbeco, Robert W; Jun 27, 2003; 125 pp.; In English
Contract(s)/Grant(s): N00014-01-1-0746
Report No.(s): AD-A492316; TR-CIS-0630-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Microsoft .NET allows the creation of distributed systems in a seamless manner Within NET small, discrete applications, referred to as Web services, are utilized to connect to each other or larger applications over a local or wide area network connection through HTTP. The Web services are written in Extensible Markup Language (XML) and registered with Internet Information Server (IIS), and can be applied in numerous fashions This project uses the NET capabilities to create a distributed discovery service (called as UNWSDS) that is an integral part of the UniFrame Approach The UniFrame Approach (UA) provides a comprehensive framework which incorporates a meta-component model; a resource discovery service, called the UniFrame Resource Discovery Service (URDS); and generative programming and Quality of Service (QoS) to allow seamless interoperation of heterogeneous distributed components The proposed UNWSDS incorporates the extensibility of Microsoft .NET through XML web services and distributed MS SQL 2000 servers into the URDS A prototype is designed and implemented to validate the proposed UNWSES The results of this approach enable extending of UniFrame to incorporate .NET as another component model in it.
DTIC
Internets; Local Area Networks; Programming Languages; Web Services

20090006530 Naval Postgraduate School, Monterey, CA USA
Performance Limits of Fair-Access in Sensor Networks with Linear and Selected Grid Topologies
Gibson, John; Xie, Geoffrey G; Xiao, Yang; Nov 2007; 7 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487232; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487232

This paper investigates fundamental performance limits of medium access control (MAC) protocols for multi-hop sensor networks. A unique aspect of this study is the modeling of a fair access criterion requiring that sensors have an equal rate of frame delivery to the base station. Tight upper bounds on network utilization and tight lower bounds on minimum time between samples are derived for fixed linear and grid topologies. The significance of these bounds is two-fold: First, they are universal, i.e., they hold for any MAC protocol. Second, they are provably tight, i.e., they can be achieved by a version of time division multiple access (TDMA) protocol that is self-clocking, and therefore does not require system-wide clock synchronization. The paper also examines the implication of the end-to-end performance bounds regarding the traffic rate and sensing time interval of individual sensors.
DTIC
Topology; Wireless Communication; Computer Networks

20090006549 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Scripted Mobile Network Routing in a Contested Environment
Otto, Anthony R; Mar 2008; 58 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487114; AFIT/GIR/ENG/08-03; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487114

Mobile wireless network protocols currently run on optimistic routing algorithms, adjusting node connectivity only when the chosen connectivity metrics, such as signal strength, pass beyond minimum thresholds. Optimistic routing has several weaknesses. Optimistic routing suffers from increased network overhead during increased frequency of node movement increased node density per area, and optimistic routing suffers from non-optimistic access change for individual nodes. The overall communication throughput of a network may be increased if the network topology change is scripted; a scripted plan can allow messages to travel along a more efficient topological path while creating less topology control traffic. This would increase the overall network bandwidth and may be an alternative solution to current network routing problems such as route loop creation. This thesis tested a network with scripted movement against an unscripted network in a simple network

featuring mobility, for increases in bandwidth due to scripted node access changes over optimistic access changes. The results showed significant improvement in the data throughput in the scripted network when there were multiple overlapping networks contending for the same node.
DTIC
Communication Networks; Mobile Communication Systems; Wireless Communication

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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*.

20090005854 NASA, Washington, DC USA
Method and associated apparatus for capturing, servicing and de-orbiting earth satellites using robotics
Cepollina, Frank J., Inventor; Burns, Richard D., Inventor; Holz, Jill M., Inventor; Corbo, James E., Inventor; Jedhrich, Nicholas M., Inventor; October 21, 2008; 49 pp.; In English
Patent Info.: Filed February 2, 2007; US-Patent-7,438,264; US-Patent-Appl-SN-11/670,781; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005854

This invention is a method and supporting apparatus for autonomously capturing, servicing and de-orbiting a free-flying spacecraft, such as a satellite, using robotics. The capture of the spacecraft includes the steps of optically seeking and ranging the satellite using LIDAR; and matching tumble rates, rendezvousing and berthing with the satellite. Servicing of the spacecraft may be done using supervised autonomy, which is allowing a robot to execute a sequence of instructions without intervention from a remote human-occupied location. These instructions may be packaged at the remote station in a script and uplinked to the robot for execution upon remote command giving authority to proceed. Alternately, the instructions may be generated by Artificial Intelligence (AI) logic onboard the robot. In either case, the remote operator maintains the ability to abort an instruction or script at any time, as well as the ability to intervene using manual override to teleoperate the robot.In one embodiment, a vehicle used for carrying out the method of this invention comprises an ejection module, which includes the robot, and a de-orbit module. Once servicing is completed by the robot, the ejection module separates from the de-orbit module, leaving the de-orbit module attached to the satellite for de-orbiting the same at a future time. Upon separation, the ejection module can either de-orbit itself or rendezvous with another satellite for servicing. The ability to de-orbit a spacecraft further allows the opportunity to direct the landing of the spent satellite in a safe location away from population centers, such as the ocean.
Official Gazette of the U.S. Patent and Trademark Office
Autonomy; Orbital Rendezvous; Robotics; Spacecraft Maintenance; Spacecraft Reentry

20090005985 Army Research Lab., Adelphi, MD USA
Detecting Planar Surfaces in Outdoor Urban Environments
David, Philip; Sep 2008; 26 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-8FEPMA
Report No.(s): AD-A488059; ARL-TR-4599; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We describe an approach to automatically detect building facades in images of urban environments. This is an important problem in vision-based navigation, landmark recognition, and surveillance applications. In particular, with the proliferation of GPS- and camera-enabled cell phones, a backup geolocation system is needed when GPS satellite signals are blocked in so-called ‘urban canyons.’ Image line segments are first located, and then the vanishing points of these segments are determined using the RANSAC robust estimation algorithm. Next, the intersections of line segments associated with pairs of vanishing points are used to generate local support for planar facades at different orientations. The plane support points are then clustered using an algorithm that requires no knowledge of the number of clusters or of their spatial proximity. Finally, building facades are identified by fitting vanishing point-aligned quadrilaterals to the clustered support points. Our experiments show good performance in a number of complex urban environments. The main contribution of our approach is its improved performance over existing approaches while placing no constraints on the facades in terms of their number or orientation, and minimal constraints on the length of the detected line segments.
DTIC
Buildings; Cities; Detection; Image Processing; Planar Structures

20090006040 Army Tank-Automotive Research and Development Command, Warren, MI USA
Tank Automotive Research, Development and Engineering Center (TARDEC) Technology Focus
Jul 2, 2008; 40 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487613; TARDEC-18942RC; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487613

This presentation was made at a joint meeting of the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC) and the German Federal Office of Defense Technology and Procurement [Bundesamt fur Wehrtechnik und Beschaffung (BWB)]. The agenda covered U.S. basis for cooperative research and development, technology integration, condition based maintenance, ground vehicle survivability, ground vehicle power and mobility, and intelligent ground systems.
DTIC
Automobiles; Germany

20090006088 Air Force Research Lab., Kirkland AFB, NM USA
A Comparison of Multi-Frame Blind Deconvolution and Speckle Imaging Energy Spectrum Signal-to-Noise Ratios (Preprint)
Matson, Charles L; Sep 11, 2008; 14 pp.; In English
Contract(s)/Grant(s): 701944; Proj-2311
Report No.(s): AD-A487955; AFRL-RD-PS-TP-2008-1005; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487955

An analytical signal-to-noise ratio (SNR) expression is derived for unbiased estimates of energy spectra obtained using multi-frame blind deconvolution (MFBD) algorithms. Because an analytical variance expression cannot, in general, be derived, Cramer-Rao lower bounds are used in place of the variances. As a result, the SNR expression provides upper bounds to the achievable SNRs that are independent of the MFBD algorithm implementation. The SNR expression is evaluated for the scenario of ground-based imaging of astronomical objects. It is shown that MFBD energy-spectrum SNRs are usually greater, and often much greater, than their corresponding speckle imaging (SI) energy-spectrum SNRs at all spatial frequencies. One reason for this SNR disparity is that SI energy spectrum SNRs are proportional to the object energy spectrum and the ensemble-averaged atmosphere energy spectrum, while MFBD SNRs are approximately proportional to the square root of these quantities. Another reason for this SNR disparity is that single-frame SI energy spectrum SNRs are limited above by one, while the MFBD energy-spectrum SNRs are not.
DTIC
Atmospheric Circulation; Energy Spectra; Image Processing; Imaging Techniques; Signal to Noise Ratios

20090006089 Air Force Research Lab., Kirkland AFB, NM USA
An Algorithm-Independent Analysis of the Quality of Images Produced Using Multi-Frame Blind Deconvolution Algorithms--Conference Proceedings (Postprint)
Matson, Charles; Haji, Alim; Sep 1, 2007; 10 pp.; In English
Contract(s)/Grant(s): DF701944; Proj-2311
Report No.(s): AD-A487956; AFRL-RD-PS-TP-2008-1006; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487956

Multi-frame blind deconvolution (MFBD) algorithms can be used to generate a deblurred image of an object from a sequence of short-exposure and atmospherically-blurred images of the object by jointly estimating the common object and all the blurring functions. In this paper we present fundamental limits (Cramer-Rao lower bounds) to the quality of restored images generated with MFBD algorithms. We show that image restorations are less noisy when using a Zemike-based point spread function (PSF) parameterization than when using a pixel-based PSF parameterization. We also show that the most noise reduction tends to occur near the edges of the true object support, even when a larger support region is used as a constraint. Finally, we show that Zernike-based PSF parameterization produces higher resolution in restored images than does pixel-based PSF parameterization.
DTIC
Algorithms; Atmospheric Circulation; Conferences; Cramer-Rao Bounds; Restoration

20090006090 Air Force Research Lab., Kirkland AFB, NM USA

A Fast and Optimal Multi-Frame Blind Deconvolution Algorithm for High-Resolution Ground-Based Imaging of Space Objects--Journal Article

Matson, Charles L; Borelli, Kathy; Jefferies, Stuart; Beckner, Jr , Charles C; Hege, E K; Lloyd-Hart, Michael; Apr 1, 2008; 47 pp.; In English

Contract(s)/Grant(s): DF701944; Proj-2311

Report No.(s): AD-A487957; AFRL-RD-PS-TP-2008-1007; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487957

We report on a multi-frame blind deconvolution algorithm that we have developed for imaging through the atmosphere. The algorithm has been parallelized to a significant degree for execution on high-peformance computer, with an emphasis on distributed-memory systems so that it can be hosted on commodity clusters. As a result, image restorations can be obtained in seconds to minutes. We have compared the quality of its output to the associated Crammer-Rao lower bounds and demonstrated that, for the cases we have tested, it achieves or closely approaches these bounds. In this paper, we describe the algorithm and its parallelization in detail, demonstrate the scalability of its parallelization across associated Crammer-Rao lower bounds, and present image restorations obtained using data collected with ground-based telescopes.

DTIC

Algorithms; Atmospheric Circulation; High Resolution; Image Processing; Imaging Techniques

20090006206 TRADOC Analysis Command, Monterey, CA USA

Military Applications of Agent-Based Simulations

Cioppa, Thomas M; Lucas, Thomas W; Sanchez, Susan M; Jan 2004; 11 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491458; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There continues to be increasing interest from a broad range of disciplines in agent-based and artificial life simulations. This includes the Department of Defense--which uses simulations heavily in its decision making process. Indeed, military conflicts can have many attributes that are consistent with complex adaptive systems--such as many entities interacting with some degree of autonomy, each of which is continually making decisions to satisfy a variety of sometimes conflicting objectives. In this paper, we present three applications of agent-based simulations used to analyze military problems. The first uses the MANA model to explore the ability of the U.S. Army's network-based Future Force to perform with degraded communications. The second studies how unmanned surface vehicles can be used in force protection missions with the Pythagoras model. The last example examines the standard Army squad size with an integrated effort using MANA, Pythagoras, and the high-resolution simulation JANUS.

DTIC

Computerized Simulation; Military Technology; Simulation

20090006210 Army Research Lab., Aberdeen Proving Ground, MD USA

A Comparison of Soldier Performance in a Moving Command Vehicle Under Manned, Teleoperated, and Semi-Autonomous Robotic Mine Detector System Control Modes

Scribner, David R; Dahn, David; Sep 2008; 52 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491479; ARL-TR-4609; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Soldiers will be required to perform missions using remote technology with increasing frequency as the U.S. Army transforms. Soldiers will be asked to carry out missions that will require them to be at greater standoff distance at the cost of degraded sensory information and resulting limited system performance. Historically, teleoperated systems have had capabilities that are twice the error rate and time required to perform a mission. This is due to the limited field of view, depth perception, vestibular cues, and other immersion reducing characteristics of remote operation. The need to provide operational improvements to the historically degraded teleoperation mode is being recognized by the U.S. Army in many areas, including route clearing and mine detection systems. The Robotic Mine Detection System (RMDS) has provided a system for mine detection and lane marking that allows several modes of operation that are purported to reduce soldier workload and error. These models include manned operation, teleoperation with cruise control, and semi-automous path following. The path following mode is a GPS following mode that allows the Soldier to alter the lateral vehicle course in discrete control inputs known as 'biasing' or 'bumping'. The study was designed to examine these modes of operation comparing the subjective workload, stress, and motion sickness as well as course completion time, average speed, and driving error in terms of lateral drift. Soldiers were asked to operate the RMDS over a secondary course while maintaining proper speed and road edge following under all four conditions. Data for vehicle position and speed were collected at a rate of 5 Hz while subjective

ratings of workload, stress, and motion sickness were collected at the mid-and end-points of the course runs. Participants were seven U.S. Army Soldiers and one Department of Defense civilian recruited from Ft. Belvoir, MD.
DTIC
Autonomy; Detection; Military Personnel; Mine Detectors; Robotics; Teleoperators

20090006222 Connecticut Center for Advanced Technology, Hartford, CT USA
National Aerospace Leadership Initiative - Phase I
Mansfield, Jr , Robert E; Dalton, Jeffrey; Churchill, Philip; Sep 30, 2008; 251 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA9550-05-1-0345
Report No.(s): AD-A491548; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The first phase of the multi-phase National Aerospace Leadership Initiative (NALI) has been completed. Four major tasks were initiated and carried out under NALI Phase I. In Task I, the foundation for the National Center for Aerospace Leadership has been established and important outreach and educational programs were conducted. Significant accomplishments in gas turbine engine modeling and in factory simulation and modeling has been made in Task II. Task III resulted in the formation of a world-class Laser Applications Laboratory that, combined with modeling and simulation, is key to transitioning next generation manufacturing technologies to small-medium size U.S. aerospace manufacturers. In Task IV, the basis for development of advanced visualization and decision support tool prototypes to improve total supply chain enterprise effectiveness has been established. The efforts were carried out by the NALI Consortium member companies: Connecticut Center for Advanced Technology (CCAT), Avetec Inc., and Concurrent Technologies Corp. (CTC)
DTIC
Aerospace Industry; Leadership; Technology Transfer

20090006289 New Mexico Univ., Albuquerque, NM USA
Using Structured Knowledge Representation for Context-Sensitive Probabilistic Modeling
Sakhanenko, Nikita A; Luger, George F; Jan 2008; 30 pp.; In English
Contract(s)/Grant(s): FA8750-06-C-0016
Report No.(s): AD-A491876; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491876

We propose a context-sensitive probabilistic modeling system (COSMOS) that reasons about a complex, dynamic environment through a series of applications of smaller, knowledge-focused models representing contextually relevant information. COSMOS uses a failure-driven architecture to determine whether a context is supported and consequently whether the current model remains applicable. The individual models are specified through sets of structured, hierarchically organized probabilistic logic statements using transfer functions that are then mapped into a representation supporting stochastic inferencing. We demonstrate COSMOS using data from a mechanical pump system.
DTIC
Knowledge Representation; Models; Sensitivity; Stochastic Processes; Transfer Functions

20090006559 University of Central Florida, Orlando, FL USA
Needle in the Haystack Secure Communication
Li, Guifang; Oct 2008; 12 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8750-07-1-0203; Proj-66SG
Report No.(s): AD-A487560; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Needle in-Haystack (NIH) is a novel physical layer secure optical data encryption scheme is investigated. NIH hides information in classical generated noise in such a way that it is indistinguishable form that noise, unless a key is possessed by a legitimate user allowing extraction of the information.
DTIC
Needles

20090006566 Assistant Secretary of the Army (Acquisition, Logistics and Technology), Fort Belvoir, VA USA
Multifunctional Utility/Logistics and Equipment (MULE) Vehicle Will Improve Soldier Mobility, Survivability and Lethality
Byers, D B; Jun 2008; 4 pp.; In English
Report No.(s): AD-A490301; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490301

The Army is on the cusp of a paradigm shift. It has been mandated that one-third of Army vehicles are to be robotic beginning in 2015. So what progress is the Army making? Just around the corner is a new breed of robots that will impact how the Army moves and fights. This journal article describes the MULE. The MULE is the multifunctional vehicle developed by Lockheed Martin Missiles and Fire Control (LM MFC) as part of the Army's Future Combat Systems (FCS) program. The MULE is a family of unmanned ground vehicles (UGVs) that will be in the 7,000 pound class of medium robots. Within 20 years, the MULE will be commonplace in every brigade in the Army. What makes these systems unique is the mobility, processing power, networked connectivity, and robot size. The MULE family consists of three robotic vehicles: the MULE Transport (MULE-T), the MULE Countermine (MULE-C), and the Armed Robotic Vehicle-Assault (Light) (ARV-A(L)). Each variant will lighten Soldier burdens in the near future. The MULE family is based on a common mobility platform that serves as the vehicle's backbone. The common mobility platform is a 6-wheeled chassis housing power and propulsion systems, computers, Autonomous Navigation System (ANS) hardware, and vehicle cooling components. By using this common mobility platform, maintenance will be simplified and common across formations. This will ease logistics burdens for multiple spare parts as well as decrease the amount of training Soldiers will need to conduct repairs. Power and propulsion within the common mobility platform will provide a vehicle that has extreme capabilities for its weight. With its engineering model, the Engineering Evaluation Unit (EEU), the MULE has demonstrated power to tow a vehicle 3.5 times heavier than itself. This flexibility will allow the robot to support limited vehicle recovery operations within brigades, freeing Soldiers and equipment from these dull and sometimes dangerous tasks.
DTIC
Autonomous Navigation; Cargo; Countermeasures; Lethality; Logistics; Mobility; Reconnaissance; Robots; Unmanned Ground Vehicles

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NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20090005111 Liverpool Univ., UK
Computation of the Dual Frame: Forward and Backward Greville Formulas
Gan, Lu; Ling, Cong; Apr 2007; 5 pp.; In English
Report No.(s): AD-A490569; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490569

We study the computation of the dual frame for oversampled filter banks (OFBs) by exploiting Greville's formula, which was derived in 1960 to compute the pseudo inverse of a matrix when a new row is appended. In this paper, we first develop the backward Greville formula to handle the case of row deletion. Based on Greville's formula, we then study the dual frame computation of the Laplacian pyramid. Through the backward Greville formula, we investigate OFBs for robust transmission over erasure channels. The necessary and sufficient conditions for OFBs robust to one erasure channel are derived. A post-filtering structure is also presented to implement the dual frame when the transform coefficients in one subband are completely lost.
DTIC
Signal Processing; Computation; Matrices (Mathematics); Deletion

20090006283 Naval Air Warfare Center, Patuxent River, MD USA
Calculation of Impedance Matrix Inner Integral to Prescribed Precision
Asvestas, John S; Yankovich, Stephen; Allen, Oliver E; Dec 18, 2008; 91 pp.; In English
Report No.(s): AD-A491811; NAWCADPAX/TR-2008/227; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491811

We present a new method for evaluating the inner integral of the impedance matrix element in the traditional

Rao-Wilton-Glisson formulation of the method of moments for perfect conductors. In this method we replace the original integrand (modified by a constant phase factor) by its Taylor series and keep enough terms to guarantee a number of significant digits in the integration outcome. We develop criteria that relate the number of Taylor terms to the number of required significant digits. We integrate the leading Taylor terms analytically and the rest through iteration formulas. We show that the iteration formulas converge for all observation points within a sphere with a radius of half-a-wavelength and center the triangle's centroid. We compare results of our method with existing ones and find them in excellent agreement. Outside this sphere, we employ a set of triangle cubatures of increasing size together with a convergence criterion to determine the integration outcome to a prescribed number of significant digits. By designing appropriate numerical experiments using a set of 25 triangles and about 10,000 observation points, we define spherical regions of space where a cubature of minimum size will provide a desired number of significant digits. The approach is quite general but we demonstrate it explicitly by using seven significant digits as the required accuracy.
DTIC
Impedance; Matrix Theory; Numerical Analysis; Taylor Series

20090006396 Marine Corps Development and Education Command, Quantico, VA USA
Expeditionary Fire Support System
Philipp, Steven A; Feb 6, 2006; 14 pp.; In English
Report No.(s): AD-A491974; USMC-EWS-2006; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Since the early 1970's, mortars have not complemented the Marine Corps Artillery Table of Equipment (TE). Expeditionary Fire Support System (EFSS) program will acquisition a mortar into service within the Marine Artillery community. This is not a new concept, but one that the Marine Artillery units will revisit. Thirty years ago 107mm Mortar, Whiskey Battery's supported Marine infantrymen in the close fight. In Fiscal Year 2006, Marine artillerymen will assume their positions behind a mortar to provide close fire support to Marine Expeditionary Units (MEU) in the Ship to Objective Maneuver (STOM) mission. Marine Artillery must be prepared to support all units with fire support in a non-linear battlefield. EFSS will support the ever changing battlefield and be the flexible fire support system that remains in the fight. Former Commandant of the Marine Corps, General James L. Jones, stated, In the past 10 years or so, we have decreased our fire support systems too far. We got rid of a lot of our artillery weapons in the name of efficiency, in the name of mobility& We have atrophied our Marine ground fires inventory to a dangerous point. We're out-gunned and out-ranged by just about everyone. So I am fixing the artillery-bringing robustness back to the Marine Artillery.
DTIC
Fires; Support Systems

20090006431 Naval Observatory, Washington, DC USA
Special Issue on Time Scale Algorithms
Matsakis, Demetrios; Tavella, Patrizia; Jan 2008; 3 pp.; In English
Report No.(s): AD-A492115; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This special issue of Metrologia presents selected papers from the Fifth International Time Scale Algorithm Symposium (VITSAS), including some of the tutorials presented on the first day. The symposium was attended by 76 persons, from every continent except Antarctica, by students as well as senior scientists, and hosted by the Real Instituto y Observatorio de la Armada (ROA) in San Fernando, Spain, whose staff further enhanced their nation's high reputation for hospitality. Although a timescale can be simply defined as a weighted average of clocks, whose purpose is to measure time better than any individual clock, timescale theory has long been and continues to be a vibrant field of research that has both followed and helped to create advances in the art of timekeeping. There is no perfect timescale algorithm, because every one embodies a compromise involving user needs. Some users wish to generate a constant frequency, perhaps not necessarily one that is well-defined with respect to the definition of a second. Other users might want a clock which is as close to UTC or a particular reference clock as possible, or perhaps wish to minimize the maximum variation from that standard. In contrast to the steered timescales that would be required by those users, other users may need free-running timescales, which are independent of external information. While no algorithm can meet all these needs, every algorithm can benefit from some form of tuning. The optimal tuning, and even the optimal algorithm, can depend on the noise characteristics of the frequency standards, or of their comparison systems, the most precise and accurate of which are currently Two Way Satellite Time and Frequency Transfer (TWSTFT) and GPS carrier phase time transfer.
DTIC
Algorithms; Global Positioning System

20090006433 Colorado State Univ., Fort Collins, CO USA
Model Justified Search Algorithms for Scheduling Under Uncertainty
Howe, Adele; Whitley, L D; Jul 25, 2008; 20 pp.; In English
Contract(s)/Grant(s): FA9550-07-1-0403
Report No.(s): AD-A492118; No Copyright; Avail.: Defense Technical Information Center (DTIC)

We have identified clear trade-offs in algorithm design for the scheduling under uncertainty problem that relate to the sources of the uncertainty. We also identified plateaus as a significant barrier to superb performance of local search on scheduling and have studied several canonical discrete optimization problems to discover and model the nature of plateaus. From this, we have developed lower and upper bound predictive models of plateau size in a significant optimization problem: MAXSAT. We also develop new theoretical results on the nature of plateaus in Elementary Landscapes.
DTIC
Algorithms; Scheduling

20090006449 Naval Postgraduate School, Monterey, CA USA
Explicit-Constraint Branching for Solving Mixed-Integer Programs
Appleget, Jeffrey A; Wood, R K; Jan 2000; 19 pp.; In English
Report No.(s): AD-A492253; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper develops a new generalized-branching technique called 'explicit-constraint branching' (ECB) to improve the performance of branch-and-bound algorithms for solving mixed-integer programs (MIPs). ECB adds structure to a MIP, in the form of auxiliary constraints and auxiliary integer variables, to allow branching on groups of (original) integer variables that would not otherwise be possible. Computational tests on three sets of real-world MIPs demonstrate that ECB often improves solution times over standard branch and bound, sometimes dramatically.
DTIC
Integers

20090006527 Department of the Navy, Washington, DC USA
A Method for Embedding Information in Sonar
Lynch, Jr, Robert S, Inventor; Sep 29, 2008; 22 pp.; In English
Report No.(s): AD-D020392; No Copyright; Avail.: Other Sources

The invention as disclosed is of a method to authenticate identify and trace sonar transmissions and echoes by embedding transparent, secure and robust digital watermarks in signal space, where the additional information incurs no cost in bandwidth. The complex short time Fourier transform is selected as the domain for embedding the digital watermark, secured by a secret key, in the time frequency representation of the signal. The watermark is designed through an iterative optimization step. This step insures that the watermarked sonar is also realizable. Selection of the time frequency region for watermarking is driven by avoidance of interference with the sonar itself, or in case of network operation, other watermarks. In addition, the selected time-frequency region remains robust to sound channel and other transmission effects. Sonar echoes are authenticated in the time-frequency plane by a correlation receiver tuned to the watermarked region using the secret key.
DTIC
Digital Systems; Echoes; Embedding; Fourier Transformation; Patent Applications; Sonar; Technology Transfer

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STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series analysis; and stochastic processes.

20090005002 Bureau of Labor Statistics, Washington, DC, USA
Evaluation of National CPS (Current Population Survey) Labor Force Variances
Zimmerman, T. S.; January 2003; 4 pp.; In English
Report No.(s): PB2008-106630; No Copyright; Avail.: National Technical Information Service (NTIS)

The Current Population Survey (CPS), a nationwide household survey conducted by the Bureau of the Census for BLS, provides official labor force estimates for the noninstitutional population of working-age. Variances for the labor force estimators are based on a modified half sample replication method. Since the variances are based on a sample the variance estimates have a considerable amount of error. One method to remove some of the sampling error in the variances is to group similar labor force items and fit a generalized variance function to the variance estimates. This paper evaluates the current

variance estimation procedure and suggests another procedure for generalizing variances for national labor force statistics. Using a multistage stratified sample of about 48,000 households, the CPS provides official labor force estimates for the working-age noninstitutional population.
NTIS
Labor; Populations; Surveys

20090005004 Bureau of Labor Statistics, Washington, DC, USA
Conceptual and Practical Issues in the Statistical Design and Analysis of Usability Tests
Bosley, J. J.; Eltinge, J. L.; Fox, J. E.; Fricker, S. S.; January 2003; 6 pp.; In English
Report No.(s): PB2008-106621; No Copyright; Avail.: CASI: A02, Hardcopy

In recent years, the Federal statistical community has focused a considerable amount of effort on usability testing for data collection instruments and for data dissemination facilities. Usability testing can help ensure that data are collected easily, efficiently, and accurately. It can also help ensure that those who retrieve Federal statistics, particularly from websites, find and understand what they are looking for. At the Bureau of Labor Statistics (BLS), we have incorporated usability testing into the development process for many data collection instruments, including the Commodities and Services (C&S) survey for the Consumer Price Index, the Consumer Expenditures Survey, and the American Time Use Survey. We have also conducted usability testing for data dissemination facilities such as BLS own website, LabStat.
NTIS
Design Analysis; Labor; Statistical Analysis

20090005006 Bureau of Labor Statistics, Washington, DC, USA; Kentucky State Univ., Frankfort, KY, USA
Variance of the Variance of Samples from a Finite Population
Cho, E.; Cho, M. J.; Eltinge, J.; January 2003; 6 pp.; In English
Report No.(s): PB2008-106617; No Copyright; Avail.: CASI: A02, Hardcopy

A direct derivation of the randomization variance of the sample variance V(sup carot)(x (sup bar)) and related formulae are presented. Examples of the special cases of uniformly distributed population are given.
NTIS
Populations; Sampling; Statistical Analysis

20090005007 Bureau of Labor Statistics, Washington, DC, USA
Small Area Estimation Under Informative Sampling
Pfeffermann, D.; Sverchkov, M.; January 2003; 6 pp.; In English
Report No.(s): PB2008-106612; No Copyright; Avail.: CASI: A02, Hardcopy

Classical small area estimation techniques assume either that all the areas are represented in the sample or that the selection of the areas to the sample is noninformative. When the areas are sampled with unequal selection probabilities that are related to the values of the response variable, the classical estimators are biased; the magnitude of the bias depends on the sampling fraction and the covariance between the sampling weights and the response variable. We illustrate this point using very simple models employing the notions of the sample distribution and sample-complement distribution. We suggest simple unbiased estimators based on these distributions.
NTIS
Sampling; Estimating

20090005008 Bureau of Labor Statistics, Washington, DC, USA
Simulation Comparison Between an Outlier Resistant Model-Based Finite Population Estimator and Design-Based Estimators under Contamination
Li, B.; January 2003; 5 pp.; In English
Report No.(s): PB2008-106601; No Copyright; Avail.: CASI: A01, Hardcopy

There are two approaches to finite population estimation. One assumes the finite population elements are fixed quantities. The randomness associated with estimators comes from the random selection of samples. Each sampled element has a weight determined by the sample design. Most Bureau of Labor Statistics surveys rely on this theory. The other approach assumes the population elements are a random draw from a larger population or super-population, in a way similar to taking random samples from a random variable. The random variable has its own mean and variance structure, usually expressed in terms of linear models. Finite population summaries of the variable under investigation, such as mean, total are estimated through

fitting sample data to the linear model. The design of the sample selection is relevant only to the selection of a suitable linear model under the super-population, but is irrelevant to how the estimates are derived from the model.
NTIS
Contamination; Labor; Populations; Simulation; Statistical Analysis

20090005009 Bureau of Labor Statistics, Washington, DC, USA
Sample Expansion for Probability Proportional to Size Without Replacement Sampling
Ernst, L. R.; January 2003; 6 pp.; In English
Report No.(s): PB2008-106603; No Copyright; Avail.: CASI: A02, Hardcopy

There exist numerous methods for selecting a fixed size sample with probability proportional to size (PPS), without replacement. Brewer and Hanif (1983) describe 50 such procedures and detail the properties of each of these procedures. The properties described are with respect to the selection of a single sample directly from the universe. However, sometimes it may be necessary to either select a subsample of the original sample or to expand the original sample to a larger sample from the same universe, where in either case the new sample is also to be a fixed size sample selected PPS, without replacement from the original universe with the original measures of size. In the case of subsampling, if the procedure used to select the original sample is strictly PPS, without replacement, then subsampling with the desired properties can always be done.
NTIS
Probability Theory; Replacing; Sampling; Surveys

20090005025 Bureau of Labor Statistics, Washington, DC, USA
Leontief and the Bureau of Labor Statistics, 1941-54: A Unfinished Chapter in the History of Economic Measurement
Kohli, M. C.; January 2008; 26 pp.; In English
Report No.(s): PB2008-106218; No Copyright; Avail.: CASI: A03, Hardcopy

While Leontiefs accomplishments have been recognized, his work with the Bureau of Labor Statistics occupies an uncertain position in historical accounts. Some observers have argued that the Bureau of Labor Statistics merely tabulated data in accordance with his theories. This paper evaluates such claims by examining the concepts and classifications used by Leontief and the Bureau in the early tables. It concludes that the changes made by the Bureau made possible significant measurements of the GNP and of the factor-content of international trade. Today statistical agencies continue to develop measures of prices and quantities, using the framework pioneered by Leontief.
NTIS
Economics; Labor

20090005048 Bureau of Labor Statistics, Washington, DC, USA
Analysis of Divergence Between Chained CPI-U (Chained Consumer Price Index-Urban) and Regular CPI-U for the All US-All Items Indexes (2000-2002)
Shoemaker, O. J.; January 2008; 8 pp.; In English
Report No.(s): PB2008-106216; No Copyright; Avail.: CASI: A02, Hardcopy

In February 2004, the BLS calculated and published its third annual set of C-CPI-U indexes for the 12 months of 2002. The C-CPI-U (Chained Consumer Price Index - Urban) is calculated and published every year, with a one-year lag, using a Tornqvist formula, and its set of weights are updated yearly so that a unique set of monthly weights are available for both time t as well as for time t-n. The C-CPI-U can thus be labeled a 'superlative' index. By contrast the Regular CPI-U uses weights that are, at a minimum, at least two years old, and uses a combination (hybrid) of Geomeans and Laspeyres formulas as its final estimator. The set of All-US-All-Items Chained C-CPI-U index results continue to diverge (lower) from Regular CPI-U index results. We investigate the nature of this divergence. We also analyze the two different weight structures, possible response biases, and the standard errors that we calculate for these indexes.
NTIS
Consumers; Cost Analysis; Divergence

20090005097 Bureau of Labor Statistics, Washington, DC, USA
Income Imputation and the Analysis of Expenditure Data in the Consumer Expenditure Survey
Fisher, J.; May 2006; 21 pp.; In English
Report No.(s): PB2008-105400; BLS/WP-394; No Copyright; Avail.: CASI: A03, Hardcopy

The Consumer Expenditure (CE) Survey began imputing income in its 2004 data. Imputation predicts income for

households that reported receiving income but failed to report a specific value. In this study, I examine how income imputation affects analysis of the CE expenditure data. Most importantly, research that uses both income and expenditures from 2004 on will not have to restrict the sample to households that reported income. The expenditure results most sensitive to the introduction of income imputation are statistics that focus on households with low levels of expenditures.
NTIS
Consumers; Income; Surveys

20090005127 Bureau of Labor Statistics, Washington, DC, USA
State Space Model-Based Approach to Intervention Analysis in the Seasonal Adjustment of BLS (Bureau of Labor Statistics) Series Some Empirical Results
Jain, R. K.; Jun. 1992; 15 pp.; In English
Report No.(s): PB2008-105401; BLS/WP-228; No Copyright; Avail.: CASI: A03, Hardcopy

The Intervention and Explanatory variables are incorporated in the statistical models of seasonal adjustment of BLS series. The State-Space/Kalman Filter methodology is used to estimate these models. EM algorithm and a quasi-Newton algorithm are employed to estimate the hyper-parameters of those models. Two BLS series are seasonally adjusted using these models and the empirical results relating to the effects of intervention analysis and explanatory variables on seasonal adjustment presented.
NTIS
Labor; Mathematical Models

20090005131 Bureau of Labor Statistics, Washington, DC, USA
Effects of Rounding on the Consumer Price Index
Williams, E.; Aug. 2006; 16 pp.; In English
Report No.(s): PB2008-105410; BLS/WP-397; No Copyright; Avail.: National Technical Information Service (NTIS)

The Bureau of Labor Statistics rounds the Consumer Price Index (CPI) to a single decimal place before releasing it, and the published CPI inflation series is calculated from those rounded index values. While rounding has only a relatively small effect on the level of the CPI series at present, it can have a significant effect on CPI inflation, the monthly percent changes in the CPI. This paper estimates the impact of rounding error on the published CPI inflation for both contemporaneous and historical data. Using an unrounded CPI series from January 1986 to July 2005 as a benchmark, I find that published CPI inflation differs from its full-precision counterpart approximately 25% of the time, and that reporting the CPI levels to three decimal places would reduce these discrepancies to under 0.5%. Further, the variance introduced by rounding error is large when compared to the sampling variation in CPI inflation. I find that the BLS could reduce total CPI inflation error variance by 42% by simply reporting more digits in the CPI index, resulting in a significantly more accurate reflection of monthly inflation. In order to extend these results to the CPI historical series, I derive the distribution of the rounding error component of inflation. From this analysis, it is possible to estimate the probability of large rounding errors for a given CPI level and round- ing precision. Three regimes emerge. Before the 1970s inflation, discrepancies due to rounding were both frequent and frequently large relative to the underlying inflation rate. During the inflationary period of the mid-1970s to mid-1980s, both the probability and relative magnitude of discrepancies decrease dramatically. Finally, the last twenty years are characterized by a slowly falling probability of any rounding-induced error, but a roughly constant probability of an error of a given size.
NTIS
Consumers; Cost Analysis; Sampling; Probability Theory; Estimates

20090005168 Bureau of Labor Statistics, Washington, DC, USA
Estimation and Analysis of Variance Components for the Revised CPI Housing Sample
Shoemaker, O. J.; January 2008; 6 pp.; In English
Report No.(s): PB2008-106213; No Copyright; Avail.: CASI: A02, Hardcopy

In 1999, the Bureau of Labor Statistics (BLS) introduced a new Housing Sample for the Rent and Rental Equivalency (REQ) estimators in the U.S. Consumer Price Index (CPI). The Housing Sample consists of, roughly, 10,000 sampled segments, composed of U.S. Census blocks, allocated in 87 Primary Sampling Units (PSUs) and collected in six panels every six months. In this paper, we model the 6-month price relative for both Rent and REQ, and analyze a random effects model that treats PSU and Segment as two random effects. We look at three years of data (1999-2001). We use the Restricted Maximum Likelihood (REML) estimation method to produce the variance components. Standard F-test procedures are applied to determine the significance of the effects in the model. Finally, the variance component results are compared to a set of

variance components produced from the previous housing sample (1987-1998).
NTIS
Analysis of Variance; Consumers; Cost Analysis; Equivalence

20090005169 Bureau of Labor Statistics, Washington, DC, USA
Access to Confidential Statistical Agency Data
Cohen, S. H.; January 2008; 5 pp.; In English
Report No.(s): PB2008-106212; No Copyright; Avail.: CASI: A01, Hardcopy

The Federal Statistical Agencies collect a wealth of economic, demographic and social data. These data are collected to meet specific or general requirements in legislation or the code of federal regulations. The agencies publish estimates from that data in various specific tabular forms in paper or on the Internet. Initial publication could be a press release followed by bulletins that present more detailed statistical data and analysis. Usually there still are many additional possible tabulations that characterize or analyze a segment of the population that are not published due to the lack of resources within the agency.
NTIS
Data Acquisition; Statistical Analysis

20090005194 Bureau of Labor Statistics, Washington, DC, USA
Effect of Some Design and Estimation Issues on the Variance Estimates of the Employment Cost Index
Paben, S. P.; January 2008; 6 pp.; In English
Report No.(s): PB2008-105417; No Copyright; Avail.: CASI: A02, Hardcopy

The Employment Cost Index (ECI) is a measure of the change in the cost of labor, free from the influence of employment shifts among occupations and industries. The calculation of the quarterly change in the ECI involves the multiplication of the previous quarter's cost weight in each industry-major occupational group cell by the estimate of the quarterly change to obtain a current cost weight for the cell. The cost weights themselves are therefore variable, and the variability generally is an increasing function of the number of quarters from the base period. The impact on the variance of the variability of the cost weights is examined. The variance of an alternative calculation of the ECI that is less affected by the variability of cost weights is also examined. Additionally, the ECI is currently in transition from a national-based sample to a geographic area-based sample. The impact on the variance of this design change, which adds an additional level of sampling while increasing the number of sample establishments is studied. Finally, the effect of using Fay's method of BRR rather than the standard BRR for operational advantages is investigated.
NTIS
Costs; Estimates

20090006110 Army Research Lab., Aberdeen Proving Ground, MD USA
Quantal Response Analysis in the Absence of a Zone of Mixed Results Using Data Augmentation
Webb, David W; Sep 2008; 20 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491027; ARL-TR-4604; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491027

Quantal response analysis is used to estimate the probability of a dichotomous response, e.g., complete penetration, as a function of a stimulus variable. Using maximum likelihood and the DiDonato-Janagin algorithm, estimates of the normal distribution parameters that underlie threshold stimulus levels are obtainable if a zone of mixed results is observed in the test data and if the average success-producing stimulus exceeds the average failure-producing stimulus. In the absence of a zone of mixed results, a method is proposed that utilizes data augmentation to estimate some parameter of interest, e.g., the probability of success at a specific stimulus level. This method generates artificial copies of the original data set of stimuli and responses and then adds a random noise component to each of the stimuli.
DTIC
Augmentation; Maximum Likelihood Estimates

20090006123 Naval Postgraduate School, Monterey, CA USA
Stochastic Network Interdiction
Cormican, Kelly J; Morton, David P; Wood, R K; Apr 1998; 15 pp.; In English
Report No.(s): AD-A491085; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491085

Using limited assets, an interdictor attempts to destroy parts of a capacitated network through which an adversary will

subsequently maximize flow. We formulate and solve a stochastic version of the interdictor's problem: Minimize the expected maximum flow through the network when interdiction successes are binary random variables. Extensions are made to handle uncertain arc capacities and other realistic variations. These two-stage stochastic integer programs have applications to interdicting illegal drugs and to reducing the effectiveness of a military force moving material, troops, information, etc., through a network in wartime. Two equivalent model formulations allow Jensen's inequality to be used to compute both lower and upper bounds on the objective, and these bounds are improved within a sequential approximation algorithm. Successful computational results are reported on networks with over 100 nodes, 80 interdictable arcs, and 180 total arcs.
DTIC
Networks; Stochastic Processes

20090006286 Carnegie-Mellon Univ., Pittsburgh, PA USA
A Survey of Systems Engineering Effectiveness - Initial Results (With Detailed Survey Response Data)
Elm, Joseph P; Goldenson, Dennis R; Emam, Khaled E; Donatelli, Nicole; Neisa, Angelica; Dec 2008; 318 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A491819; CMU/SEI-2008-SR-034; No Copyright; Avail.: Defense Technical Information Center (DTIC) ONLINE: http://hdl.handle.net/100.2/ADA491819

This survey quantifies the relationship between the application of Systems Engineering (SE) best practices to projects and programs and the performance of those projects and programs. The survey population consisted of projects and programs executed by defense contractors who are members of the Systems Engineering Division (SED) of the National Defense Industrial Association (NDlA). The deployment of SE practices on a project or program was measured through the availability and characteristics of specific SE-related work products. Project Performance was measured through typically available project measures of cost performance schedule performance and scope performance. Additional project and program information such as project size project domain and other data was also collected to aid in characterizing the respondent's project. Analysis of the survey responses revealed moderately strong statistical relationships between Project Performance and several categorizations of specific of SE best practices. Notably stronger relationships are apparent by combining the effects of more than one the best practices categories. Of course, Systems Engineering Capability alone does not ensure outstanding Project Performance. The survey results show notable differences in the relationship between SE best practices and performance between more challenging as compared to less challenging projects. The statistical relationship between Project Performance and the combination of SE Capability and Project Challenge is quite strong tor survey data of this type.
DTIC
Inference; Surveys; Systems Engineering

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SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20090005206 Lenart (Robert P.), Pittsburgh, PA, USA; Northrop Grumman Corp., Los Angeles, CA, USA
Mixed Integer Linear Programming Trajectory Generation for Autonomous Nap-of-the-Earth Flight in a Threat Environment
Ma, C. S. K., Inventor; Miller, R. H., Inventor; 17 Feb 05; 35 pp.; In English
Contract(s)/Grant(s): AF-F33615-99-C-3613
Patent Info.: Filed Filed 17 Feb 05; US-Patent-Appl-SN-11-060 347
Report No.(s): PB2008-106106; No Copyright; Avail.: CASI: A03, Hardcopy

A method of planning a path of a vehicle comprises the steps of: defining a first plurality of constraints representing dynamics of the vehicle; defining a second plurality of constraints representing collisions with obstacles; defining a third plurality of constraints representing visibility to threats; and using the first, second and third plurality of constraints with mixed integer linear programming to generate a trajectory for a vehicle from a starting point to a destination point in an environment containing the obstacles and the threats.
NTIS
Autonomy; Integers; Linear Programming; Nap-of-the-Earth Navigation; Patent Applications; Threat Evaluation; Trajectories

20090005217 Carter, DeLuca, Farrell and Schmidt, LLP, Melville, NY, USA

Tree-to-Graph Folding Procedure for Systems Engineering Requirements

Austin, Mark A., Inventor; Shmunis, Natalya, Inventor; Mayank, Vimal, Inventor; Everett, Frank, Inventor; 16 Feb. 2006; 16 pp.; In English

Contract(s)/Grant(s): NAG5-13642; NAG512464

Patent Info.: Filed Filed 2 Jun. 05; US-Patent-Appl-SN-11-157074; US 2006/0037019

Report No.(s): PB2008-100960; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005217

A method is provided for generating a graph data representation having a plurality of nodes corresponding to respective systems engineering requirements. The method includes accessing a first data representation of a collection of systems requirements and relationships there between and generating a second data representation of the collection of systems requirements. The generating the second data representation includes accessing respective systems requirements of the collection of systems requirements; creating a node to correspond to each accessed systems requirement if a node corresponding to the accessed systems requirement does not exist; and creating an edge between the created or pre-existing node and each node corresponding to a systems requirement having a relationship with the accessed systems requirement. Each node of the second data representation is a node of said graph data representation and corresponds to a different systems requirement of the collection of systems requirements.

Official Gazette of the U.S. Patent and Trademark Office

Folding; Patent Applications; Systems Engineering; Trees (Mathematics)

20090005933 Military Academy, West Point, NY USA

PEO Soldier Simulation Road Map V - The MATREX Federation

Kewley, Jr , Robert H; Tolk, Andreas; Litwin, Thomas; Apr 2008; 45 pp.; In English; Original contains color illustrations

Report No.(s): AD-A486791; DSE-TR-0802; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA486791

The purpose of this study is to continue to build a capability for PEO Soldier to assess the platoon level effectiveness of different soldier equipment architectures using distributed simulation. Three combat models - IWARS, OneSAF, and COMBAT XXI. are integrated via the High-Level Architecture (HLA) in order to provide this capability. This year's effort focused on developing and demonstrating a runtime interaction between IWARS and OneSAF. In addition, a systems engineering methodology is proposed and demonstrated for driving federated simulation development with operational requirements. This methodology relies heavily upon the Military Missions and Means Framework, the Federation Development and Execution Process, and Model Driven Architectures. Successful integration was achieved with a squad-level scenario, and continued development will refine this federation by joining COMBAT XXI, adding analysis capabilities, and preparing for verification and validation.

DTIC

Combat; Roads; Simulation; Systems Engineering

20090006085 Army Research Lab., Adelphi, MD USA

Empirical Mode Decomposition Based Features for Diagnosis and Prognostics of Systems

Khatri, Hiralal; Ranney, Kenneth; Tom, Kwok; del Rosario, Romeo; Apr 2008; 30 pp.; In English; Original contains color illustrations

Report No.(s): AD-A487732; ARL-TR-4301; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487732

We present a new procedure to generate additional features for system diagnosis. The procedure is based on empirical mode decomposition of measured signals obtained by monitoring the relevant state of a system. This procedure is different from the existing procedures for defining features, which are generally obtained using the statistics of the measured signal, the matched filter outputs, and the wavelet decomposition of measured signals. Features derived by this new procedure complement the existing features for diagnosis, and therefore they should improve performance of the classifier used to diagnose systems. We illustrate the procedure by generating new features for diagnosis of the AH64A helicopter transmission assembly.

DTIC

Decomposition; Diagnosis; Systems Analysis

20090006198 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Addressing Uncertainty in Signal Propagation and Sensor Performance Predictions

Wilson, D K; Pettit, Chris L; Mackay, Sean; Lewis, Matthew S; Seman, Peter M; Nov 2008; 51 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491357; ERDC/CRREL-TR-03-21; No Copyright; Avail.: Defense Technical Information Center (DTIC)

As advanced sensors are increasingly relied upon for force protection, rapid strike, maneuver support, and other tasks, expert decision support tools (DSTs) are needed to recommend appropriate mixes of sensors and placements that will maximize their effectiveness. These tools should predict effects on sensor performance of the many complexities of the environment, such as terrain conditions, the atmospheric state, and background noise and clutter. However, the information available for such inputs is often incomplete and imprecise. To avoid drawing unwarranted conclusions from DSTs, the calculations should reflect a realistic degree of uncertainty in the inputs. In this report, a Bayesian probabilistic framework is developed for this purpose. The initial step involves incorporating uncertainty in the weather forecast, terrain state, and tactical situation by constructing an ensemble of scenarios. Next, a likelihood function for the signal propagation model parameters specifies uncertainty at smaller spatial scales, such as that caused by wind gusts, turbulence, clouds, vegetation, and buildings. An object-oriented software implementation of the framework is sketched. Examples illustrate the importance of uncertainty for optimal sensor selection and determining sensor coverage.

DTIC

Background Noise; Decision Support Systems; Detectors; Performance Prediction

20090006446 Naval Postgraduate School, Monterey, CA USA

Exploring the World of Agent-Based Simulations: Simple Models, Complex Analyses

Sanchez, Susan M; Lucas, Thomas W; Yucesan, E; Chen, C -H; Snowdon, J L; Charnes, J M; Dec 2002; 12 pp.; In English; Original contains color illustrations

Report No.(s): AD-A492247; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Agent-based simulations are models where multiple entities sense and stochastically respond to conditions in their local environments, mimicking complex large-scale system behavior. We provide an overview of some important issues in the modeling and analysis of agent-based systems. Examples are drawn from a range of fields: biological modeling, sociological modeling, and industrial applications, though we focus on recent results for a variety of military applications. Based on our experiences with various agent-based models, we describe issues that simulation analysts should be aware of when embarking on agent-based model development. We also describe a number of tools (both graphical and analytical) that we have found particularly useful for analyzing these types of simulation models. We conclude with a discussion of areas in need of further investigation.

DTIC

Military Technology; Models; Operations Research; Simulation

20090006523 Naval Postgraduate School, Monterey, CA USA

Interdicting a Nuclear-Weapons Project

Brown, Gerald; Carlyle, Matthew; Harney, Robert; Skroch, Eric; Wood, Kevin; Dec 4, 2007; 37 pp.; In English; Original contains color illustrations

Report No.(s): AD-A487231; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487231

A ‘proliferator’ seeks to complete a first small batch of fission weapons as quickly as possible, while an ‘interdictor’ wishes to delay that completion for as long as possible. We develop and solve a max-min model that identifies resource-limited interdiction actions that maximally delay completion time of the proliferator’s weapons project, given that the proliferator will observe any such actions and adjust his plans to minimize that time. The model incorporates a detailed project-management (CPM) submodel, and standard optimization software solves the model in a few minutes on a personal computer. We exploit off-the-shelf project-management software to manage a database, control the optimization, and display results. Using a range of levels for interdiction effort, we analyze a published case study that models three, alternate, uranium-enrichment technologies. The task of ‘cascade loading’ appears in all technologies and turns out to be an inherent fragility for the proliferator at all levels of interdiction effort. Such insights enable policymakers to quantify the effects of interdiction options at their disposal, be they diplomatic, economic, or military.

DTIC

Nuclear Weapons; Computer Systems Programs; Fission Weapons; Uranium

20090006529 Department of the Navy, Washington, DC USA
A Method for Solving Combinatoral Optimization Problems
Ruffa, Anthony A, Inventor; Sep 29, 2008; 33 pp.; In English
Report No.(s): AD-D020394; No Copyright; Avail.: Other Sources

A method for solving a combinatorial optimization problem and applying the solutions to routing as employed in naval convoying and other transit point scheduling. The method involves isolating a plurality of vertices into open-ended zones with lengthwise boundaries. In each zone, a minimum length Hamiltonian path is found for each combination of boundary vertices, leading to an approximation for the minimum-length Hamiltonian Cycle. The method discloses that when the boundaries create zones with boundary vertices confined to the adjacent zones, the sets of candidate HPs are found by advancing one zone at a time, considering only the vertices in the zone in question (with embedded HPs from previous zones) and an adjacent zone in the direction of progression. Determination of the optimal Hamiltonian paths for subsequent zones has the effect of filtering out non-optimal Hamiltonian paths from earlier zones.
DTIC
Combinatorial Analysis; Optimization; Scheduling

20090006551 Naval Postgraduate School, Monterey, CA USA
Catching the 'Network Science' Bug: Insight and Opportunity for the Operations Researcher
Alderson, David L; Jan 21, 2008; 38 pp.; In English
Report No.(s): AD-A487138; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487138

Recent efforts to develop a universal view of complex networks have created both excitement and confusion about the way in which knowledge of network structure can be used to understand, control, or design system behavior. This paper offers perspective on the emerging field of 'network science' in three ways. First, it briefly summarizes the origins, methodological approaches, and most celebrated contributions within this increasingly popular field. Second, it contrasts the predominant perspective in the network science literature (that abstracts away domain-specific function and instead focuses on graph theoretic measures of system structure and dynamics) with that of engineers and practitioners of decision science (who emphasize the importance of network performance, constraints, and tradeoffs). Third, it proposes optimization-based reverse engineering to address some important open questions within network science from an operations research perspective. We advocate for increased, yet cautious, participation in this field by operations researchers.
DTIC
Operations Research; Communication Networks; Systems Analysis

20090006590 Naval Postgraduate School, Monterey, CA USA
Canonical Methods in the Solution of Variable-Coefficient Lanchester-Type Equations of Modern Warfare
Taylor, James G; Brown, Gerald G; Feb 1976; 27 pp.; In English
Report No.(s): AD-A487391; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This paper develops a mathematical theory for solving deterministic, Lanchester-type, 'square-law' attrition equations for combat between two homogeneous forces with temporal variations in fire effectivenesses (as expressed by the Lanchester attrition-rate coefficients). It gives a general form for expressing the solution of such variable-coefficient combat attrition equations in terms of Lanchester functions, which are introduced here and can be readily tabulated. Different Lanchester functions arise from different mathematical forms for the attrition-rate coefficients. We give results for two such forms: (1) effectiveness of each side's fire proportional to a power of time, and (2) effectiveness of each side's fire linear with time but with a nonconstant ratio of attrition-rate coefficients. Previous results in the literature for a nonconstant ratio of these attrition-rate coefficients only took a convenient form under rather restrictive conditions.
DTIC
Warfare; Combat; Methodology

20090006622 Naval Postgraduate School, Monterey, CA USA
Dynamic Programming and the Backpacker's Linear Search Problem
Washburn, Alan; Jan 1995; 10 pp.; In English
Report No.(s): AD-A487452; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A backpacker approaches a road with a marker on it desirous of finding the marker but having only a rough idea of where it is located. It is well known among backpackers that it is best to aim either right or left of the marker since otherwise it will

not be clear which way to turn upon reaching the road. The problem of deciding exactly where to aim can be formalized as a modification of the Linear Search Problem. This paper does so, and also discusses dynamic programming as a solution method.
DTIC
Dynamic Programming; Searching

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology, set theory, group theory and number theory.

20090006055 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
On Graph Isomorphism and the PageRank Algorithm
Augeri, Christopher J; Sep 2008; 153 pp.; In English
Contract(s)/Grant(s): Proj-ENG-08-314
Report No.(s): AD-A490530; AFIT/DCS/ENG/08-08; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490530

Graphs express relationships among objects, such as the radio connectivity among nodes in unmanned vehicle swarms. Some applications may rank a swarm's nodes by their relative importance, for example, using the PageRank algorithm applied in certain search engines to order query responses. The PageRank values of the nodes correspond to a unique eigenvector that can be computed using the power method, an iterative technique based on matrix multiplication. The first result is a practical lower bound on the PageRank algorithm's execution time that is derived by applying assumptions to the PageRank perturbation's scaling value and the PageRank vector's required numerical precision. The second result establishes nodes contained in the same block of the graph's coarsest equitable partition must have equal PageRank values. The third result, the AverageRank algorithm, ensures such nodes are assigned equal PageRank values. The fourth result, the ProductRank algorithm, reduces the time needed to find the PageRank vector by eliminating certain dot products in the power method if the graph's coarsest equitable partition contains blocks composed of multiple vertices. The fifth result, the QuotientRank algorithm, uses a quotient matrix induced by the coarsest equitable partition to further reduce the time needed to compute a swarm's PageRank vector.
DTIC
Algorithms; Eigenvectors; Graph Theory; Isomorphism

20090006285 Carnegie-Mellon Univ., Pittsburgh, PA USA
Can You Trust Your Data? Establishing the Need for a Measurement and Analysis Infrastructure Diagnostic
Kasunic, Mark; McCurley, James; Zubrow, David; Nov 2008; 31 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8721-05-C-0003
Report No.(s): AD-A491818; CMU/SEI-2008-TN-028; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491818

An organization's measurement and analysis infrastructure directly Impacts the quality of the decisions made by people at all organizational levels Ensuring information quality is a challenge for most organizations-partly because they might not be fully aware of their own data quality levels Without this information they cannot know the full business impact of poor or unknown data quality or determine how to begin improving their data This report describes common errors in measurement and analysis and the need for a criterion-based assessment method that will allow organizations to evaluate key characteristics of their measurement programs.
DTIC
Errors; Measurement

70
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*.

20090005049 Illinois Inst. of Tech., Chicago, IL, USA
Rare Nonleptonic Decays of the Omega Hyperon: Measurement of the Branching Ratios for Omega-+ --> Xi*0(1530) (anti-Xi*0(1530)) pi-+ and Omega-+ --> Xi-+ pi+- pi-+
Kamaev, O.; Dec. 01, 2007; 163 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-921108; FERMILAB-THESIS-2007-40; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available

Hadrons; Hyperons; Particle Decay

20090005050 Illinois Univ., Urbana-Champaign, IL, USA
Measurement of the CP Asymmetry in Semimuonic b Decays Produced in PPBAR Collision at s(1/2) = 1.96 TeV**
Marino, C. P.; Dec. 01, 2007; 146 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-921109; FERMILAB-THESIS-2007-39; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Asymmetry; Collisions; Invariance; Particle Decay

20090005051 Fermi National Accelerator Lab., Batavia, IL, USA
Measurement of the Lifetime Difference and CP-Violating Phase in B(underscore)s -> J/psi Phi Decays
Milnik, M.; Nov. 01, 2007; 146 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-921110; FERMILAB-THESIS-2007-38; No Copyright; Avail.: National Technical Information Service (NTIS)

Over the past decades the current theoretical description, the Standard Model of elementary particle physics, was solidified by many measurements as the basic theory describing fundamental particles and their interactions. It is extremely successful in explaining the high-precision data collected by experiments so far. The Standard Model includes several intrinsic parameters which have to be measured in experiments. Independent analyses of different physical processes can constrain those parameters. By combining those measurements physicists might be sensitive to physics beyond the Standard Model. If they are inconsistent it allows to get a hint on the theory that might supersede the Standard Model.
NTIS

Invariance; Standard Model (Particle Physics); Elementary Particles

20090005132 Fermi National Accelerator Lab., Batavia, IL, USA
Searches for Standard Model Higgs at the Tevatron
Cortabitarte, R. V.; Nov. 01, 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76CH03000
Report No.(s): DE2007-921106; FERMILAB-CONF-07-610-E; No Copyright; Avail.: National Technical Information Service (NTIS)

No abstract available

Higgs Bosons; Particle Accelerators

20090005135 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Deeply Virtual Compton Scattering with CLAS
Girod, F. X.; Nov. 07, 2007; 4 pp.; In English
Report No.(s): DE2007-921029; No Copyright; Avail.: National Technical Information Service (NTIS)

The introduction of parton Wigner distributions in the nucleon provided us with a rigorous landscape of the different

approaches to the hadron structure, linking together all possible hadronic observables. There is unfortunately as of today no known experimental process to access them. Projecting out light-cone energy and transverse momenta, a Fourier transform leads to Generalized Parton Distributions (GPDs). Those encompass Form Factors and Parton Distribution Functions, as well as a wealth of new physical informations. For instance, the Energy-Momentum tensor of partons in the nucleon can be parameterized in terms of GPDs, providing distributions of masses, angular momenta, or forces inside the nucleon.
NTIS
Compton Effect; Electron Scattering

20090005138 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; South Carolina Univ., Columbia, SC, USA
Chiral Restoration in the Nuclear Medium
January 2007; 8 pp.; In English
Report No.(s): DE2007-921053; No Copyright; Avail.: National Technical Information Service (NTIS)

The theory of the strong interaction, Quantum Chromodynamics (QCD), has been extremely successful in describing high-energy and short-distance-scale experiments involving quarks and gluons. Applying QCD to low energy and large-distance-scale experiments has however been a major challenge. Although the rapidly increasing strength of the interaction in this latter case makes it impossible to apply perturbative techniques, the symmetries of QCD (such as chiral symmetry) provide guiding principles to deal with strong interaction phenomena. Various QCD-inspired predictions are now available in the non-perturbative domain, which can be tested experimentally at current hadron and electromagnetic facilities.
NTIS
Chirality; Restoration; Symmetry

20090005139 Florida State Univ., Tallahassee, FL, USA
CLAS Excited Baryon Program at JLab
Crede, V.; January 2007; 8 pp.; In English
Report No.(s): DE2007-921056; No Copyright; Avail.: National Technical Information Service (NTIS)

Nucleons are complex systems of conned quarks and exhibit characteristic spectra of excited states. Highly excited nucleon states are sensitive to details of quark connement which is poorly understood within Quantum Chromodynamics (QCD), the fundamental theory of strong interactions. Thus, measurements of excited states and the corresponding determination of their properties are needed to come to a better understanding of how connement works in nucleons. However, the excited states of the nucleon cannot simply be inferred from cleanly separated spectral lines. Quite the contrary, a spectral analysis in nucleon resonance physics is challenging because of the fact that the resonances are broadly overlapping states which decay into a multitude of nal states involving mesons and baryons. To provide a consistent and complete picture of an individual nucleon resonance, the various possible production and decay channels must be treated in a multichannel framework that permits separating resonance from background contributions. Very often, resonances reveal themselves more clearly through interference with dominant amplitudes. These interference terms can be isolated via polarization observables. The current CLAS effort is to utilize highly-polarized hydrogen and deuterium targets as well as polarized photon beams toward a complete measurement of a large number of reaction channels.
NTIS
Baryons; Form Factors; Spectroscopy

20090005140 Idaho State Univ., Pocatello, ID, USA
Need for Polarization for Extracting Baryon Resonances and the NSTAR Program at CLAS
Cole, P. L.; January 2007; 8 pp.; In English
Report No.(s): DE2007-921057; No Copyright; Avail.: National Technical Information Service (NTIS)

We report on the NSTAR program in Hall B of JLab on using polarization observables to extract parameters of baryon resonances. The scientific purpose of the program is to improve the understanding of the underlying quark degrees of freedom, especially in the higher resonance regions, where we expect to uncover many of missing baryon resonances that mainly decay through multi-meson channels. With the high-quality beam of circularly- and linearly-polarized photons onto unpolarized and polarized proton and deteurium targets, and coupled with the nearly complete solid angle coverage of CLAS, we will extract the differential cross sections and associated polarization observables obtained by the photoproduction of vector mesons and

kaons at center of mass energies of 1.7 to 2.2 GeV. The paper will primarily present the photon beam aspects of the excited baryon program.
NTIS
Baryon Resonance; Ion Engines; Ion Propulsion; Photon Beams

20090005141 Idaho State Univ., Pocatello, ID, USA
Phi-Meson Photoproduction with Linearly Polarized Photons at Threshold Energies
Salamanca, J.; Cole, P. L.; January 2007; 1 pp.; In English
Report No.(s): DE2007-921058; No Copyright; Avail.: National Technical Information Service (NTIS)
The observables provided by linearly-polarized photons are of interest in delineating the contributions of the various hadronic processes giving rise to vector meson photoproduction. In particular, we describe how (omega-meson) production affords an incisive tool for exploring the nature of the parity exchange at threshold energies, the strangeness content of proton, as well as extracting signatures for the violation of Okubo-Zweig-lizuka observation (OZI rule).
NTIS
Hadrons; Mesons; Photons; Photoproduction; Vector Mesons

20090005142 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; George Washington Univ., Washington, DC, USA
G13 Experiment at Jefferson Lab: Strangeness Production on the Neutron in the Deutron with Polarized Photons: Gamma-Vector n--> KY-vector
Munevar, E.; Berman, B. L.; Nadel-Turonski, P.; January 2006; 4 pp.; In English
Report No.(s): DE2007-921059; No Copyright; Avail.: Department of Energy Information Bridge
Strangeness has been shown to be important for the understanding of the so-called missing resonances. Due to the scarce experimental data in strangeness photoproduction on the neutron, phenomenological models such as coupled-channels analyses resort to certain approximations that do not allow getting either accuracy or agreement between different analyses when extracting resonance parameters. Thus, in order to obtain high-quality data on the neutron channels, a new experiment (designated g 13), based on a liquid deuterium target and a polarized photon beam (both circular and linear polarization) covering from threshold to 2.3 GeV has been done at the Thomas Jefferson National Accelerator Facility. In this paper, a brief description of the gl3 experiment is given.
NTIS
Kaons; Neutrons; Photons; Photoproduction; Strangeness

20090005143 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Florida State Univ., Tallahassee, FL, USA
Measurement of Pi+Pi- Photoproduction in Double Polarization Experiments Using the CLAS Spectrometer
Hanretty, C.; Oct. 2007; 4 pp.; In English
Report No.(s): DE2007-921060; JLAB/PHY-07-756; No Copyright; Avail.: Department of Energy Information Bridge
A problem encountered in hadron spectroscopy is the fact that the excited states of the nucleon are not seen as cleanly separated spectral lines. Instead the spectrum contains resonance states that are both broad and overlapping. The prediction of these states is also difficult as the QCD Lagrangian is not solvable at low energies because of the large value of the strong coupling constant and as of yet we have no usable lattice- QCD calculations derived from a fundamental theory. Constituent Quark Models (CQM) and corresponding predictions are based on three quark degrees of freedom and show good agreement with measured resonance properties in the low-energy regime. The experimental motivation is not to test these models, but rather to use them as guides for finding the regions containing the most interesting physics. The region of interest for this experiment is the region around 1.8 GeV and above in which the majority of these ‘missing’ resonances lie as predicted by the CQMs.
NTIS
Hadrons; Nucleons; Photoproduction; Spectrometers; Spectroscopy

20090005144 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Florida State Univ., Tallahassee, FL, USA
Exotic Mesons at JLAB Before 2013. The Search for New Forms of Matter at CLAS
Brookwalter, C.; January 2007; 4 pp.; In English
Report No.(s): DE2007-921061; No Copyright; Avail.: Department of Energy Information Bridge
A proposal to search for exotic mesons in photoproduction has been accepted for running at Thomas Jefferson National

Accelerator Facility, using the CEBAF Large Acceptance Spectrometer in Hall B. This program will bolster previously-thin statistics in many photoproduction channels, primarily those with charged particles in the final state, as well as seeking to confirm earlier findings in neutral channels, if possible. The promise of the neutral 3pi channel is discussed. In addition, the experiment seeks to study the spectrum of both exotic and ordinary strangeonia. Limitations of the CLAS detector for meson spectroscopy are discussed, as well as possible solutions to minimize such limitations.
NTIS
Mesons; Photoproduction; Spectrometers

20090005145 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; South Carolina Univ., Columbia, SC, USA
Search for the Theta+ Pentaquark in the Reaction gammad-->pK0K-(p) with CLAS
Baltzell, N. A.; Oct. 2007; 4 pp.; In English
Report No.(s): DE2007-921065; JLAB/PHY-07-754; No Copyright; Avail.: National Technical Information Service (NTIS)
The naive constituent quark model, with only three-quark and quark-anti-quark states, has been remarkably successful in describing the mass spectra of well-known baryons and mesons. The additional interactions of quantum chromodynamics predict additional states, some of which cannot be described by the simple quark model. The search for these exotic states is a useful tool in testing our understanding of nature as described by the theories.
NTIS
Quarks; Quantum Chromodynamics

20090005146 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; South Carolina Univ., Columbia, SC, USA
Polarization Transfer in 4He(e-vector, e(prime)p-vector)3H
Paolone, M.; Oct. 2007; 4 pp.; In English
Report No.(s): DE2007-921066; JLAB/PHY-07-753; No Copyright; Avail.: Department of Energy Information Bridge
The nucleon is a composite object, and while strongly bound inside a dense nucleus one might expect the internal structure to be modified by interaction with external fields. Since the European Muon Collaboration first observed that the ratio of structure functions per nucleon for the deuteron and the dense iron nuclei was not unity many models of medium modification of the nucleon electromagnetic form factors have been proposed; such as the chiral quark soliton model (CQSM) or the quark-meson coupling (QMC) model, in which nuclear matter is treated as interacting through self-consistent exchange of scalar and vector mesons. With this model, one can show the predicted ratio of Sachs form factors (GE/GM) for a bound nucleon in nuclear medium versus the same form factor ratio for a free unbound nucleon. The QMC model predicts this double-ratio to be dependent on the Q(2) value of the reaction as well as on the density of the nuclear media.
NTIS
Chirality; Nucleons; Quark Models; Quarks; Polarization

20090005147 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; South Carolina Univ., Columbia, SC, USA
Time of Flight Upgrade for CLAS at 12 GeV
Graham, L.; January 2007; 4 pp.; In English
Report No.(s): DE2007-921067; No Copyright; Avail.: National Technical Information Service (NTIS)
The Time of Flight (TOF) system is a detection system within the CEBAF Large Acceptance Spectrometer (CLAS) at Jefferson National Accelerator Facility. CLAS, being a magnetic toroidal multi-gap spectrometer, is used in the detection of particles and their varying properties. Jefferson National Accelerator Facility is providing an incoming electron beam of energy 6 GeV that is used to probe the structure and production of these particles. The CLAS detector is currently adapted to energies of up to 6 GeV, but with recent approval it will now upgrade to energies of 12GeV. CLAS consists of drift chambers to determine the charged particle paths, gas Cherenkov counters for electron discrimination, TOF scintillators for particle identification, and an electromagnetic calorimeter for identifying showering electrons and photons. The TOF system, which is our focus, is composed of scintillation counters at the forward angle, and covers an area of 206 meters squared. Therefore, we look to upgrade and construct the TOF system of CLAS and outline strategies of current construction, purpose for design, and outlook for the TOF system upgrade.
NTIS
Detection; Spectrometers; Temporal Resolution

20090005148 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; Florida State Univ., Tallahassee, FL, USA

Search for Gluonic Excitations

Eugenio, P.; Oct. 2007; 6 pp.; In English

Report No.(s): DE2007-921068; JLAB/PHY-07-735; No Copyright; Avail.: Department of Energy Information Bridge

Studies of meson spectra via strong decays provide insight regarding QCD at the confinement scale. These studies have led to phenomenological models for QCD such as the constituent quark model. However, QCD allows for a much richer spectrum of meson states which include extra states such as exotics, hybrids, multi-quarks, and glueballs. First discussion of the status of exotic meson searches is given followed by a discussion of plans at Jefferson Lab to double the energy of the machine to 12 GeV, which will allow us to access photoproduction of mesons in search for gluonic excited states.

NTIS

Excitation; Mesons

20090005153 Fallon (Stephen P.) and Greer, Burns and Crain Ltd., Chicago, IL, USA; California Univ., Berkeley, CA, USA

System and Method for Mechanical Testing of Freestanding Microscale to Nanoscale Thin Films

Mackin, T. J., Inventor; Leseman, Z. C., Inventor; 2 Dec 05; 36 pp.; In English

Contract(s)/Grant(s): NSF-02-17469

Patent Info.: Filed Filed 2 Dec 05; US-Patent-Appl-SN-11-292 958

Report No.(s): PB2008-106130; No Copyright; Avail.: CASI: A03, Hardcopy

Method and device for measuring mechanical properties of microscale and nanoscale thin film membranes. A testing system comprises a unitary material load cell, including a substrate, a beam supported to the substrate at its ends and otherwise substantially free from the substrate, a test-probe extending from the substrate and connected to the beam, and a scale to measure movement of the test-probe relative to the substrate. The system further comprises a thin film support, supporting a thin film at its circumference and providing a freestanding thin film, and a positioner to move the unitary material load cell for controlled pushing against the freestanding thin film.

NTIS

Mechanical Properties; Patent Applications; Thin Films

20090005160 Blank Rome, LLP, Washington, DC, USA

Efficient Room-Temperature Source of Polarized Single Photons

Lukishova, S. G., Inventor; Boyd, R. W., Inventor; Stroud, C. R., Inventor; 9 Jan 04; 22 pp.; In English

Contract(s)/Grant(s): ARO-DAAD19-02-1-0285; DE-FC03-92SF19460

Patent Info.: Filed Filed 9 Jan 04; US-Patent-Appl-SN-10-753 323

Report No.(s): PB2008-106136; No Copyright; Avail.: CASI: A03, Hardcopy

An efficient technique for producing deterministically polarized single photons uses liquid-crystal hosts of either monomeric or oligomeric/polymeric form to preferentially align the single emitters for maximum excitation efficiency. Deterministic molecular alignment also provides deterministically polarized output photons; using planar-aligned cholesteric liquid crystal hosts as 1-D photonic-band-gap microcavities tunable to the emitter fluorescence band to increase source efficiency, using liquid crystal technology to prevent emitter bleaching. Emitters comprise soluble dyes, inorganic nanocrystals or trivalent rare-earth chelates.

NTIS

Patent Applications; Photons

20090005219 Opto-Knowledge Systems, Inc., Torrance, CA, USA

General Line of Sight Stabilization System

Gat, Nahun, Inventor; 26 Jan. 2006; 8 pp.; In English

Contract(s)/Grant(s): NAS13-03014

Patent Info.: Filed Filed 20 Jul. 04; US-Patent-Appl-SN-10-710538; US 2006/0017816

Report No.(s): PB2008-100633; No Copyright; Avail.: CASI: A02, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005219

A line of sight stabilization system using two mirrors pivotally mounted to a fixed platform that can be used with existing imaging systems to provide pitch, roll, and yaw compensation while maintaining image orientation. By deflecting only the photons, the inventive system avoids the need to stabilize the entire imaging sensor and optics system. The only mass to move

is that of the two imaging system mirrors. By monitoring attitude changes via an inertial measurement system, proceeding platform positions can be estimated for subsequent image acquisitions, and efficient mirror positioning can provide optimal image orientation and stabilization. This approach requires small motors with low torque, providing a less expensive, lightweight, and small image orientation and stabilization system.
Official Gazette of the U.S. Patent and Trademark Office
Line of Sight; Patent Applications; Imaging Techniques; Stability

20090005220 Tope-McKay and Associates, Malibu, CA, USA
Sub-Millimeter Wave Frequency Heterodyne Detector System
Siegel, Peter H., Inventor; Dengler, Rrobert, Inventor; 26 Jan. 2006; 14 pp.; In English
Patent Info.: Filed Filed 1 Oct. 04; US-Patent-Appl-SN-10-956734; US 2006/0016997
Report No.(s): PB2008-100619; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005220

The present invention relates to sub-millimeter wave frequency heterodyne imaging systems. More specifically, the present invention relates to a sub-millimeter wave frequency heterodyne detector system for imaging the magnitude and phase of transmitted power through or reflected power off of mechanically scanned samples at sub-millimeter wave frequencies.
Official Gazette of the U.S. Patent and Trademark Office
Frequencies; Heterodyning; Patent Applications; Receivers; Submillimeter Waves

20090005222 Akerman Senterfit, West Palm Beach, FL, USA
Radiography by Selective Detection of Scatter Field Velocity Components
Jacobs, Alan M., Inventor; Dugan, Edward T., Inventor; Shedlock, Daniel, Inventor; 26 Jan. 2006; 13 pp.; In English
Contract(s)/Grant(s): NAS8-6BUY
Patent Info.: Filed Filed 20 Jul. 04; US-Patent-Appl-SN-10-896 243; US 2006/0018434
Report No.(s): PB2008-100642; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005222

A reconfigurable collimated radiation detector, system and related method includes at least one collimated radiation detector. The detector has an adjustable collimator assembly including at least one feature, such as a fin, optically coupled thereto. Adjustments to the adjustable collimator selects particular directions of travel of scattered radiation emitted from an irradiated object which reach the detector. The collimated detector is preferably a collimated detector array, where the collimators are independently adjustable. The independent motion capability provides the capability to focus the image by selection of the desired scatter field components. When an array of reconfigurable collimated detectors is provided, separate image data can be obtained from each of the detectors and the respective images cross-correlated and combined to form an enhanced image.
Author
Backscattering; Detection; Patent Applications; Radiography

20090005946 Stanford Linear Accelerator Center, CA, USA
Papers from U.S. Department of Energy Science Undersgraduate Laboratory Intership Program (SULI)
Nov. 2007; 428 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919782; No Copyright; Avail.: National Technical Information Service (NTIS)

A fast track finder is presented which, unlike its more efficient, more computationally costly O(n3) time counterparts, tracks particles in O(n) time (for n being the number of hits). Developed as a tool for processing data from the ILCs proposed SiD detector, development of this fast track finder began with that proposed by Pablo Yepes in 1996 and adjusted to accommodate the changes in geometry of the SiD detector.
NTIS
Education; Detectors

20090005949 Stanford Linear Accelerator Center, CA, USA
Thinking Inside the Box
Boeheim, C. T.; Nov. 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920012; SLAC-PUB-12986; No Copyright; Avail.: Department of Energy Information Bridge

In early 2007, SLAC was faced with a shortage of both electrical power and cooling in the main computer building, at

the same time that the BaBar collaboration needed a new cluster of 250 batch machines installed. A number of different options were explored for the expansion. Provision of additional electrical power to the building was estimated to take one to two years, and cost several million dollars; additional cooling was even worse. Space in a Silicon Valley co-location facilities was reasonable on a one-year timescale, but broke even in costs by the end of three years, and were more expensive after that. There were also unresolved questions about the affects of additional latency from an offsite compute cluster to the onsite disk servers. The option of converting existing experimental hall space into computer space was estimated at one year, with uncertain availability. An option to aggressively replace several existing clusters with more power-efficient equipment was studied closely, but was disruptive to continued operations, expensive, and didnt provide any additional headroom. Finally, the installation of a Sun Project Blackbox (PBB) unit was selected as providing the capacity on a timescale of six months for a reasonable cost with minimal disruption to service. SLAC obtained and installed a beta unit and have been running it in production since September 2007. The experiences described are with the Early Access version of the PBB. The production version of the box has engineering changes based in part on our experiences.
NTIS
Computers; Cooling; Linear Accelerators

20090005950 Stanford Linear Accelerator Center, CA, USA
Possible Connection Between Dark Energy and the Hierarchy
Chen, P.; Gu, J.; January 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00151
Report No.(s): DE2007-920015; SLAC-PUB-13012; No Copyright; Avail.: Department of Energy Information Bridge

Recently it was suggested that the dark energy maybe related to the well-known hierarchy between the Planck scale (1019GeV) and the TeV scale. The same brane-world setup to address this hierarchy problem may also in principle address the smallness problem of dark energy. Specically, the Planck-SM hierarchy ratio was viewed as a quantum gravity-related, dimensionless fine structure constant where various physical energy scales in the system are associated with the planck mass through different powers of the 'gravity fine structure constant'. In this paper we provide a toy model based on the Randall-Sundrum geometry where SUSY-breaking is induced by the coupling between a SUSY-breaking Higgs field on the brane and the KK gravitinos. We show that the associated Casimir energy density indeed conforms with the dark energy scale.
NTIS
Dark Energy; Hierarchies

20090005953 Massachusetts Inst. of Tech., Cambridge, MA, USA
Radiative Penguin Decays at the beta Factories
Koneke, K.; January 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920017; SLAC-PUB-13007; No Copyright; Avail.: National Technical Information Service (NTIS)

Now, at the verge of the Large Hadron Collider (LHC) becoming operational, an exciting new era of discovery in high-energy particle physics is anticipated. There is a whole series of new physics models attempting to fix some of the shortcomings of the Standard Model (SM) of elementary particle physics, most notably the hierarchy problem of the Higgs sector. Low energy supersymmetry (SUSY) is probably the most popular extension of the SM. But all these new models introduce new free parameters. Current precision experiments can be used to constrain the allowed space of these additional new parameters and therefor guide the searches at the LHC. One very interesting class of decays are so-called penguin decays where the leading order SM decay contribution is described by a one-loop Feynman diagram. Here, I will concentrate on penguin decays of B mesons where a photon is radiated off. Unknown particles that do not exist in the SM can contribute considerably to these decays, e.g. by appearing in this loop, and thus shift measurable observables. But if the measurements agree with SM based theoretical predictions, constraints on various beyond the SM physics scenarios can be extracted. There is a large interest in B meson decays since they provide an excellent window into the physics of quark mixing. In the SM, this is parameterized by four numbers that appear as the four independent parameters of the Cabibbo-Kobayashi-Maskawa (CKM) quark mixing matrix. A stringent test of the SM is performed by overconstraining these four parameters with independent measurements, of which many can be done by studying B meson decays.
NTIS
Industrial Plants; Mesons

20090005955 Stanford Linear Accelerator Center, CA, USA; Technische Univ., Dresden, Germany
Measurement of sin (2beta) in Tree Dominated B(sup 0) Decays and Ambiguity Removal
Lacker, H.; January 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920018; SLAC-PUB-13018; No Copyright; Avail.: Department of Energy Information Bridge
The most recent results from the B-factories on the time-dependent CP asymmetries measured in B0-decays mediated by b ->ccs quark-transitions are reviewed. The Standard Model interpretation of the results in terms of the parameter sin 2 leads to a four-fold ambiguity on the unitarity triangle which can be reduced to a two-fold ambiguity by measuring the sign of the parameter cos 2. The results on cos2 obtained so far are reviewed.
NTIS
Ambiguity; Invariance; Mesons

20090006022 Stanford Linear Accelerator Center, CA, USA
Lepton Flavour Violation and Baryon Number Non-Conservation in tau yields lambda + h
January 2006; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920019; SLAC-PUB-13006; No Copyright; Avail.: Department of Energy Information Bridge
One of the important unresolved issues in physics is the presence of a large baryon asymmetry in todays universe. According to Sakharov three conditions must be satisfied in order for a baryon asymmetry to arise from an initial state with zero baryon number: baryon number violation, C and CP symmetry violation, and a departure from thermal equilibrium. No baryon number violating processes have yet been observed. Although we know that the baryon number was violated in the early universe we do not know how this came about.
NTIS
Baryons; Conservation; Invariance; Leptons

20090006023 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Nucleon Structure Studies in Hall A At JLAB
de Jager, K.; January 2007; 12 pp.; In English
Report No.(s): DE2007-920505; No Copyright; Avail.: Department of Energy Information Bridge
Three examples are presented from the broad program of nucleon structure research in Hall A at Jefferson Lab (JLab): a measurement of the neutron charge form factor to double the squared momentum-transfer of present data, highly accurate cross-section measurements of Deeply Virtual Compton Scattering and a program of parity-violating asymmetry studies with the 12 GeV upgrade that will provide sensitive probes of the Standard Model and its extensions.
NTIS
Nucleons; Structures

20090006025 Virginia Univ., Charlottesville, VA, USA; Thomas Jefferson National Accelerator Facility, Newport News, VA, USA
Recent Results from the JLAB Spin Physics Program
Slifer, K.; Nov. 28, 2007; 7 pp.; In English
Report No.(s): DE2007-920578; JLAB/PHY-07-750; No Copyright; Avail.: National Technical Information Service (NTIS)
We present here select recent results from the Thomas Jefferson National Laboratory Spin Physics program, along with the perspective on some upcoming experiments.
NTIS
Nucleons; Spin

20090006026 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Richmond Univ., VA, USA
Measuring Form Factors and Structure Functions with CLAS
Gilfoyle, G. P.; Oct. 2007; 9 pp.; In English
Report No.(s): DE2007-920580; JLAB/PHY-07-760; No Copyright; Avail.: National Technical Information Service (NTIS)
The physics program at the Thomas Jefferson National Accelerator Facility includes a strong effort to measure form factors and structure functions to probe the structure of hadronic matter, reveal the nature of confinement, and develop an understanding of atomic nuclei using quark-gluon degrees of freedom. The CLAS detector is a large acceptance device

occupying one of the end stations. We discuss here two programs that use CLAS; measuring the magnetic form factor of the neutron, and the virtual photon asymmetry of the proton. The form factor has been measured with unprecedented kinematic coverage and precision up to Q2 = 4.7 GeV2 and is consistent within 5%- 10% of the dipole parameterization. The proton virtual photon asymmetry has been measured across a wide range in Bjorken x. The data exceed the SU(6)-symmetric quark prediction and show evidence of a smooth approach to the scaling limit prescribed by perturbative QCD.
NTIS
Form Factors; Hadrons; Neutrons

20090006027 Stanford Linear Accelerator Center, CA, USA; Cincinnati Univ., OH, USA
Charmed Meson Dalitz Plot Analyses at BaBar
Mishra, K.; Nov. 2007; 8 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920592; SLAC/PUB-13041; No Copyright; Avail.: National Technical Information Service (NTIS)
The amplitudes describing D and Ds meson weak decays into final states with three pseudo-scalers are dominated by intermediate resonances that lead to highly nonuniform intensity distributions in the available phase space.
NTIS
Charm (Particle Physics); Mesons; Particle Decay

20090006028 Stanford Linear Accelerator Center, CA, USA; Warwick Univ., Coventry, UK
Charmless Hadronic B Decays at BaBar
Mohanty, G. B.; Nov. 2007; 7 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920599; SLAC/PUB-13011; No Copyright; Avail.: National Technical Information Service (NTIS)
We report recent measurements of branching fractions and charge asymmetries of charmless hadronic B decays using the data collected with the BABAR detector at the PEP-II asymmetric energy e(+)e(-) collider.
NTIS
Hadrons; Particle Decay

20090006029 Stanford Linear Accelerator Center, CA, USA; Liverpool Univ., UK
Charmless Hadronic B Decays at BaBar (SLAC/PUB-13028)
Burke, J. P.; Nov. 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920597; SLAC/PUB-13028; No Copyright; Avail.: Department of Energy Information Bridge
We report recent measurements for the branching fractions of charmless hadronic B decays obtained from data collected by the BABAR detector at the PEP-II asymmetric-energy collider at the Stanford Linear Accelerator Center.
NTIS
Hadrons; Particle Decay

20090006030 Stanford Linear Accelerator Center, CA, USA; Manchester Univ., UK
Measurement of the CKM Angles at BaBar and Belle
Barlow, N.; January 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920601; SLAC/PUB-13038; No Copyright; Avail.: National Technical Information Service (NTIS)
The primary goal of the BaBar and Belle experiments is to overconstrain the CKM Unitarity Triangle.
NTIS
CP Violation; Measurement; Triangles

20090006031 Stanford Linear Accelerator Center, CA, USA; Massachusetts Univ., Amherst, MA, USA
Exclusive Hadronic Final States in e+e- Interactions at BaBar
Saremi, S.; January 2007; 4 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-920602; SLAC/PUB-13037; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Annihilation Reactions; Hadrons

20090006037 Wells Saint John, PS, Spokane, WA, USA
Ion Mobility Spectrometry Method and Apparatus
Hill, H. H., Inventor; Tam, M., Inventor; 29 Apr 06; 20 pp.; In English
Contract(s)/Grant(s): ARO-DAAD190216350
Patent Info.: Filed Filed 29 Apr 06; US-Patent-Appl-SN-11-830 927
Report No.(s): PB2008-106122; No Copyright; Avail.: CASI: A03, Hardcopy

The invention includes an ion mobility spectrometer having a liquid filled drift chamber. The chamber has an ionization region partitioned from and an ion separation region by a reversible ion-migration block. An electrical field within the chamber allows ions to migrate toward the electrode collector. Passage of ions from the ionization region is triggered by reversing the block allowing ions to migrate into the ion separation region. The invention includes a method of ion mobility analysis in liquid phase. Ions are mobilized to migrate through a drift liquid and are detected at an end of a drift chamber. The invention also includes a method of generating ions in a sample. A sample containing molecules in a first solvent is introduced into a second solvent through a charged capillary where the electrically charged sample is electro-disperses to ionize the molecules.
NTIS
Ion Mobility Spectroscopy; Ions; Mobility; Patent Applications; Spectrometers

20090006191 Defence Science and Technology Organisation, Victoria, Australia
An Evaluation of the Effective Block Approach Using P-3C and F-111 Crack Growth Data
Wallbrink, C; Amaratunga, R; Hu, W; Jackson, P; Mongru, D; Sep 2008; 92 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491306; DSTO-TR-2195; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Recently an effective block approach has been proposed to address the experimentally observed growth rates of fatigue cracks at critical locations on F/A-18 airframes. In this approach, each program of spectrum load is treated as an equivalent constant amplitude cycle, and the baseline crack growth rate data are obtained using a similar spectrum load of interest. A procedure was devised to allow the use of the model parameters obtained under one load spectrum to predict the crack growth under a different load spectrum. In this study, we critically evaluate the capability of the effective block approach, using data obtained for the F-111 and P-3C coupon test programs, to gauge its general applicability to other aircraft operated by the Royal Australian Air Force. The data used in the evaluation encompasses different load spectra, different materials and different crack configurations. This investigation has found that the effective block approach was able to model fatigue crack growth in 2024-T851 aluminium under the F-111 flight spectra examined, but it could not produce an acceptable estimation of the total crack growth life for the P-3C spectra studied. It was, however, able to produce reasonable predictions of fatigue crack growth in a chosen interval of crack length. This report provides an independent evaluation and guidance for the application of the effective block approach.
DTIC
Crack Propagation; F-111 Aircraft

20090006291 Georgetown Univ., Washington, DC USA
Prediction of Magnetic and Electronic Phenomena in Molecular-Assembled Crystals
Liu, Amy Y; Baruah, Tunna; Park, Kyungwha; Dec 19, 2008; 4 pp.; In English
Contract(s)/Grant(s): N00014-02-1-1046
Report No.(s): AD-A491900; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491900

This grant supported two postdoctoral fellows who worked on a variety of problems related to the prediction of materials properties from first principles. Projects included optimization of a parallel code for calculating magnetic anisotropy parameters; application of the method to molecule-based magnets; studies of structural and electronic properties of interfaces between ferromagnets and semiconductors; and investigation and quantification of vibrational contributions to the Van der Waals interaction between molecules.
DTIC
Crystals; Electromagnetic Properties; Magnets

20090006437 Mitre Corp., McLean, VA USA
Current Spreading in Long Objects
Eardley, D; Oct 2008; 23 pp.; In English
Report No.(s): AD-A492130; JSR-08-531; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This note derives the distribution of electrical spreading currents along the length of solid conducting objects for which

the length substantially exceeds the width. Sources and sinks of DC (or very low frequency AC) current are placed at one end of the object, and the fall-off of spreading current is studied as a function of length. The fall-off can be great; for instance in the case of a solid rectangular object, the fall-off of spreading current along the length is 27dB per unit width. Comparison is made to inductive coupling, which becomes important as frequency increases.
DTIC
Alternating Current; Direct Current; Spreading

20090006457 Naval Undersea Warfare Center, Newport, RI USA
Measurement of the Shear Wavespeed in an Isotropic Elastomeric Plate
Hull, Andrew J; Cray, Benjamin A; Oct 10, 2008; 33 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj-03302
Report No.(s): AD-A492287; NUWC-NPT-TR-11894; No Copyright; Avail.: Defense Technical Information Center (DTIC)

A method to estimate the shear wavespeed in an isotropic, thick, elastomeric plate is demonstrated in this report. A point force is applied to the plate and a scanning laser vibrometer is used to measure normal velocity on one surface. The temporal domain measurements are transformed into the frequency domain using a Fourier transform, then, the spatial domain measurements are transformed into the kx, ky wavevector domain using two Fourier transforms. Once the data are in the wavevector-frequency domain, the propagation wavenumbers for specific Lamb waves can be estimated from the peaks within the kx,ky spectra. Using the estimated values of the propagation wavenumbers, a Newton-Raphson gradient method is applied to the Raleigh-Lamb dispersion curve equations to obtain an estimate of the shear wavespeed, a quantity that is generally difficult to measure. A simulation and an experiment are included to illustrate the method, and the accuracy of the measurement process is discussed.
DTIC
Elastomers; Isotropy; Shear Properties

20090006462 State Research Center of Russia, Moscow, Russian Federation
Incidental/Absorbed Exposure Electromagnetic Field Energy Ratio Analysis Under Laboratory Experiment Conditions (for Russian-French Immunology Project)
Stepanov, Vladimir S; Ilyin, Leonid A; Nov 7, 2007; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A492303; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report results from a contract tasking SRC-Institute of Biophysics as follows: Since early 1950s, the significant number of experimental studies were elaborated to examine health effects induced by acute or chronic exposure to the radiofrequency electromagnetic field (RF EMF). In such studies, the RF EMF characteristics (exposure (dose), essentially) of the irradiation in different biological objects were predominantly identified basing upon the measured intensity of the non-distorted incidental RF EMF. Thus, the RF EMF distribution in the biological object body was not taken into account. Such approach does not give the opportunity to compare the obtained results versus similar data obtained in different foreign laboratories. However, the absorbed energy information (so-called SAR concept application) is very important, when establishing maximum permissible values of RF EMF intensity and harmonizing the international electromagnetic safety standards under the framework of World Health Organization International EMF Project. Under this research, the study of the ratio pattern of calculated exposure dose, when identifying the energy of the incidental and absorbed RF EMF via data of the laboratory experiment, will be elaborated in the framework of Russian-French Immunology Project under the umbrella of the World Health Organization.
DTIC
Absorption; Electromagnetic Fields; Exposure; Immunology; Radio Frequencies

20090006557 Army Research Lab., Cleveland, OH USA
Modal Synthesis of a Non-Proportionally Damped, Gyroscopically Influenced, Geared Rotor System via the State-Space
Stringer, David B; Sheth, Pradip N; Allaire, Paul E; Sep 2008; 35 pp.; In English; Original contains color illustrations
Report No.(s): AD-A487534; ARL-TR-4582; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Modal synthesis provides for degree-of-freedom reduction and model simplification. This report presents a method for conducting modal synthesis on a geared rotor dynamic system under the influences of non-proportional damping and gyroscopic effects. Based on the familiar first-order, state-space methodology, a coordinate transformation is developed for diagonalizing the state-space equations of motion for each substructure of the system. A modal synthesis procedure then

assembles the system equations of motion from the individual substructures. The coupling between the substructures occurs via the gear mesh. Using this methodology, the size and complexity of the model are reduced without incurring any significant loss in accuracy. The reduced model still allows for traditional methods of system analysis: Eigen-solution analysis, frequency domain response, and time domain response. Validation of this methodology occurs through its application to a finite element analysis of a geared system already published in the literature. The application illustrates that the results of the reduced system match almost exactly with the full finite element model. Additionally, the topics of gearing and gyroscopic effects are discussed with respect to limitations that arise from the analysis. In addition to model simplification, this technique also exhibits further potential for use in optimization and system identification schemes.
DTIC
Equations of Motion; Rotor Dynamics; Rotors

20090006571 Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA
Recent Experimental Results from JLab
de Jager, K.; Dec. 11, 2007; 17 pp.; In English
Report No.(s): DE2007-920649; No Copyright; Avail.: Department of Energy Information Bridge

The JLab 6 GeV research program in hadronic physics can be separated into three broad areas of investigation: the structure of the nuclear building blocks; the structure of nuclei; and symmetry tests in nuclear physics. Here, the results of eight recent experiments are presented that answer detailed questions of two of these areas: measure precisely the nucleons charge and magnetization distribution; determine the internal structure of the nucleon in the valence region; develop the experimental methods for performing tomography of the nucleon; probe the nuclear interior with a controlled impurity to learn about deeply-lying shell structurel clarify the short-range nature of nucleon-nucleon interactions in nuclei and compare the properties of bound nucleons with free ones; and test chiral perturbation theory by studying the properties of Goldstone bosons.
NTIS
Hadrons; Symmetry

20090006572 Fermi National Accelerator Lab., Batavia, IL, USA; Indiana Univ., Bloomington, IN, USA; University of Northern Illinois, De Kalb, IL, USA
LC Scintillator-based Muon Detector/Tail-catcher R&
Abrams, R.; Blazey, G.; Driutti, A.; Dychkant, A.; Fisk, H. E.; January 2007; 5 pp.; In English
Report No.(s): DE2007-920721; FERMILAB/CONF-07-589-E; No Copyright; Avail.: National Technical Information Service (NTIS)

Preliminary analysis of test beam data from strip scintillator planes read-out with multi-anode PMTs (MAPMTs) is presented along with a description of the independent systematic measurements of relative response for all channels of several MAPMTs used in the tests. Test beam measurements for the response of a scintillator strip, read out with Si photo-sensors, is also described.
NTIS
Catchers; Muons; Scintillation Counters

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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*.

20090005062 Christie, Parker and Hale, LLP, Pasadena, CA, USA
Technique and Device for Through-the-Wall Audio Surveillance
McGrath, William R., Inventor; 30 Mar 05; 12 pp.; In English
Contract(s)/Grant(s): NAS7-1407
Patent Info.: Filed 30 Mar. 2005; US-Patent-Appl-SN-11-095,122; US 2005/0220310
Report No.(s): PB2007-105267; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005062

Systems and methods are disclosed for detecting audible sound and/or the vibration of objects. Embodiments of the present invention are able to detect sound and other vibrations through barriers. One embodiment of the invention includes

an RF transmitter configured to generate an RF signal having a frequency of at least 100 MHz and an unmodulated amplitude, an RF receiver configured to receive a reflected RF signal comprising an RF carrier having the same frequency as the generated RF signal that is amplitude modulated by an information signal and a signal processor configured to extract audio frequency information from the amplitude of the reflected RF signal.
Official Gazette of the U.S. Patent and Trademark Office
Hearing; Patent Applications; Surveillance; Vibration; Walls

20090005216 Origin Law-Boeing, Claremont, CA, USA
Parametrically Disciplined Operation of a Vibratory Gyroscope
Shcheglov, Kirill V., Inventor; Hayworth, Ken J., Inventor; Challoner, A. Dorian, Inventor; Peay, Chris S., Inventor; 23 Feb. 2006; 29 pp.; In English
Contract(s)/Grant(s): NAS7-1402
Patent Info.: Filed Filed 29 Jul. 05; US-Patent-Appl-SN-11-192759; US 2006/0037417
Report No.(s): PB2008-100962; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005216

Parametrically disciplined operation of a symmetric nearly degenerate mode vibratory gyroscope is disclosed. A parametrically-disciplined inertial wave gyroscope having a natural oscillation frequency in the neighborhood of a sub-harmonic of an external stable clock reference is produced by driving an electrostatic bias electrode at approximately twice this sub-harmonic frequency to achieve disciplined frequency and phase operation of the resonator. A nearly symmetric parametrically-disciplined inertial wave gyroscope that can oscillate in any transverse direction and has more than one bias electrostatic electrode that can be independently driven at twice its oscillation frequency at an amplitude and phase that disciplines its damping to zero in any vibration direction. In addition, operation of a parametrically-disciplined inertial wave gyroscope is taught in which the precession rate of the driven vibration pattern is digitally disciplined to a prescribed non-zero reference value.
Official Gazette of the U.S. Patent and Trademark Office
Gyroscopes; Patent Applications; Vibration

20090005255 Honeywell International, Inc., Morristown, NJ USA
Systems and methods for self-synchronized digital sampling
Samson, Jr., John R., Inventor; October 14, 2008; 8 pp.; In English
Contract(s)/Grant(s): NAS8-01140
Patent Info.: Filed November 1, 2005; US-Patent-7,437,272; US-Patent-Appl-SN-11/264,566; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005255

Systems and methods for self-synchronized data sampling are provided. In one embodiment, a system for capturing synchronous data samples is provided. The system includes an analog to digital converter adapted to capture signals from one or more sensors and convert the signals into a stream of digital data samples at a sampling frequency determined by a sampling control signal; and a synchronizer coupled to the analog to digital converter and adapted to receive a rotational frequency signal from a rotating machine, wherein the synchronizer is further adapted to generate the sampling control signal, and wherein the sampling control signal is based on the rotational frequency signal.
Official Gazette of the U.S. Patent and Trademark Office
Data Sampling; Synchronism; Pulse Communication

20090005801 SunPower, Inc., Athens, OH USA
Multi-stage pulse tube cryocooler with acoustic impedance constructed to reduce transient cool down time and thermal loss
Gedeon, David R., Inventor; Wilson, Kyle B., Inventor; October 21, 2008; 10 pp.; In English
Contract(s)/Grant(s): NAS5-02021
Patent Info.: Filed August 23, 2005; US-Patent-7,437,878; US-Patent-Appl-SN-11/209,983; No Copyright; Avail.: CASI: A02, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005801

The cool down time for a multi-stage, pulse tube cryocooler is reduced by configuring at least a portion of the acoustic impedance of a selected stage, higher than the first stage, so that it surrounds the cold head of the selected stage. The

surrounding acoustic impedance of the selected stage is mounted in thermally conductive connection to the warm region of the selected stage for cooling the acoustic impedance and is fabricated of a high thermal diffusivity, low thermal radiation emissivity material, preferably aluminum.
Official Gazette of the U.S. Patent and Trademark Office
Acoustic Impedance; Cryogenic Cooling; Fabrication; Losses; Thermal Diffusivity

20090006086 Weston Geophysical Corp., Lexington, MA USA
Quantification of Rock Damage from Small Explosions and its Effect on Shear-Wave Generation: Phase I - Homogeneous Crystalline Rock
Leidig, Mark; Boyd, Peter; Martin, Randolph J; Lewkowicz, James F; Richter, Dorothy; Garfield, Robert; Reid, Jeffrey A; Bonner, Jessie L; Sep 30, 2008; 11 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): FA8718-08-C-0044; Proj-1010
Report No.(s): AD-A487736; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487736

We are currently conducting a one-year feasibility study to determine the most efficient way to characterize the damage from an explosive source and to identity the source(s) of shear wave generation. We hope to quantify crack nucleation and growth (Ashby and Sammis, 1990) as an S-wave generation mechanism in the far-field (Sammis, 2002) and to map the cone of damage (Patton et. al. 2005; Stevens et. al. 2003) above a source, modeled by a compensated linear vector dipole (CLVD). This study is being conducted at a quarry in Barre, Vermont, in a granite body that has a low fracture density and typically forms large blocks used for monuments. In this study, we are detonating five small (<200 lb) explosions at depths of approximately 9, 12, and 17 m each separated by at least 20 m so the damage zones do not overlap. We plan to use two different types of explosives in order to provide different fracturing in the rocks. An ammonium nitrate fuel oil (ANFO)-Emulsion mixture with a slow velocity of detonation (VOD) should produce larger length cracks while a molecular explosive with a high VOD should produce a large rubble zone near the borehole and cracks of smaller lengths. We are quantitatively and qualitatively defining the damage around the source using coring, cross-borehole seismic tomography, and borehole televiewers before and after the explosions. We will also deploy a large network of accelerometers and seismometers from S m to 30km from each blast. These Stations will include near-source (<1 km) accelerometers and short-period seismometers that will record the physical characteristics of the primary seismic pulse created by the explosions. We will also deploy two linear arrays of intermediate and short-period sensors in order to track the P- and S-waves energy partitioning from the explosions with hopes of relating the observables hack to the variation in damage caused by the explosions. The explosions are planned for July 2008.
DTIC
Crystallinity; Damage; Explosions; Nuclear Explosions; Rocks; S Waves

20090006151 Library of Congress, Washington, DC USA
Whales and Sonar: Environmental Exemptions for the Navy's Mid-Frequency Active Sonar Training
Alexander, Kristina; Nov 14, 2008; 21 pp.; In English
Report No.(s): AD-A491231; CRS-RL34403; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491231

Mid-frequency active (MFA) sonar emits pulses of sound from an underwater transmitter to help determine the size, distance, and speed of objects. The sound waves bounce off objects and reflect back to underwater acoustic receivers as an echo. MFA sonar has been used since World War II, and the Navy indicates it is the only reliable way to track submarines, especially more recently designed submarines that operate more quietly, making them more difficult to detect. Scientists have asserted that sonar may harm certain marine mammals under certain conditions, especially beaked whales. Depending on the exposure, they believe that sonar may damage the ears of the mammals, causing hemorrhaging and/or disorientation. The Navy agrees that the sonar may harm some marine mammals, but says it has taken protective measures so that animals are not harmed.
DTIC
Education; Frequencies; Sonar; Whales

20090006192 Army Engineer Research and Development Center, Vicksburg, MS USA
Library of Habitat Models to Evaluate Benefits of Aquatic Restoration Projects on Fishes
Killgore, K J; Hoover, Jan J; Murphy, Catherine E; Aug 2008; 11 pp.; In English
Report No.(s): AD-A491319; ERDC-TN-EMRRP-ER-10; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Habitat models are used to evaluate impacts of water resource development activities such as flood control and navigation projects, and environmental benefits of restoration or mitigation projects. These models generally take the form of an index ranging from 0.0 (poor habitat) to 1.0 (optimum habitat), referred to as a Habitat Suitability Index (HSI). HSI's are used to weight acres of affected habitat, a method compatible with the commonly used Habitat Evaluation Procedure (www.fws.gov/policy/hbindex.cfm) or Instream Flow Incremental Methodology (www.fort.usgs.gov/Products/Software/IFIM/). Both of these methods multiply quality (i.e., HSI) and quantity (e.g., acres) to determine habitat conditions. HSI s represent the biological components of the evaluation (e.g., number of species, relative abundance) and their responses to changes in habitat conditions. The multiplicative product of HSI and acres of habitat is a unit (e.g., Habitat Unit, Weighted Usable Area) that can be compared among project alternatives and averaged over the life of the project (e.g., Average Annual Habitat Unit). The U.S. Army Engineer Research and Development Center (ERDC) continues to evaluate consequences of flood control, water supply, and navigation projects on fish assemblages, as well as benefits of aquatic restoration. Many of these projects have been completed through leveraged funds from Corps of Engineers Districts (primarily Vicksburg and Memphis Districts) and the Ecosystem Management and Restoration Research Program at ERDC. HSI models are based on field-derived correlations between biotic-abiotic variables, resulting in a library of regression equations developed over the past 10 years. The purpose of this technical note is to summarize the HSI models and describe their development and applicability as assessment tools in similar aquatic systems.
DTIC
Fishes; Habitats; Libraries; Marine Biology; Restoration; Water Resources

20090006218 Army Aeromedical Research Lab., Fort Rucker, AL USA
Noise and Reverberation Reduction in Post Chapel Activity Room
Houtsma, Adrianus J; Nov 18, 2008; 27 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491523; USAARL-2009-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In the fall of 2005 the author was contacted by the Fort Rucker Post Chaplain to investigate and offer some suggestions for improving the acoustics in the chapel's activity room. Visual inspection and Sabine-model calculations led to the recommendation to install additional sound-absorbing surface area. In January 2006, the Fort Rucker Directorate of Public Works presented a contractor's proposal to add 700 square feet of absorbing baffles suspended from the ceiling. This plan was later changed to include an additional 1000 square feet of absorbing wall panel to the already existing wall-mounted paneling. This report contains results of reverberation time measurements, made before and after installation of the additional paneling. It shows that the renovation was effective, reducing reverberation times at all frequencies by almost a factor of two except at the lowest measured frequency (125 Hz) where reverberation time was unaffected. It is expected that, with a carefully tuned electronic public address system, the space should now be acoustically functional for worship, conferences, theater and music performances, and social functions.
DTIC
Noise Reduction; Reverberation

20090006466 VanDeuren (Reinhart Boener), Rockford, IL, USA
Method and System to Perform Energy-Extraction Based Active Noise Control
Kelkar, Atul, Inventor; Joshi, Suresh M., Inventor; 23 Mar. 2006; 29 pp.; In English; Original contains black and white illustrations
Contract(s)/Grant(s): NCC1-01039; NSF 0196198; NSF 0301740
Patent Info.: Filed Filed 9 Dec. 03; US-Patent-Appl-SN-10-731742; US 2006/0064180
Report No.(s): PB2008-101925; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090006466

A method to provide active noise control to reduce noise and vibration in reverberant acoustic enclosures such as aircraft, vehicles, appliances, instruments, industrial equipment and the like is presented. A continuous-time multi-input multi-output (MIMO) state space mathematical model of the plant is obtained via analytical modeling and system identification. Compensation is designed to render the mathematical model passive in the sense of mathematical system theory. The compensated system is checked to ensure robustness of the passive property of the plant. The check ensures that the passivity

is preserved if the mathematical model parameters are perturbed from nominal values. A passivity-based controller is designed and verified using numerical simulations and then tested. The controller is designed so that the resulting closed-loop response shows the desired noise reduction.
Author
Active Control; Extraction; Noise Reduction; Vibration Damping

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*.

20090004999
Criticality Curves for Plutonium Hydraulic Fluid Mixtures
January 2006; 44 pp.; In English
Report No.(s): DE2007-919537; HNF-33756; No Copyright; Avail.: Department of Energy Information Bridge
This document shows the critical volume and critical mass for various concentrations of plutonium in hydraulic fluid . Between 1 and 2 gallons of hydraulic fluid were discovered in the bottom of HA-23S. This HA-23S hydraulic fluid was reported by engineering to be Fyrquell(reg.) 220. The hydraulic fluid in Glovebox HA-23S is Fyrquel(reg.) 220 which contains phosphorus. Critical spherical geometry in air is calculated with 0 in., 1 in., or 12 inches hydraulic fluid reflection.
NTIS
Critical Mass; Hydraulic Fluids; Plutonium

20090005832 White Sands Missile Range, NM USA
Test Operations Procedure (TOP) 1-2-612 Nuclear Environment Survivability
Oct 24, 2008; 141 pp.; In English; Original contains color illustrations
Report No.(s): AD-A488222; TOP-1-2-612; No Copyright; Avail.: Defense Technical Information Center (DTIC)
This Test Operations Procedure (TOP) is a general outline on test and analysis procedures required to determine the effects of a specified nuclear environment on Army materiel.
DTIC
Environments; Nuclear Radiation

20090006267 Library of Congress, Washington, DC USA
Iran's Nuclear Program: Status
Kerr, Paul K; Nov 20, 2008; 22 pp.; In English
Report No.(s): AD-A491665; CRS-RL34544; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491665
Although Iran claims that its nuclear programs are exclusively for peaceful purposes, they have generated considerable concern that Tehran is pursuing a nuclear weapons program. Indeed, the UN Security Council has responded to Iran's refusal to suspend work on its uranium enrichment and heavy-water nuclear reactor programs by adopting several resolutions which imposed sanctions on Tehran. Despite this pressure, Iran continues at its Natanz centrifuge facility to enrich uranium, expand the number of operating centrifuges, and conduct research on new types of centrifuges. Tehran has also continued to produce centrifuge feedstock, as well as work on its heavy-water reactor and associated facilities. Whether Iran is pursuing a nuclear weapons program is, however, unknown. A National Intelligence Estimate made public in December 2007 assessed that Tehran halted its nuclear weapons program, defined as Iran's nuclear weapon design and weaponization work and covert uranium conversion-related and uranium enrichment related work, in 2003. The estimate, however, also assessed that Tehran is keeping open the option to develop nuclear weapons and that any decision to end a nuclear weapons program is inherently reversible. Although Iran has cooperated with the International Atomic Energy Agency (IAEA) to an extent, the agency says that Tehran has not gone far enough to alleviate all of the agency's concerns about Iran s enrichment and heavy-water reactor programs. The IAEA continues to investigate the program, particularly evidence that Tehran may have conducted procurement activities and research directly applicable to nuclear weapons development. This report expands and replaces RS21592, Iran s Nuclear

Program: Recent Developments, by Sharon Squassoni, and will be updated as necessary.
DTIC
International Relations; Iran

20090006429 Ball Corp., Irvine, CA USA
Radiation Hardness of Efratom M-100 Rubidium Frequency Standard
English, Thomas C; Vorwerk, Henry; Rudie, Norman J; Dec 1982; 30 pp.; In English
Report No.(s): AD-A492110; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The effects of nuclear radiation on rubidium gas cell frequency standards and components are presented. including the results of recent tests where a continuously operating rubidium frequency standard (Efratom, Model M-100) was subjected to simultaneous neutron/gamma radiation. At the highest neutron fluence [7.5 x 10(12) n/cm2] and total dose [11 krad(Si)] tested, the unit operated satisfactorily; the total frequency change over the 2.5 hour test period due to all causes, including repeated retraction from and insertion into the reactor, was less than 1 x 1O(-10), The effects of combined neutron/gamma radiation on rubidium-frequency- standard physics-package components were also studied, and the results are presented.
DTIC
Frequency Standards; Hardness; Radiation Hardening; Rubidium

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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*.

20090005154 Alston and Bird, LLP, Charlotte, NC, USA
Solid State Laser Medium and Laser Medium Heat Transfer Method
Fork, R. L., Inventor; Laycock, R., Inventor; 2 May 05; 17 pp.; In English
Contract(s)/Grant(s): DOD-W911NF-04-10097; DAAD19-02-1-0073; NASA-NCC8-200
Patent Info.: Filed Filed 2 May 05; US-Patent-Appl-SN-11-120-303
Report No.(s): PB2007-110124; No Copyright; Avail.: CASI: A03, Hardcopy
ONLINE: http://hdl.handle.net/2060/20090005154

A solid state laser medium comprising at least one cooling element, i.e. cooling element, in contact with and alternating in series with at least one gain element. At least one cooling element and at least one gain element are joined at an interface having a center point, wherein the interface is physically modified at the interface such that the heat transfer coefficient at the interface decreases radially from the center point of the interface. The modified interface promotes thermal transfer from the gain element in the axial direction, in such a manner as to reduce thermal distortion affecting optical properties of the laser. Concentric radially disposed barriers to heat flow that hinder heat flow in the radial direction may be added within the gain element to further reduce thermal distortion within the laser medium.
Official Gazette of the U.S. Patent and Trademark Office
Cooling; Heat Transfer; Lasers; Media; Patent Applications; Solid State Lasers

20090005245 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Improving Coastal Ocean Color Validation Capabilities through Application of Inherent Optical Properties (IOPs)
Mannino, Antonio; September 2008; 1 pp.; In English
Contract(s)/Grant(s): NNX06AH32G; No Copyright; Avail.: Other Sources; Abstract Only

Understanding how the different components of seawater alter the path of incident sunlight through scattering and absorption is essential to using remotely sensed ocean color observations effectively. This is particularly apropos in coastal waters where the different optically significant components (phytoplankton, detrital material, inorganic minerals, etc.) vary widely in concentration, often independently from one another. Inherent Optical Properties (IOPs) form the link between these biogeochemical constituents and the Apparent Optical Properties (AOPs). understanding this interrelationship is at the heart of successfully carrying out inversions of satellite-measured radiance to biogeochemical properties. While sufficient covariation of seawater constituents in case I waters typically allows empirical algorithms connecting AOPs and biogeochemical parameters to behave well, these empirical algorithms normally do not hold for case I1 regimes (Carder et al. 2003). Validation in the context of ocean color remote sensing refers to in-situ measurements used to verify or characterize algorithm products or any assumption used as input to an algorithm. In this project, validation capabilities are considered those

measurement capabilities, techniques, methods, models, etc. that allow effective validation. Enhancing current validation capabilities by incorporating state-of-the-art IOP measurements and optical models is the purpose of this work. Involved in this pursuit is improving core IOP measurement capabilities (spectral, angular, spatio-temporal resolutions), improving our understanding of the behavior of analytical AOP-IOP approximations in complex coastal waters, and improving the spatial and temporal resolution of biogeochemical data for validation by applying biogeochemical-IOP inversion models so that these parameters can be computed from real-time IOP sensors with high sampling rates. Research cruises supported by this project provides for collection and processing of seawater samples for biogeochemical (pigments, DOC and POC) and optical (CDOM and POM absorption coefficients) analyses to enhance our understanding of the linkages between in-water optical measurements (IOPs and AOPs) and biogeochemical constituents and to provide a more comprehensive suite of validation products.

Author

Optical Properties; Sea Water; Water Color; Sunlight; Light Transmission; Absorptivity; Biogeochemistry; Electromagnetic Absorption; Optical Measurement; Remote Sensing

20090006203 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Simulation of Fog Oil Deposition During Military Training Operations

Haehnel, Robert B; Nov 2008; 32 pp.; In English; Original contains color illustrations

Report No.(s): AD-A491391; ERDC/CRREL-TR-08-20; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In this study we evaluate the ability to simulate deposition of a fog oil (Standard Grade Fuel Number 2 or SGF2) obscurant on the ground using the SCIPuff aerosol transport model. Model results are compared to actual deposition of fog oil measure on the ground during two military training exercises in Alaska. One exercise took place during late summer; the other occurred during midwinter. The results show that SCIPuff can be used to give a general picture of the spatial deposition of fog oil by successfully reproducing the overall trends of the field data and predicting the deposition to within an order of magnitude or better. Improved predictive capability might be realized using more sophisticated flow solvers employing computational fluid dynamics (CFD) and large eddy simulation (LES) methods. However, use of CFD and LES would increase significantly the computational expense required. This study shows that model results are sensitive to the aerosol droplet size distribution used and that there appears to be some dependency of this size distribution on air temperature or fog oil used (pure SGF2 vs. SGF2:diesel mix). To improve the predictive modeling capability of aerosol transport models, it is recommended that further work be accomplished to quantify the environmental and mixture effects on the airborne fog oil droplet size distribution. In lieu of this information, an estimate of the deposition, good to within about an order of magnitude, can be obtained using a lognormal droplet size distribution with a mean droplet size of 1 micrometer and variance of 1.7.

DTIC

Aerosols; Deposition; Education; Environmental Surveys; Fog; Military Operations; Oils; Simulation; Smoke

20090006410 Woods Hole Oceanographic Inst., MA USA

Imaging Procedures for Stranded Marine Mammals

Ketten, Darlene R; Montie, Eric W; Jan 2008; 27 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): N00244-071-0022

Report No.(s): AD-A492039; WHOI-2008-02; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This report provides an introduction to biomedical imaging techniques and guidelines for diagnostic imaging of marine mammals to assist with both live examination and necropsy procedures. The procedures described are based on imaging equipment and techniques that are relatively common in human and veterinary facilities and to provide the majority of stranding response groups with the most likely options that will assist their efforts. The imaging techniques described include basic radiography, computed tomography (CT), and magnetic resonance imaging (MRI) and are applicable to both live and post-mortem cases. Special emphasis has been placed on whole body, airway, head, and ear imaging procedures. Sub-sections cover basic information on the basic principles and appropriate applications for radiography vs. CT vs. MRI, handling and preparation of live and dead animals in clinical settings, and image and data formats that may be encountered. The protocols are also listed in outline form in order to provide a rapid overview. The introductory discussion of principles behind techniques is not required to employ the protocols but does provide additional information that can aid in deciding which techniques are most efficacious and what the limitations are for interpretation of imaging data. Examples of some pathology imaged with these procedures are also provided.

DTIC

Animals; Imaging Techniques; Marine Biology; Marine Mammals

20090006454 Stanford Univ., Stanford, CA USA

Micro-Structured Materials for Generation of Coherent Light and Optical Signal Processing

Fejer, M M; Route, R K; Charbonneau-Lefort, M; Huang, J; Hum, D; Kuo, P; Langrock, C; Dec 22, 2008; 35 pp.; In English

Contract(s)/Grant(s): FA9550-05-1-0180

Report No.(s): AD-A492283; SPO-33301; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Our research interests focus on improving nonlinear optical materials, developing microstructuring techniques to access new wavelength regions and new applications, and fabricating devices for high-power visible generation, ultra-fast optical interactions, mid-IR generation, and optical signal processing. This program has continued the development of microstructured nonlinear optical materials and quasi-phase-matched devices based on those materials. The material systems investigated, periodically-poled ferroelectrics, especially lithium niobate (PPLN) and lithium tantalate (PPLT), and orientation-patterned GaAs (OP-GaAs), enable nonlinear interactions impossible in conventional nonlinear media. This work included characterization of vapor-transport- equilibrated near-stoichiometric ferroelectrics, enhancements in periodic-poling technology, and development of improved proton-exchanged waveguide techniques. Following the materials characterization and improved processing techniques, we have been able to fabricate new devices including OP-GaAs devices for broadband optical parametric generation (OPG) at mid-infrared wavelengths, wide bandwidth parametric amplifiers in aperiodic QPM structures, high power visible light generation including the sodium yellow line, and reverse-proton-exchanged PPLN waveguide devices for quasi-group-velocity- matching, optical signal processing, and generation of nearly-transform- limited OPG.

DTIC

Coherent Light; Optical Data Processing; Optical Materials

20090006611 QorTek, Inc., Williamsport, PA USA

Thin, nearly wireless adaptive optical device

Knowles, Gareth, Inventor; Hughes, Eli, Inventor; September 30, 2008; 14 pp.; In English

Contract(s)/Grant(s): NAS5-03014

Patent Info.: Filed September 10, 2007; US-Patent-7,429,113; US-Patent-Appl-SN-11/900,088; No Copyright; Avail.:

CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006611

A thin, nearly wireless adaptive optical device capable of dynamically modulating the shape of a mirror in real time to compensate for atmospheric distortions and/or variations along an optical material is provided. The device includes an optical layer, a substrate, at least one electronic circuit layer with nearly wireless architecture, an array of actuators, power electronic switches, a reactive force element, and a digital controller. Actuators are aligned so that each axis of expansion and contraction intersects both substrate and reactive force element. Electronics layer with nearly wireless architecture, power electronic switches, and digital controller are provided within a thin-film substrate. The size and weight of the adaptive optical device is solely dominated by the size of the actuator elements rather than by the power distribution system.

Official Gazette of the U.S. Patent and Trademark Office

Optical Equipment; Adaptive Optics; Optical Materials

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

20090005095 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

The Particle-in-Diffuse-Cell Method: A Meshfree Approach for Plasmas Simulation

Marques, Gleber nelson; [2008]; 175 pp.; In Portuguese; Original contains black and white illustrations

Report No.(s): INPE-15237-TDI/1324; Copyright; Avail.: CASI: C01, CD-ROM; A08, Hardcopy

This thesis describes an original meshfree formulation for plasmas simulation based on the Particle-In-Cell (PIC) particle model and the Element-Free Galerkin method (EFGM). Recalling the diffuse element concept introduced before the EFGM proposition, we realize the diffuse cell concept, which allowed the development of the Particle-In-Diffuse-Cell (PIDC) formulation. Electrostatic PIC models and the EFGM were revised, as well as the parallelization of PIC codes and collisional models. Due to the the ability of easy adaptivity of the meshfree methods, and its robustness for computing the electric field, it is a very desired feature for PIC models. An interpolating EFGM with the domain truncation technique was rigorously

evaluated for the computation of continuous and discontinuous electric fields. PIDC potential applications include complex bi- or tri-dimensional geometries, and/or the requirement of frequent mesh refinement, in these scenarios, the PIDC formulation can be seen as a promising new numerical alternative instead of PIC mesh-based methods.
Author
Particle In Cell Technique; Meshfree Methods; Plasmas (Physics); Simulation

20090005152 Orrick, Herrington and Sutcliffe, LLP, Irvine, CA, USA; California Univ., Berkeley, CA, USA
Apparatus for Magnetic and Electrostatic Confinement of Plasma
Rostoker, N., Inventor; Binderbauer, M., Inventor; 1 Jul 05; 39 pp.; In English
Contract(s)/Grant(s): ONR-N00014-99-1-0857
Patent Info.: Filed Filed 1 Jul 05; US-Patent-Appl-SN-11-173 204
Report No.(s): PB2008-106129; No Copyright; Avail.: CASI: A03, Hardcopy

An apparatus 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
Patent Applications; Plasma Control; Plasmas (Physics)

20090006109 Tech-X Corp., Boulder, CO USA
Dependence of Electron Peak Current on Hollow Cathode Dimensions and Seed Electron Energy in a Pseudospark Discharge (Postprint)
Cetiner, S O; Stoltz, P; Messmer, P; Cambier, Jean-Luc; Jan 18, 2008; 10 pp.; In English
Contract(s)/Grant(s): FA8650-04-C-2511; Proj-OSDB
Report No.(s): AD-A490995; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490995

The pre-breakdown and breakdown phases of a pseudospark discharge are investigated using the two-dimensional kinetic plasma simulation code OOPIC(trademark)Pro. Trends in the peak electron current at the anode are presented as function of the hollow cathode dimensions and mean seed injection velocities at the cavity back wall. The plasma generation process by ionizing collisions is examined, showing the effect on supplying the electrons that determine the density of the beam. The mean seed velocities used here are varied between the velocity corresponding to the energy of peak ionization cross-section, fifteen times this value and no mean velocity (i.e. electrons injected with a temperature of 2.5 eV). The reliance of the discharge characteristics on the penetrating electric field is shown to decrease as the mean seed injection velocity increases because of its ability to generate a surplus plasma independent of the virtual anode. As a result, the peak current increases with the hollow cathode dimensions for the largest average injection velocity, while for the smallest value it increases with the area of penetration of the electric field in the hollow cathode interior. Additionally, for a given geometry an increase in the peak current with the surplus plasma generated is observed. Although the present study uses Argon only, the variation in the discharge dependencies with the seed injection energy relative to the ionization threshold is expected to apply independently of the gas type. Secondary electrons due to electron and ion impact are shown to be important only for the largest impact areas and discharge development times of the study.
DTIC
Electron Energy; Hollow Cathodes; Seeds

20090006439 Microstructures Technologies, Inc., Vancouver, WA USA
Plasma Sterilization Experiments
Moore, Mary; Blessing, David; Moore, Robert; Dec 14, 2008; 18 pp.; In English
Contract(s)/Grant(s): FA9550-07-C-0147
Report No.(s): AD-A492140; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The purpose of this project was to investigate the feasibility of antibacterial plasma treatment of biological tissue. A low-

temperature plasma was produced in air that killed 1E5-1E6 bacterial populations on synthetic skin in under 20 seconds. The bacteria used was Staphylococcus epidermis and the skin surface consisted of human keratinized cells. While there was no visible damage to the skin, caution is advised in applying this to live organisms until more research is done. Further work on electroporation of skin in the presence of electric fields needs to be considered. The electrical resistance of the skin relies on intact layers so particular care should be used in considering antibacterial electrical treatments for wound management. For intact skin, plasma treatment shows potential for controlling bacterial growth in situations where an imbalance in the normal microbiota has occurred. For this application, cycled treatment may be optimum.
DTIC
Plasmas (Physics); Sterilization

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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*.

20090005937 Stanford Linear Accelerator Center, CA, USA; California Univ., Santa Barbara, CA, USA
Radiative and Electroweak Pengiun Decays of B Mesons
Richman, J. D.; January 2007; 6 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919440; SLAC-PUB-12988; No Copyright; Avail.: Department of Energy Information Bridge
Radiative and electroweak penguin decays of B mesons are flavor-changing-neutral-current processes that provide powerful ways to test the Standard Model at the one-loop level, to search for the effects of new physics, and to extract Standard Model parameters such as CKM matrix elements and quark masses. The large data samples obtained by the B-factory experiments BaBar and Belle, together with an intensive theoretical effort, have led to significant progress towards understanding these rare decays.
NTIS
Electroweak Interactions (Field Theory); Industrial Plants; Mesons

20090005938 Stanford Linear Accelerator Center, CA, USA; Wisconsin Univ., Madison, WI, USA
Hadronic Charm Decays from B Factories
Band, H. R.; January 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919441; SLAC-PUB-12987; No Copyright; Avail.: Department of Energy Information Bridge
The B-Factory collaborations have produced many new charm meson and baryon analyses for the 2006 summer conferences featuring larger data sets, expanded particle searches and increased sophistication. Covering the many re- sults from BELLE and BaBar is impossible for this short writeup. Only a sampling of the newest discoverierent analysis techniques.
NTIS
Baryons; Hadrons; Industrial Plants; Mesons; Particle Accelerators; Particle Decay

20090005940 Stanford Linear Accelerator Center, CA, USA; Paul Scherrer Inst., Villigen, Switzerland
Secondary Electron Yield and Groove Chamber Tests in PEP-II
Pivi, M.; Collet, G.; King, F.; Markiewicz, T.; Raubenheimer, T.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919443; SLAC-PUB-12969; No Copyright; Avail.: National Technical Information Service (NTIS)
Possible remedies for the electron cloud in positron damping ring (DR) of the International Linear Collider (ILC) includes thin-film coatings, surface conditioning, photon antechamber, clearing electrodes and chamber with grooves or slots. We installed chambers in the PEP-II Low Energy Ring (LER) to monitor the secondary electron yield (SEY) of TiN, TiZrV (NEG) and technical accelerator materials under the effect of electron and photon conditioning in situ. We have also installed chambers with rectangular grooves in straight sections to test this possible mitigation technique. In this paper, we describe the ILC R&D ongoing effort at SLAC to reduce the electron cloud effect in the damping ring, the chambers installation in the PEP-II and latest results.
NTIS
Damping; Electron Clouds; Grooves; Particle Accelerators; Positrons

20090005941 Stanford Linear Accelerator Center, CA, USA; Istituto Nazionale di Fisica Nucleare, Frascati, Italy
Optimization of Chromatic Optics near the Half Integer in PEP-II
Yocky, G.; Cai, Y.; Decker, F. J.; Nosochkov, Y.; Wienands, U.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919444; SLAC-PUB-12972; No Copyright; Avail.: Department of Energy Information Bridge

The PEP-II collider has benefited greatly from the correction of the chromatic functions. By optimizing sextupole family strengths, it is possible to correct the non-linear chromaticity, the chromatic beta, and the second order dispersion in both the LER and HER. Having implemented some of these corrections, luminosity was improved in PEP-II by almost 10%.
NTIS
Color; Integers; Luminosity; Particle Accelerators

20090005942 Stanford Linear Accelerator Center, CA, USA; Fermi National Accelerator Lab., Batavia, IL, USA; Argonne National Lab., IL USA; Brookhaven National Lab., Upton, NY USA
COMPASS, the COMunity Petascale Project for Accelerator Science and Simulation, a Broad Computational Accelerator Physics Initiative
Cary, J. R.; Spentzouris, P.; Amundson, J.; McInnes, L.; Borland, M.; Nov. 2007; 9 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919447; SLAC-PUB-12985; No Copyright; Avail.: Department of Energy Information Bridge

Accelerators are the largest and most costly scientific instruments of the Department of Energy, with uses across a broad range of science, including colliders for particle physics and nuclear science and light sources and neutron sources for materials studies. COMPASS, the Community Petascale Project for Accelerator Science and Simulation, is a broad, four-office (HEP, NP, BES, ASCR) effort to develop computational tools for the prediction and performance enhancement of accelerators. The tools being developed can be used to predict the dynamics of beams in the presence of optical elements and space charge forces, the calculation of electromagnetic modes and wake fields of cavities, the cooling induced by comoving beams, and the acceleration of beams by intense fields in plasmas generated by beams or lasers. In SciDAC-1, the computational tools had multiple successes in predicting the dynamics of beams and beam generation. In SciDAC-2 these tools will be petascale enabled to allow the inclusion of an unprecedented level of physics for detailed prediction.
NTIS
Mathematical Models; Particle Accelerators; Simulation

20090005943 Stanford Linear Accelerator Center, CA, USA
Parallel Controls Software Approach for PEP II: AIDA and MATLAB Middle Layer
Wittmer, W.; Colocho, W.; White, G.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919445; SLAC-PUB-12973; No Copyright; Avail.: Department of Energy Information Bridge

The controls software in use at PEP II (Stanford Control Program - SCP) had originally been developed in the eighties. It is very successful in routine operation but due to its internal structure it is difficult and time consuming to extend its functionality. This is problematic during machine development and when solving operational issues. Routinely, data has to be exported from the system, analyzed offline, and calculated settings have to be reimported. Since this is a manual process, it is time consuming and error-prone. Setting up automated processes, as is done for MIA (Model Independent Analysis), is also time consuming and specific to each application. Recently, there has been a trend at light sources to use MATLAB as the platform to control accelerators using a MATLAB Middle Layer (MML), and so called channel access (CA) programs to communicate with the low level control system (LLCS). This has proven very successful, especially during machine development time and trouble shooting. A special CA code, named AIDA (Accelerator Independent Data Access), was developed to handle the communication between MATLAB, modern software frameworks, and the SCP. The MML had to be adapted for implementation at PEP II. Colliders differ significantly in their designs compared to light sources, which poses a challenge. PEP II is the first collider at which this implementation is being done. We will report on this effort, which is still ongoing.
NTIS
Particle Accelerators; Time Measurement

20090005951 Stanford Linear Accelerator Center, CA, USA; California Univ., Lawrence Berkeley National Lab., Berkeley, CA, USA; Argonne National Lab., IL, USA; Leiden Univ., Netherlands

Polaron Coherence Condensation as the Mechanism for Colossal Magnetoresistance in Layered Managanites

Mannella, N.; Yang, W. L.; Tanaka, K.; Zhou, X. J.; Zheng, H.; Nov. 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-920014; SLAC-PUB-13017; No Copyright; Avail.: National Technical Information Service (NTIS)

Angle-resolved photoemission spectroscopy data for the bilayer manganite La12Sr18Mn2O7 show that, upon lowering the temperature below the Curie point, a coherent polaronic metallic groundstate emerges very rapidly with well defined quasiparticles which track remarkably well the electrical conductivity, consistent with macroscopic transport properties. Our data suggest that the mechanism leading to the insulator-to-metal transition in La12Sr18Mn2O7 can be regarded as a polaron coherence condensation process acting in concert with the Double Exchange interaction.

NTIS

Magnetoresistivity; Polarons

20090005956 Stanford Linear Accelerator Center, CA, USA

Leptonic Decays at BABAR. (October 2007)

January 2007; 4 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-918969; SLAC-PUB-12936; No Copyright; Avail.: Department of Energy Information Bridge

We present recent results on leptonic B decays using data collected by the BaBar detector at the PEP-II asymmetric-energy e+e- collider at the Stanford Linear Accelerator Center.

NTIS

Particle Accelerators; Leptons; Decay; Asymmetry

20090005958 Fermi National Accelerator Lab., Batavia, IL, USA; Muons, Inc., Batavia, IL, USA; Oxford Instruments Superconducting Technology, Cateret, NJ, USA

Effect of Subelement Spacing in RRP NB(sub 3)SN Strands

Barzi, E.; Turrioni, D.; Alsharo'a, M.; Field, M.; Hong, S.; January 2007; 8 pp.; In English

Report No.(s): DE2007-919076; FERMILAB-CONF-07-398; No Copyright; Avail.: National Technical Information Service (NTIS)

The Restacked Rod Process (RRP) is the Nb3Sn strand technology presently producing the largest critical current densities at 4.2 K and 12 T. However, when subject to plastic deformation, RRP subelements (SE) were found to merge into each other, creating larger filaments with a somewhat continuous barrier. In this case, the strand sees a larger effective filament size, deff, and its instability can dramatically increase locally leading to cable quench. To reduce and possibly eliminate this effect, Oxford Instruments Superconducting Technology (OST) developed for FNAL a modified RRP strand design with larger Cu spacing between SEs arranged in a 60/61 array. Strand samples of this design with sizes from 0.7 to 1 mm were first evaluated for transport current properties. A comparison study was then performed between the regular 54/61 and the modified 60/61 design using 0.7 mm round and deformed strands. Finite element modeling of the deformed strands was also performed with ANSYS.

NTIS

Critical Current; Current Density; Spacing; Strands

20090005959 Fermi National Accelerator Lab., Batavia, IL, USA; Florida Univ., Gainesville, FL, USA

Min-Bias at the Tevatron

Field, R.; January 2007; 8 pp.; In English

Report No.(s): DE2007-919080; FERMILAB-CONF-07-465; No Copyright; Avail.: National Technical Information Service (NTIS)

Tevatron data on minimum bias collisions are examined and the modeling of this process is discussed. Extrapolations to the LHC are studied.

NTIS

Bias; Collisions; Particle Accelerators

20090005961 Fermi National Accelerator Lab., Batavia, IL, USA
Top Quark Mass Measurements at CDF
January 2007; 4 pp.; In English
Report No.(s): DE2007-919084; FERMIABL-CONF-07-513; No Copyright; Avail.: National Technical Information Service (NTIS)
No abstract available
Particle Accelerators; Quarks

20090005962 Istituto di Scienze Matematiche Fisiche e Chimiche, Milan, Italy; Jefferson (Thomas) National Accelerator Facility, Newport News, VA, USA
High Pressure Rinsing System Comparison
Seretore, D.; Fusetti, M.; Michelato, P.; Pagani, C.; Higo, T.; January 2007; 3 pp.; In English
Report No.(s): DE2007-919355; No Copyright; Avail.: Department of Energy Information Bridge
High pressure rinsing (HPR) is a key process for the surface preparation of high field superconducting cavities. A portable apparatus for the water jet characterization, based on the transferred momentum between the water jet and a load cell, has been used in different laboratories. This apparatus allows collecting quantitative parameters that characterize the HPR water jet. In this paper, we present a quantitative comparison of the different water jets produced by various nozzles routinely used in different laboratories for the HPR process.
NTIS
Cavities; High Pressure; Hydraulic Jets; Superconductivity; Superconductors (Materials)

20090006007 Universal Energy Systems, Inc., Dayton, OH USA
Athermal Mechanisms of Size-Dependent Crystal Flow Gleaned from Three-Dimensional Discrete Dislocation Simulations
Rao, S I; Dimiduk, D M; Parthasarathy, T A; Uchic, M D; Tang, M; Woodward, C; Jan 2008; 35 pp.; In English
Contract(s)/Grant(s): FA8650-04-D-5233; Proj-2311
Report No.(s): AD-A490438; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490438
Recent experimental studies discovered that micrometer-scale face-centered cubic crystals show strong strengthening effects, even at high initial dislocation densities. We use large-scale 3-D discrete dislocation simulations (DDS) to explicitly model the deformation behavior of FCC Ni microcrystals in the size range 0.5 to 20 microns. The study shows that two size-sensitive thermal hardening processes, beyond forest hardening, are sufficient to develop the dimensional scaling of the flow stress, stochastic stress variation, flow intermittency and high initial strain-hardening rates, similar to experimental observations for various materials. One mechanism, source-truncation hardening, is especially potent in micrometer-scale volumes. A second mechanism, termed exhaustion hardening, results from a breakdown of the mean-field conditions for forest hardening in small volumes, thus biasing the statistics of ordinary dislocation processes.
DTIC
Crystals; Microcrystals; Simulation; Thermodynamic Properties; Three Dimensional Models

20090006010 Massachusetts Inst. of Tech., Cambridge, MA, USA; Jefferson (Thomas) Lab. Computer Center, Newport News, VA, USA; New Mexico State Univ., Las Cruces, NM, USA; College of William and Mary, Williamsburg, VA, USA
Ab initio Hadron Structure from Lattice QCD
Bratt, J. D.; Edwards, R. G.; Engelhardt, M.; Fleming, G. T.; Musch, B.; January 2007; 5 pp.; In English
Report No.(s): DE2007-919362; No Copyright; Avail.: National Technical Information Service (NTIS)
Early scattering experiments revealed that the proton was not a point particle but a bound state of many quarks and gluons. Deep inelastic scattering (DIS) experiments have accurately determined the probability of struck quarks carrying a fraction of the protons momentum. The current generation of experiments and Lattice QCD calculations will provide detailed multi-dimensional pictures of the distributions of quarks and gluons inside the proton.
NTIS
Hadrons; Inelastic Scattering; Quantum Chromodynamics

20090006011 Thomas Jefferson National Accelerator Facility, Newport News, VA, USA; Brookhaven National Lab., Upton, NY USA; Institute for Nuclear Studies, Otwock-Swierk, Poland; State Univ. of New York, Stony Brook, NY, USA

Status of Nb-Pb Superconducting RF-Gun Cavities

Sekutowicz, J.; Iversen, J.; Klinke, D.; Kostin, D.; Moeller, W.; January 2007; 3 pp.; In English

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

Report No.(s): DE2007-919406; No Copyright; Avail.: Department of Energy Information Bridge

We report on the progress and status of an electron RFgun* made of two superconductors: niobium and lead. The presented design combines the advantages of the RF performance of bulk niobium superconducting cavities and the reasonably high quantum efficiency of lead. The design of RF-gun and performance of 3 test cavities without and with the emitting lead spot are reported in this contribution. Measured quantum efficiency for lead at 2K is presented briefly.

NTIS

Cavities; Radio Frequencies; Superconductivity; Superconductors (Materials)

20090006012 Stanford Linear Accelerator Center, CA, USA

Calculating IP Tuning Knobs for the Pep II High Energy Ring Using Singular Value Decomposition, Response Matrices and an Adapted Moore Penrose Method

Wittmer, W.; January 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC03-76SF00515

Report No.(s): DE2007-919409; SLAC-PUB-12975; No Copyright; Avail.: National Technical Information Service (NTIS)

The PEP II lattices are unique in their detector solenoid field compensation scheme by utilizing a set of skew quadrupoles in the IR region and the adjacent arcs left and right of the IP. Additionally, the design orbit through this region is nonzero. This combined with the strong local coupling wave makes it very difficult to calculate IP tuning knobs which are orthogonal and closed. The usual approach results either in non-closure, not being orthogonal or the change in magnet strength being too big. To find a solution, the set of tuning quads had to be extended which resulted having more degrees of freedom than constraints. To find the optimal set of quadrupoles which creates a linear, orthogonal and closed knob and simultaneously minimizing the changes in magnet strength, the method using Singular Value Decomposition, Response Matrices and an Adapted Moore Penrose method had to be extended. The results of these simulations are discussed and the results of first implementation in the machine are shown.

NTIS

Decomposition; Focusing; Knobs; Magnets; Matrices (Mathematics); Tuning

20090006013 Stanford Linear Accelerator Center, CA, USA

CMAD: A New Self-Consistent Parallel Code to Simulate the Electron Cloud Build-Up and Instabilities

Pivi, M. T. F.; January 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-919411; SLAC-PUB-12970; No Copyright; Avail.: National Technical Information Service (NTIS)

We present the features of CMAD, a newly developed self-consistent code which simulates both the electron cloud build-up and related beam instabilities. By means of parallel (Message Passing Interface - MPI) computation, the code tracks the beam in an existing (MAD-type) lattice and continuously resolves the interaction between the beam and the cloud at each element location, with different cloud distributions at each magnet location. The goal of CMAD is to simulate single- and coupled-bunch instability, allowing tune shift, dynamic aperture and frequency map analysis and the determination of the secondary electron yield instability threshold. The code is in its phase of development and benchmarking with existing codes. Preliminary results on benchmarking are presented in this paper.

NTIS

Electron Beams; Electron Clouds; Stability

20090006016 Stanford Linear Accelerator Center, CA, USA; Argonne National Lab., IL USA; Naval Research Lab., Washington, DC, USA

High Power Testing of a Fused Quartz-Based Dielectric-Loaded Accelerating Structure

Jing, C.; Power, J. G.; Konecny, R.; Gai, W.; Yusof, Z.; January 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-919417; SLAC-PUB-12958; No Copyright; Avail.: Department of Energy Information Bridge

We report on the most recent results from a series of high power tests being carried out on rf-driven dielectric loaded

accelerating (DLA) structures. The purpose of these tests is to determine the viability of the DLA as a traveling-wave accelerator and is a collaborative effort between Argonne National Laboratory (ANL), Naval Research Laboratory (NRL), and Stanford Linear Accelerator Center (SLAC). In this paper, we report on the recent high power tests of a fused quartz-based DLA structure that was carried out at incident powers of up to 12 MW at NRL and 37 MW at SLAC. We also report on test results of a TiN coated quartz structure, that exhibits good multipactor suppression.
NTIS
Dielectrics; Particle Accelerators; Quartz

20090006018 Stanford Linear Accelerator Center, CA, USA; Los Alamos National Lab., NM USA; Oak Ridge National Lab., TN USA
Superconducting Materials Testing with a High-Q Copper RF Cavity
Tantawi, S. G.; Dolgashev, V.; Bowden, G.; Lewandowski, J.; Nantista, C. D.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919418; SLAC-PUB-12957; No Copyright; Avail.: Department of Energy Information Bridge
Superconducting RF is of increasing importance in particle accelerators. We have developed a resonant cavity with high quality factor and an interchangeable wall for testing of superconducting materials. A compact TE01 mode launcher attached to the coupling iris selectively excites the azimuthally symmetric cavity mode, which allows a gap at the detachable wall and is free of surface electric fields that could cause field emission, multipactor, and RF breakdown. The shape of the cavity is tailored to focus magnetic field on the test sample. We describe cryogenic experiments conducted with this cavity. An initial experiment with copper benchmarked our apparatus. This was followed by tests with Nb and MgB2. In addition to characterizing the onset of superconductivity with temperature, our cavity can be resonated with a high power klystron to determine the surface magnetic field level sustainable by the material in the superconducting state. A feedback code is used to make the low level RF drive track the resonant frequency.
NTIS
Cavities; Cavity Resonators; Copper; Q Factors; Radio Frequencies; Superconductors (Materials)

20090006019 Stanford Linear Accelerator Center, CA, USA; National Lab. for High Energy Physics, Ibaraki, Japan
High Power Test of Normal Conducting Single-Cell Structures
Dolgashev, V. A.; Tantawi, S. G.; Nantista, C. D.; Higashi, Y.; Higo, T.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919419; SLAC-PUB-12956; No Copyright; Avail.: Department of Energy Information Bridge
We report the results of the first high power tests of single-cell traveling-wave and standing-wave structures. These tests are part of an experimental and theoretical study of rf breakdown in normal conducting structures at 11.4 GHz. The goal of this study is to determine the gradient potential of normal-conducting rf-powered particle beam accelerators. The test setup consists of reusable mode converters and short test structures and is powered by SLACs XL-4 klystron. This setup was created for economical testing of different cell geometries, cell materials and preparation techniques with short turn-around time. The mode launchers and structures were manufactured at SLAC and KEK and tested in the SLAC Klystron Test Lab.
NTIS
Gradients; Particle Accelerators; Standing Waves

20090006020 Stanford Linear Accelerator Center, CA, USA; Argonne National Lab., IL USA
RF Design of Normal Conducting Deflecting Structures for the Advanced Photon Source
Dolgashev, V.; Borland, M.; January 2007; 3 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-919420; SLAC-PUB-12955; No Copyright; Avail.: Department of Energy Information Bridge
Use of normal conducting deflecting structures for production of short x-ray pulses is now under consideration at Argonnes Advanced Photon Source (APS). The structures have to produce up to 4 MV maximum deflection per pair of structures with a 1 kHz repetition rate. At the same time, the structures should not cause deterioration of beam properties in the APS ring. Following these requirements, we proposed 2815 MHz standing wave deflecting structures with heavy wakefield damping. In this paper we discuss design considerations and present our current design.
NTIS
Deflection; Particle Accelerators; Photons; Radio Frequencies; X Rays

20090006100 Ohio Aerospace Inst., Cleveland, OH USA

Method for the growth of large low-defect single crystals

Powell, J. Anthony, Inventor; Neudeck, Philip G., Inventor; Trunek, Andrew J., Inventor; Spry, David J., Inventor; November 11, 2008; 45 pp.; In English

Patent Info.: Filed December 2, 2006; US-Patent-7,449,065; US-Patent-Appl-SN-11/633,111; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090006100

A method and the benefits resulting from the product thereof are disclosed for the growth of large, low-defect single-crystals of tetrahedrally-bonded crystal materials. The process utilizes a uniquely designed crystal shape whereby the direction of rapid growth is parallel to a preferred crystal direction. By establishing several regions of growth, a large single crystal that is largely defect-free can be grown at high growth rates. This process is particularly suitable for producing products for wide-bandgap semiconductors, such as SiC, GaN, AlN, and diamond. Large low-defect single crystals of these semiconductors enable greatly enhanced performance and reliability for applications involving high power, high voltage, and/or high temperature operating conditions.

Official Gazette of the U.S. Patent and Trademark Office

Defects; Single Crystals; Crystal Defects; Crystal Growth

20090006116 Air Force Research Lab., Edwards AFB, CA USA

Interpenetrated Structure and Compressibility Studies in Pressure Frozen Pentafluoropyridine Crystals at 0.3 and 1.1 GPa (Postprint)

Olejniczak, Anna; Katrusiak, Andrzej; Vij, Ashwani; Jan 2008; 6 pp.; In English; Original contains color illustrations

Contract(s)/Grant(s): FA8655-06-1-3039; Proj-2303

Report No.(s): AD-A491069; AFRL-PR-ED-JA-2007-290; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491069

Pentafluoropyridine has been in-situ pressure crystallized in a diamond-anvil cell (DAC) and its structure determined at 0.30(5) GPa and 1.10(5) GPa and at room temperature by single-crystal X-ray diffraction. The freezing pressure of pentafluoropyridine has been determined to be 0.10(5) GPa. The crystals are monoclinic, space group P21/c. The crystal packing is governed by F...F and C/N...F van der Waals contacts, but no ring stacking is observed. The intermolecular interactions are non-directional, and the crystal compresses nearly isotropically between 0.3 and 1.1 GPa.

DTIC

Compressibility; Crystal Structure; Crystals; High Pressure

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20090005859 Government Accountability Office, Washington, DC, USA

Inspectors General: Actions Needed to Improve Audit Coverage of NASA

December 2008; 77 pp.; In English; Original contains black and white illustrations

Report No.(s): GAO-09-88; No Copyright; Avail.: CASI: A05, Hardcopy

GAO was asked to review the National Aeronautics and Space Administration (NASA) Office of Inspector General (OIG) and provide information on (1) the audit and investigative coverage of NASA; (2) the NASA OIG s audit and investigative accomplishments; (3) the NASA OIG s budget and staffing levels, including staff attrition rates; and (4) the results of external reviews of the NASA OIG. GAO obtained information from NASA OIG reports, interviews, and documentation. GAO is making two recommendations for the NASA IG to (1) revise strategic and annual planning to include audits of NASA s program economy and efficiency with potential monetary savings by working with an objective third party to obtain external review and consultation during the planning process and (2) take actions to identify the causes of high staff turnover with the assistance of an objective expert. In addition, GAO is recommending that the Integrity Committee follow up on its investigative finding that the NASA IG had an appearance of a lack of independence. In comments on a draft of the report,

the Integrity Committee and the NASA IG disagreed with the recommendations. GAO believes the recommendations are valid and provides a detailed response to these comments in the body of the report.
Author
Management Planning; NASA Programs; Cost Reduction; Cost Analysis; Management

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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*.

20090005038 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Global Land Data Assimilation System (GLDAS) Products, Services and Application from NASA Hydrology Data and Information Services Center (HDISC)
Fang, Hongliang; Beaudoing, Hiroko K.; Rodell, matthew; Teng, William L.; Vollmer, Bruce E.; [2009]; 9 pp.; In English; ASPRS 2009 Annual Conference, 8-31 Mar. 2009, Baltimore, MD, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The Global Land Data Assimilation System (GLDAS) is generating a series of land surface state (e.g., soil moisture and surface temperature) and flux (e.g., evaporation and sensible heat flux) products simulated by four land surface models (CLM, Mosaic, Noah and VIC). These products are now accessible at the Hydrology Data and Information Services Center (HDISC), a component of the NASA Goddard Earth Sciences Data and Information Services Center (GES DISC). Current data holdings include a set of 1.0 degree resolution data products from the four models, covering 1979 to the present; and a 0.25 degree data product from the Noah model, covering 2000 to the present. The products are in Gridded Binary (GRIB) format and can be accessed through a number of interfaces. Users can search the products through keywords and perform on-the-fly spatial and parameter subsetting and format conversion of selected data. More advanced visualization, access and analysis capabilities will be available in the future. The long term GLDAS data are used to develop climatology of water cycle components and to explore the teleconnections of droughts and pluvial.
Author
Land Management; Earth Sciences; Data Acquisition; Data Integration; Information Systems; Climatology; Hydrology

20090005056 Wested, San Francisco, CA, USA
Connecting Students to Advanced Courses Online. Innovations in Education
Dec. 2007; 100 pp.; In English
Report No.(s): PB2008-104484; No Copyright; Avail.: CASI: A05, Hardcopy

America has long been regarded as a center of innovation and creativity. In the last 50 years, American ingenuity has pioneered space exploration, developed life-saving medicines, and launched the World Wide Web. Harnessing this power of innovation for the benefit of American schools is fast becoming an education imperative. Our countrys productivity and prosperity depend on our education systems ability to meet the challenges of the 21st century. this guide highlights six providers of academic course work that are going beyond the convention of brick-and-mortar schools by delivering rigorous curricula to students through Internet technology. These providers, along with the schools and districts they serve, recognize that American students must master advanced technical skills and solve complex problems to prepare for demanding higher education and workforce environments. Education is not a one-size-fits-all endeavor, and advances in technology provide an opportunity to personalize education, use time more efficiently, and tailor instruction in innovative ways. Online course work enables students to attend class inside or outside of school, learn concepts at their own pace, and receive extra help or more challenging assignments. We know that rigorous course work is one of the best ways to improve student achievement. Yet too few high schools especially those serving low-income and minority populations offer challenging courses. The providers profiled in the following pages demonstrate how implementing online classes can enrich curricula and enable a greater number of students to challenge themselves. This guide is one in a series of Innovations in Education publications produced by the U.S. Department of Education that highlights promising practices like strategies to engage parents in their childs education. We know that if we want our students to become the worlds innovators, we must be innovators ourselves.
NTIS
Connectors; Education; On-Line Systems; Students

20090005101 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Visualization of Geographical Data Driven by the OMT-G Conceptual Model

Oliveira, Maria da Piedade Gomes; [2007]; 108 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15244-TDI/1331; Copyright; Avail.: CASI: C01, CD-ROM; A06, Hardcopy

Even though users from various knowledge domains are familiar with the data they work with, most of the time they do not know the coding and the structure used for their storage in database management systems, nor the most adequate ways to visualize and analyze those data. In practice, users actively participate in the creation of conceptual schemas for applications development, while later they are required to interact with the physical database schema in order to perform visualization or analysis tasks. In this context, this thesis proposes MAVI, a method to support information visualization. This method guides the user about the selection of visualization techniques for geographic data, characterized by their spatial, temporal, and descriptive attributes. The method is based on the connection between an OMT-G conceptual schema and a corresponding physical schema, in order to create a structure that allows the retrieval of physical representation characteristics from names and terms used in the conceptual design. In parallel to that, a catalog of visualization techniques has been created, describing the characteristics of the input data required by each technique and the types of analysis that the technique can provide. By cross-comparing the characteristics of the data with the requirements of the techniques, the user, based only on terms and concepts that are familiar to him, can obtain a list of visualization techniques that are adequate for his purposes. The main contribution of the thesis includes the direct interaction of the user with terms from the conceptual schema, generating results that are based on the underlying physical database schema.

Author

Geographic Information Systems; Scientific Visualization; Data Base Management Systems

20090005102 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Comparison of the R-Tree, Grid Files and Hilbert Space Filling Curves Performances for Spatial Queries on Geographical Databases

Teotonio, Frederico Augusto Bede; [2008]; 77 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15251-TDI/1338; Copyright; Avail.: CASI: C01, CD-ROM; A05, Hardcopy

The development of spatial databases has been influenced by the research on spatial indexes. There has been a considerable amount of research on multidimensional indexes such as R-trees and its variants. The performance improvements when using spatial indexes for spatial operations led database developers to include R-tree support on their products. Despite these advances, there are database management systems (DBMS) that do not provide spatial indexing in their internal core. Users of this and similar DBMS may want to develop spatial applications, but may be deterred because of performance drawbacks. One obvious solution would be to implement spatial indexes in the DBMS kernel. However, such solution may not be feasible, either because of lack of access to the source code or due to time and cost constraints. This work investigates an alternative way of including spatial indexes in DBMS. We consider indexes such as Hilbert space-filling curves and Fixed Grid developed on top of TerraLib GIS Library. Our main goal is to provide, through this library, the functionalities that are not available in a DBMS that do not include spatial index support and verify the performance between the indexes and the native mechanisms of the SGBDs like B-Trees and R-Trees.

Author

Data Base Management Systems; Geographic Information Systems; Information Retrieval; Indexing (Information Science)

20090005202 Office of the Assistant Secretary of Defense Networks and Information Integration, Washington, DC USA

Enabling Technologies for Net-Centricity -- Information on Demand

Grimes, John J; Jul 2007; 4 pp.; In English

Report No.(s): AD-A487658; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The focus of net-centric operations is to provide a more effective and efficient force that includes the warfighter, the intelligence community, and the business processes that support and enable the warfighters' success. The ability to access information, to share that information, and to collaborate with others is at the heart of net-centric operations. The ongoing transformation represents a fundamental change, a strategy that requires a cultural shift regarding how information and information technology is viewed and used.

DTIC

Defense Program; Information Transfer

20090005228 NASA Ames Research Center, Moffett Field, CA USA

Query-Based Document Composition

Maluf, David A., Inventor; Bell, David G., Inventor; Gurram, Mohana M., Inventor; Gawdiak, Yuri O., Inventor; 2 Mar. 2006; 20 pp.; In English

Patent Info.: Filed Filed 1 Sep. 04; US-Patent-Appl-SN-10-943 652; US 2006/0047646

Report No.(s): PB2008-101120; No Copyright; Avail.: CASI: A03, Hardcopy

ONLINE: http://hdl.handle.net/2060/20090005228

Method and system for querying a collection of unstructured and semi-structured documents in a specified database to identify presence of, and provide context and/or content for, keywords and/or keyphrases. The documents are analyzed and assigned a node structure, including an ordered sequence of mutually exclusive node segments or strings. Each node has an associated set of at least four, five or six attributes with node information and can represent a format marker or text, with the last node in any node segment usually being a text node. A keyword (or keyphrase) query is specified, the query is converted to a statement that is recognized and respondeed to by the specified database, and the last node in each node segment is searched for a match with the keyword. When a match is found at a query node, or at a node determined with reference to a query node, the system displays the context and/or the content of the query node.

Author

Data Bases; Information Retrieval; Documents

20090005892 Rapid Reaction Technology Office, Washington, DC USA

Rapid Reaction Technology Office Overview and Objectives: Breaking the Terrorist/Insurgency Cycle

Riley, Benjamin; Apr 3, 2008; 14 pp.; In English; Original contains color illustrations

Report No.(s): AD-A487338; No Copyright; Avail.: Defense Technical Information Center (DTIC)

Overview and objectives of the Rapid Reaction Technology Office (RRTO) as presented by its director.

DTIC

Accelerated Life Tests; Military Technology; Research Management; User Requirements

20090006046 Columbia Univ., Palisades, NY USA

Improvements to a Major Digital Archive of Seismic Waveforms from Nuclear Explosions: Borovoye Seismogram Archive

Kim, Won-Young; Patton, Howard; Randall, George; Richards, Paul; Sep 30, 2008; 11 pp.; In English

Contract(s)/Grant(s): FA8718-07-C-0004; Proj-1010

Report No.(s): AD-A487649; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA487649

We are in the second year of a three-year project to generate in modern form an easily usable archive of digital seismograms derived from regional waveforms recorded at the Borovoye Observatory (BRV), northern Kazakhstan, over a thirty-year period going back to 1966 and spanning the time when state-of-the-art sensors and dataloggers were introduced at this site by several different western groups. The BRV seismograms, which include multichannel regional signals from 350 underground nuclear test explosions carried out in Eurasia, were made generally available to western scientists in 2001, but only as copies of the bits in the original digital waveforms. These copies contain large numbers of glitches and did not include instrument responses for approximately two-thirds of the events. In the first two years of this project, we are focusing on basic processing of the damaged waveforms to make them more easily usable by the removal of glitches and the inclusion of instrument responses (including absolute gains as well as poles and zeroes).

DTIC

Documents; Nuclear Explosions; Seismograms; Waveforms

20090006144 Marine Corps Development and Education Command, Quantico, VA USA

Information Operations in Iraq: The Mufsiddoon versus the U.S. and Coalition Forces

Hamstra, Eric J; Apr 2008; 31 pp.; In English

Report No.(s): AD-A491182; No Copyright; Avail.: Defense Technical Information Center (DTIC)

ONLINE: http://hdl.handle.net/100.2/ADA491182

The terrorists in Iraq have outperformed the USA and Coalition Forces in Information Operations (IO) throughout most of the Iraqi War. They have made great use of the media in projecting their messages. Of particular note is the degree to which they have used the internet to spread their propaganda. Currently there are thousands of web sites affiliated with or connected

to the terrorists' major web sites. These web sites have helped to generate international media coverage promote the terrorists' cause. The terrorists also have taken advantage of the USA' IO blunders with the media. The USA has inadvertently helped the terrorists' efforts to legitimize themselves by using words such as 'mujahedeen,' 'jihad,' and 'jihadist' to describe them. Other U.S. IO blunders include misunderstanding the Iraqi culture and poor use of public affairs. Despite the many difficulties the USA has experienced in its IO efforts, there have been successes, particularly in the use of ridicule to counter the propaganda of Al Qaeda in Iraq (AQI). The author sets forth several potential IO strategies that might help the USA in this war: (1) using the enemy's language (Arabic) against him; (2) branding the enemy as 'mufsidoon' committing 'hirabah"; (3) making better use of the media, particularly the local Iraqi media; (4) training U.S. and Iraqi forces on how to interact with the media; and (5) continuing to make the enemy an object of derision. Despite their initial blunders, the USA and Coalition forces can still wage a successful IO campaign in Iraq if proper training in IO is provided to all U.S. and Coalition forces and the power of words is better utilized in the media.
DTIC
News Media; Warfare

20090006189 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (October-December 2006)
Czerw, Russell J; Roy, Michael J; Lamiell, James M; Yackel, Edward E; Bilynsky, Roman; Henderson, James B; Reyes, Joel; Moody, Ron; Freeman, David; Blair, David; Michaud, Edward; Higdon, Mark L; Dec 2006; 72 pp.; In English
Report No.(s): AD-A491296; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The featured topic of this issue of the AMEDD Journal is electronic medical records. The journal contains the following articles: 'Perspective,' an overview of the issue's articles, by MG Russell J. Czerw; 'Certification in Military Medicine: The Time is Now,' by COL Michael J. Roy, MC, USA, et al.; 'US Army Clinical Investigation,' by COL James M. Lamiell, MC, USA, et al.; 'Expanding the Role of the Nurse Practitioner in the Deployed Setting,' by MAJ (P) Edward E. Yackel, AN, USA, et al.; 'Forward Deployed Neurologists? But That's Where the Troops Are!,' by LTC Roman Bilynsky, MC, USA; 'Theater Immersion: Training a Medical Task Force for Operations in Iraq,' by COL James B. Henderson, USA; 'Application of Geographic Information System Technology to Preventive Medicine Interventions,' by Joel Reyes, BS, et al.; 'The New Name of the Military Electronic Medical Record,' by LTC Ron Moody, MC, USA, and David Freeman; 'A Global Electronic Medical Record, Today's Reality,' by LTC Ron Moody, MC, USA, and David Blair, MD; 'AHLTA Deployment Status and Development Strategy,' by LTC Ron Moody, MC, USA, et al.; 'Electronic Medical Records, Medical Coding, and Outcome Improvement,' by LTC Ron Moody, MC, USA; 'The Tactical Electronic Medical Record: The Key to Medical Transformation,' by LTC Edward Michaud, MC, USA, et al.; and 'Implementation of the Theater Medical Information Program During Operation Iraqi Freedom IV,' by MAJ Mark L. Higdon, MC, USA.
DTIC
Computer Storage Devices; Deployment; Education; Information Systems; Medical Services; Military Operations; Military Personnel; Records Management

20090006220 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
U.S. Army Medical Department Journal (January-March 1999)
Peake, James B; Liewehr, Frederick R; Ritzer, Darren R; Miller, Charles F; Turner, Betty E; Pinto, Robert C; Pincus, Simon H; Nam, Theodore S; Still, Ron; Austerman, Wayne R; Mar 1999; 57 pp.; In English
Report No.(s): AD-A491543; No Copyright; Avail.: Defense Technical Information Center (DTIC)

This issue of the AMEDD Journal spotlights the Knowledge Management Network (KMN) and the information-sharing potential it promises. Also in this issue are four other articles and a book review. 'Psychological Aspects of Deployment: The Bosnian Experience' details the psychological impact of deployment on soldiers, with implications for mission effectiveness and soldier well-being. 'Stress-Free Endodontics by Case Selection' highlights the practice of endodontics in general dentistry practice. All healthcare professionals will appreciate the underlying message of careful patient selection when applying therapeutic treatments. 'Asia-Pacific Medicine Conference: AMEDD Support of the National Security Strategy' outlines the AMEDD's continued support and involvement in the nation's security strategy in one of the world's most important social, political, and economic regions. Of particular note is the use of an annual conference to link participants and share information. 'Human Dimensions Research during Operation 'Joint Guard,' Bosnia' reports on a study from the Walter Reed institute of Research regarding the psychological status of soldiers deployed to Bosnia. This report has implications for combat

stress control measures designed to keep the force fit. The Book Review features a comprehensive examination of a reference textbook dealing with the causes and multiple hazards of sepsis and septic infection.
DTIC
Bosnia and Herzegovina; Deployment; Information Management; Medical Services; Military Operations; Networks

20090006231 Army War Coll., Carlisle Barracks, PA USA
War Without Borders: The Colombia-Ecuador Crisis of 2008
Marcella, Gabriel; Dec 2008; 59 pp.; In English
Report No.(s): AD-A491603; No Copyright; Avail.: Defense Technical Information Center (DTIC)

On March 1, 2008, the Colombian air force attacked the clandestine camp of the Revolutionary Armed Forces of Colombia (FARC) in a remote region of northeastern Ecuador, killing its leader, Ra l Reyes, and 24 other people. The FARC had been using Ecuadorean territory for years to rest and resupply. The attack was successful, but it detonated the worst crisis in Inter-American diplomacy of the last decade. For Colombia, the attack demonstrated the new professionalism of its armed forces and police and the continuing success of the strategy of democratic security enunciated by President Alvaro Uribe. Moreover, it signaled the remarkable advances being made by Bogot in pursuing the FARC, in reducing the high level of insecurity that has dominated the country for a generation, and the increasing reach and presence of the government to areas outside of its control. The attack was immensely popular within Colombia, which now began to see the light at the end of tunnel in defeating the FARC. Moreover, the death of Reyes was one of a series of losses of high level commanders. Within Ecuador, the story was markedly different. Within hours after the attack, the government of President Rafael Correa fulminated against Uribe, thus beginning a ferocious diplomatic assault that would last for months, lead to the recall of ambassadors, and bring in the Organization of American States. For a number of reasons, Ecuador felt victimized. First, it was undergoing a particularly difficult political process of trying to bolster a failing state riven by political polarization and the threat of violence. Second, a high level of corruption had weakened the institutions of the state. Third, Ecuador did not have the capacity to secure its border with Colombia. Though its military was extensively deployed on the border, it lacked the logistics to deal with the threat. Fourth, in 2000 Ecuador had assumed an unrealistic stance of neutrality with respect to Colombia's internal conflict.
DTIC
Colombia; Ecuador; Emergencies; Foreign Policy; International Relations; Management Methods; Military Operations; Narcotics; Warfare

20090006269 Marine Corps Development and Education Command, Quantico, VA USA
A Knowledge Management Case Study: The First U.S. Navy Expeditionary Strike Group (ESG-3) to Implement Knowledge Management
Davis, III, George D; Jan 2008; 38 pp.; In English
Report No.(s): AD-A491672; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA491672

Expeditionary Strike group 3 (ESG 3) was the first Expeditionary Strike Group to employ Knowledge Management. This case study describes the procedures executed during the staffs deployment from February 2006 to February 2007 in order to create new knowledge.
DTIC
Electrostatic Gyroscopes; Information Management; Navy

20090006384 Army Construction Engineering Research Lab., Champaign, IL USA
Construction Operations Building Information Exchange (COBIE): Requirements Definition and Pilot Implementation Standard
East, E W; Jun 2007; 195 pp.; In English; Original contains color illustrations
Report No.(s): AD-A491932; ERDC/CERL TR-07-30; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Construction Operations Building Information Exchange (COBIE) specification denotes how information may be captured during design and construction and provided to facility operators. COBIE eliminates the current process of transferring massive amounts of paper documents to facility operators after construction has been completed. COBIE eliminates the need for post-hoc as-built data capture and helps to reduce operational costs. This report describes the background and process used to create and implement COBIE. An international panel of experts, facility operators, construction managers, and asset managers participated in this project under the auspices of the Development Team of the National Building Information Modeling Standard (NBIMS). This report documents the requirements analysis that led to a

pilot implementation standard, specifications for the pilot implementation standard, and the creation of an Information Delivery Manual with process maps used to link user requirements into the Industry Foundation Class model.
DTIC
Construction; Data Management; Information; Life (Durability); Management Information Systems; Software Development Tools; User Requirements

20090006413 Engineer Research and Development Center, Alexandria, VA USA
Functional Decomposition of Modeling and Simulation Terrain Database Generation Process
Yakich, Valerie R; Lashlee, J D; Sep 19, 2008; 55 pp.; In English; Original contains color illustrations
Report No.(s): AD-A492047; ERDC/TEC-SR-08-1; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The construction of terrain databases is a complex and dynamic procedure. Every terrain database addresses a unique set of simulation federate needs and data availability. This report documents the conceptual procedure as implemented by Lockheed Martin Simulation, Training, and Support and decomposes terrain database construction using the Integration Definition for Function Modeling (IDEF). This report includes sufficient detail to conceptually describe the process and provide a foundation for discussion of new and existing terrain database construction efforts among stakeholders with varying levels of technical expertise.
DTIC
Data Base Management Systems; Data Bases; Decomposition; Simulation; Terrain

20090006416 Naval Postgraduate School, Monterey, CA USA
Standardized Verification, Validation, and Accreditation (VV&A) Documentation Schema Description Document
Blais, Curtis; Oct 31, 2008; 213 pp.; In English; Original contains color illustrations
Contract(s)/Grant(s): N65236-07-WR-00390
Report No.(s): AD-A492051; NPS-MV-08-001; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The Department of Defense (DoD) Modeling and Simulation Steering Committee (M&S SC) is sponsoring several Acquisition Modeling and Simulation (M&S) Projects. One of those projects is titled, 'Standardized Documentation for Verification, Validation, and Accreditation (VV&A).' Previous efforts defined standardized content and format requirements (i.e., templates) for four core VV&A documents, now codified in a new Military Standard (MIL-STD-3022) and associated Data Item Descriptions. A tool is under development to automate those templates to assist developers in creating standardized VV&A information across the DoD and Military Departments. In support of this effort, the Naval Postgraduate School was tasked to identify specific VV&A metadata that will enable the sharing of information across all communities enabled by M&S via the Global Information Grid (GIG) anywhere in the world and at anytime, and to formalize the structure and content of that metadata and the content of VV&A documents using the Extensible Markup Language (XML). This document describes the design of XML schemas defining the structure and content of standardized VV&A documentation and VV&A documentation project-level metadata.
DTIC
Information Systems; Standardization

20090006451 General Accounting Office, Washington, DC USA
DOD Personnel Clearances: Preliminary Observations about Timeliness and Quality
Dec 19, 2008; 41 pp.; In English
Report No.(s): AD-A492259; GAO-09-261R; No Copyright; Avail.: Defense Technical Information Center (DTIC)

The enclosed briefing provides our preliminary assessment of the timeliness and quality of the Department of Defense's (DOD) personnel security clearance program. These findings are based on an ongoing engagement that we have been conducting since February 2008 under the Comptroller General's authority to conduct evaluations on his own initiative. In 2009, we plan to issue a report providing more details regarding these findings. In response to a draft of this briefing report, DOD provided written comments and the Office of Personnel Management (OPM) provided comments via email. Our summary and evaluation of DOD's and OPM's comments are included in enclosure II and DOD's written comments are reprinted in their entirety in enclosure III.
DTIC
Clearances; Defense Program; Personnel; Security

20090006502 National Defense Univ., Norfolk, VA USA
The Impact of Organizational Culture on the Sharing of Homeland Security Information
Bradey, Jeffery E; Apr 4, 2008; 81 pp.; In English
Report No.(s): AD-A487177; JFSC-25789; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA487177

This thesis identifies problems that have impacted the implementation of the Homeland Security Information Network. These problems have ranged from programmatic to legal to cultural issues. The Department of Homeland Security has addressed several of the problems impacting the Homeland Security Information Network. The Department of Homeland Security established a program management office and a privacy office to resolve some of the challenges to the Homeland Security Information Network program. The clash of cultures is often discussed in relation to mergers and acquisitions in the business world. This phenomenon bas been exhibited by participants in homeland security information sharing during the deployment of the Homeland Security Information Network. Solving these cultural problems requires cooperation and buy-in from the senior leadership of the Department of Homeland Security to the end users of the Homeland Security Information Network in the federal, state, and local governments. Finding a technique to effect meaningful culture change in the homeland security community is the key to making the Homeland Security Information Network a viable information sharing tool.
DTIC
Security; Project Management; Information Transfer

20090006568 Army Medical Research and Materiel Command, Fort Detrick, MD USA
Wounded Warrior: Medical Information Management from the Battlefield to Home
Hines, Jr, Claude; Apr 5, 2008; 31 pp.; In English; Original contains color illustrations
Report No.(s): AD-A490360; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490360

The need for a cost effective Department of Defense (DoD) military Central Data Repository (CDR) to provide ready access to deployed Service members' lifetime health care information was identified in 1991, shortly after the Persian Gulf War. Service member complaints of unexplained illnesses lead to a number of congressionally directed investigations into the underlying causes of 'Gulf War Syndrome.' In their efforts to screen military patient records for pre-existing conditions and trends, investigators were unable to retrieve or collate information necessary to clearly identify the underlying cause(s) of the reported illness. The primary impediment was the manner in which medical data recorded in the military health records were maintained. The Theater Medical Information Program - Joint (TMIP-J) develops battlefield information management and information technology (IM/IT) solutions to improve quality of care and communications by capturing information electronically. The TMIP-J family of systems is used by the Military's theater medical community to electronically capture, store and transmit Service members' medical treatment data, including tracking and recording medical encounter information, tracking and monitor medical supplies, managing the logistics of patient evacuation, and providing medical threat and intelligence information to Combatant Commanders. TMIP-J software is tailored to run in low-to-no communication environments on a combination of hand-held devices, laptops and desktop computers. ... This presentation will delve into the challenges and successes TMIP-J faces during the development, update and integration process of the applications supporting the theater medical business practice, including lessons learned. [TATRC website, 15 Dec 2008]
DTIC
Biomedical Data; Information Management; Information Systems; Military Personnel; Records Management

20090006617 Defense Information Systems Agency, Arlington, VA USA
Sharing Information Today: Maritime Domain Awareness
Todd, Michael; Jul 2007; 3 pp.; In English
Report No.(s): AD-A487442; No Copyright; Avail.: Defense Technical Information Center (DTIC)

In a world where unforeseen human or natural disasters (i.e., U.S.S. Cole, September 11, Hurricane Katrina, the 2004 Indian Ocean tsunami, and the possibility of an avian flu pandemic) may occur, interagency information sharing and collaboration is essential to mitigating the effects of these types of catastrophic events. The Maritime Domain Awareness Data Sharing Community of Interest (MDA DS COI) pilot demonstrated a net-centric data-sharing capability as a first step towards addressing the common challenge of global identification and tracking of maritime vessels, cargo, and crew usage of existing information sources to better secure our coasts, ports, and waterways. This Department of Defense (DoD), Department of Homeland Security (DHS), and Department of Transportation (DOT) partnership developed capabilities to expose maritime data as a consumable Web-enabled service to authorized, unanticipated users employing community-based agreements defining a common vocabulary and data-sharing services. This COI pilot also leveraged enterprise services resulting in a

repeatable process, an extensible vocabulary, and reusable services available for developing responsive, agile solutions for any number of data-sharing challenges.
DTIC
Internets; Defense Program

20090006620 Naval Postgraduate School, Monterey, CA USA
Bits, Bangs, or Bucks? The Coming Information Crisis
Washburn, Alan R; Jan 2001; 13 pp.; In English
Report No.(s): AD-A487446; No Copyright; Avail.: Defense Technical Information Center (DTIC)

There is a crisis approaching for military OR, centered on the role of information on the battlefield. It is clear to military professionals that information is becoming increasingly important, but unfortunately the OR profession's ability to measure its contribution is still primitive. We are not good at deciding whether information is cost/effective or whether information is more important than firepower, and yet precisely these questions will be asked more and more frequently as budgets shrink.
DTIC
Information Systems; Military Technology

20090006642 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Lossless Astronomical Image Compression and the Effects of Random Noise
Pence, William; [2009]; 17 pp.; In English; Original contains black and white illustrations; Copyright; Avail.: CASI: A03, Hardcopy

In this paper we compare a variety of modern image compression methods on a large sample of astronomical images. We begin by demonstrating from first principles how the amount of noise in the image pixel values sets a theoretical upper limit on the lossless compression ratio of the image. We derive simple procedures for measuring the amount of noise in an image and for quantitatively predicting how much compression will be possible. We then compare the traditional technique of using the GZIP utility to externally compress the image, with a newer technique of dividing the image into tiles, and then compressing and storing each tile in a FITS binary table structure. This tiled-image compression technique offers a choice of other compression algorithms besides GZIP, some of which are much better suited to compressing astronomical images. Our tests on a large sample of images show that the Rice algorithm provides the best combination of speed and compression efficiency. In particular, Rice typically produces 1.5 times greater compression and provides much faster compression speed than GZIP. Floating point images generally contain too much noise to be effectively compressed with any lossless algorithm. We have developed a compression technique which discards some of the useless noise bits by quantizing the pixel values as scaled integers. The integer images can then be compressed by a factor of 4 or more. Our image compression and uncompression utilities (called fpack and funpack) that were used in this study are publicly available from the HEASARC web site.Users may run these stand-alone programs to compress and uncompress their own images.
Author
Random Noise; Compressing; Data Compression; Astronomy; Pixels; Floating Point Arithmetic; Image Processing

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20090005253 National Academy of Sciences - National Research Council, Washington, DC, USA
Severe Space Weather Events--Understanding Societal and Economic Impacts Workshop Report
[2008]; 18 pp.; In English; Copyright; Avail.: Other Sources

The adverse effects of extreme space weather on modern technology--power grid outages, high-frequency communication blackouts, spacecraft anomalies--are well known and well documented, and the physical processes underlying space weather are also generally well understood. Less well documented and understood, however, are the potential economic and societal impacts of the disruption of critical technological systems by severe space weather. As a first step toward determining the socioeconomic impacts of extreme space weather events and addressing the questions of space weather risk assessment and management, a public workshop was held in May 2008. The workshop brought together representatives of industry, the government, and academia to consider both direct and collateral effects of severe space weather events, the current state of the space weather services infrastructure in the USA, the needs of users of space weather data and services, and the ramifications of future technological developments for contemporary society's vulnerability to space weather. The workshop

concluded with a discussion of un- or underexplored topics that would yield the greatest benefits in space weather risk management.
Author
Economic Impact; Space Weather; Solar Activity Effects; Solar Terrestrial Interactions; Costs; Resources; Electromagnetic Radiation

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

20090005205 Assistant Secretary of the Army (Acquisition, Logistics and Technology), Fort Belvoir, VA USA
Future Combat Systems (FCS) Autonomous Navigation System (ANS) Technology Will Revolutionize Warfare
Price, Michael W; Munkeby, Steven; Jun 2008; 4 pp.; In English
Report No.(s): AD-A490312; No Copyright; Avail.: Defense Technical Information Center (DTIC)
ONLINE: http://hdl.handle.net/100.2/ADA490312

The capabilities that the UGV and ANS provide to the warfighter will revolutionize the way we conduct combat operations. They will reduce risk to the soldiers in hazardous situations and reduce soldier workload and manpower requirements, particularly with the MULE family of vehicles during combat and convoy operations.
DTIC
Autonomous Navigation; Combat; Warfare

88
SPACE SCIENCES (GENERAL)

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

20090005184 NASA Johnson Space Center, Houston, TX, USA
A Process for Comparing Dynamics of Distributed Space Systems Simulations
Cures, Edwin Z.; Jackson, Albert A.; Morris, Jeffery C.; [2009]; 12 pp.; In English; Joint 2009 Spring Simkulation Interoperability Workshop (SIW), 23-27 Mar. 2009, San DIego, CA, USA; Copyright; Avail.: CASI: A03, Hardcopy

The paper describes a process that was developed for comparing the primary orbital dynamics behavior between space systems distributed simulations. This process is used to characterize and understand the fundamental fidelities and compatibilities of the modeling of orbital dynamics between spacecraft simulations. This is required for high-latency distributed simulations such as NASA s Integrated Mission Simulation and must be understood when reporting results from simulation executions. This paper presents 10 principal comparison tests along with their rationale and examples of the results. The Integrated Mission Simulation (IMSim) (formerly know as the Distributed Space Exploration Simulation (DSES)) is a NASA research and development project focusing on the technologies and processes that are related to the collaborative simulation of complex space systems involved in the exploration of our solar system. Currently, the NASA centers that are actively participating in the IMSim project are the Ames Research Center, the Jet Propulsion Laboratory (JPL), the Johnson Space Center (JSC), the Kennedy Space Center, the Langley Research Center and the Marshall Space Flight Center. In concept, each center participating in IMSim has its own set of simulation models and environment(s). These simulation tools are used to build the various simulation products that are used for scientific investigation, engineering analysis, system design, training, planning, operations and more. Working individually, these production simulations provide important data to various NASA projects.
Author
Aerospace Systems; Systems Engineering; Computerized Simulation; Complex Systems

20090006001 NASA Goddard Space Flight Center, Greenbelt, MD, USA

MESSENGER Observations of Magnetic Reconnection in Mercury's Magnetosphere

Slavin. James A.; [2009]; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

During MESSENGER'S second flyby of Mercury on October 6,2008, very intense reconnection was observed between the planet's magnetic field and a steady southward interplanetary magnetic field (IMF). The dawn magnetopause was threaded by a strong magnetic field normal to its surface, approx.14 nT, that implies a rate of reconnection approx.10 times the typical rate at Earth and a cross-magnetospheric electric potential drop of approx.30 kV. The highest magnetic field observed during this second flyby, approx.160 nT, was found at the core of a large dayside flux transfer event (FTE). This FTE is estimated to contain magnetic flux equal to approx.5% that of Mercury's magnetic tail or approximately one order of magnitude higher fraction of the tail flux than is typically found for FTEs at Earth. Plasmoid and traveling compression region (TCR) signatures were observed throughout MESSENGER'S traversal of Mercury's magnetotail with a repetition rate comparable to the Dungey cycle time of approx.2 min. The TCR signatures changed from south-north, indicating tailward motion, to north-south, indicating sunward motion, at a distance approx.2.6 RM (where RM is Mercury's radius) behind the terminator indicating that the near-Mercury magnetotail neutral line was crossed at that point. Overall, these new MESSENGER observations suggest that magnetic reconnection at the dayside magnetopause is very intense relative to what is found at Earth and other planets, while reconnection in Mercury's tail is similar to that in other planetary magnetospheres, but with a very short Dungey cycle time.

Author

Interplanetary Magnetic Fields; Mercury (Planet); Planetary Magnetospheres; Planetary Magnetotails; Electric Potential; Magnetic Field Reconnection; Magnetic Flux

89
ASTRONOMY

Includes observations of celestial bodies; astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20090005026 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Detecting Exoplanets with the New Worlds Observer: The Problem of Exozodiacal Dust

Roberge, A.; Noecker, M. C.; Glassman, T. M.; Oakley, P.; Turnbull, M. C.; January 04, 2009; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Dust coming from asteroids and comets will strongly affect direct imaging and characterization of terrestrial planets in the Habitable Zones of nearby stars. Such dust in the Solar System is called the zodiacal dust (or 'zodi' for short). Higher levels of similar dust are seen around many nearby stars, confined in disks called debris disks. Future high-contrast images of an Earth-like exoplanet will very likely be background-limited by light scattered of both the local Solar System zodi and the circumstellar dust in the extrasolar system (the exozodiacal dust). Clumps in the exozodiacal dust, which are expected in planet-hosting systems, may also be a source of confusion. Here we discuss the problems associated with imaging an Earth-like planet in the presence of unknown levels of exozodiacal dust. Basic formulae for the exoplanet imaging exposure time as function of star, exoplanet, zodi, exozodi, and telescope parameters will be presented. To examine the behavior of these formulae, we apply them to the New Worlds Observer (NWO) mission. NWO is a proposed 4-meter UV/optical/near-IR telescope, with a free flying starshade to suppress the light from a nearby star and achieve the high contrast needed for detection and characterization of a terrestrial planet in the star's Habitable Zone. We find that NWO can accomplish its science goals even if exozodiacal dust levels are typically much higher than the Solar System zodi level. Finally, we highlight a few additional problems relating to exozodiacal dust that have yet to be solved.

Author

Extrasolar Planets; Planet Detection; Cosmic Dust; Infrared Telescopes; Infrared Astronomy

20090005027 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Exoplanet Community Report on Direct Infrared Imaging of Exoplanets

Danchi, William C.; Lawson, Peter R.; January 04, 2009; 1 pp.; In English; Original contains poor quality, truncated or crooked pages; No Copyright; Avail.: Other Sources; Abstract Only

Direct infrared imaging and spectroscopy of exoplanets will allow for detailed characterization of the atmospheric constituents of more than 200 nearby Earth-like planets, more than is possible with any other method under consideration. A flagship mission based on larger passively cooled infrared telescopes and formation flying technologies would have the highest

angular resolution of any concept under consideration. The 2008 Exoplanet Forum committee on Direct Infrared Imaging of Exoplanets recommends: (1) a vigorous technology program including component development, integrated testbeds, and end-to-end modeling in the areas of formation flying and mid-infrared nulling; (2) a probe-scale mission based on a passively cooled structurally connected interferometer to be started within the next two to five years, for exoplanetary system characterization that is not accessible from the ground, and which would provide transformative science and lay the engineering groundwork for the flagship mission with formation flying elements. Such a mission would enable a complete exozodiacal dust survey (<1 solar system zodi) in the habitable zone of all nearby stars. This information will allow for a more efficient strategy of spectral characterization of Earth-sized planets for the flagship missions, and also will allow for optimization of the search strategy of an astrometric mission if such a mission were delayed due to cost or technology reasons. (3) Both the flagship and probe missions should be pursued with international partners if possible. Fruitful collaboration with international partners on mission concepts and relevant technology should be continued. (4) Research and Analysis (R&A) should be supported for the development of preliminary science and mission designs. Ongoing efforts to characterize the the typical level of exozodiacal light around Sun-like stars with ground-based nulling technology should be continued.
Author
Extrasolar Planets; Planet Detection; Infrared Imagery; Spectroscopy; Infrared Telescopes; Technology Assessment; Research and Development; Mission Planning; Astrometry

20090005033 NASA Goddard Space Flight Center, Greenbelt, MD, USA; NASA Goddard Space Flight Center, Greenbelt, MD, USA
Catching Up on State Transitions in Cygnus X-1
Boeck, Moritz; Hanke, Manfred; Wilms, Joern; Pirner, Stefan; Grinberg, Victoria; Markoff, Sera; Pottschmidt, Katja; Nowak, Michael A.; Pooley, Guy; September 2008; 5 pp.; In English; 7th Microquasar Workshop: Microquasars and Beyond, 1-5 Sep. 2008, Izmir, Turkey; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; DLR 50OR0801; Copyright; Avail.: CASI: A01, Hardcopy

In 2005 February we observed Cygnus X-1 over a period of 10 days quasi-continuously with the Rossi X-ray Timing Explorer and the Ryle telescope. We present the results of the spectral and timing analysis on a timescale of 90 min and show that the behavior of Cyg X-1 is similar to that found during our years long monitoring campaign. As a highlight we present evidence for a full transition from the hard to the soft state that happened during less than three hours. The observation provided a more complete picture of a state transition than before, especially concerning the evolution of the time lags, due to unique transition coverage and analysis with high time resolution.
Author
Cygnus Constellation; X Ray Sources; Spectrum Analysis

20090005039 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Mechanical Overview of the International X-Ray Observatory
Robinson, David W.; McClelland, Ryan S.; [2009]; 10 pp.; In English; 2009 IEEE Aerospace Conference, 7-14 Mar. 2009, Big Sky, MT, USA; Original contains color and black and white illustrations; Copyright; Avail.: CASI: A02, Hardcopy

The International X-ray Observatory (IXO) is a new collaboration between NASA, ESA, and JAXA which is under study for launch in 2020. IXO will be a large 6600 kilogram Great Observatory-class mission which will build upon the legacies of the Chandra and XMM-Newton X-ray observatories. It combines elements from NASA's Constellation-X program and ESA's XEUS program. The observatory will have a 20-25 meter focal length, which necessitates the use of a deployable instrument module. Currently the project is actively trading configurations and layouts of the various instruments and spacecraft components. This paper will provide a snapshot of the latest observatory configuration under consideration and summarize the observatory from the mechanical engineering perspective.
Author
Astronomical Observatories; Spacecraft Configurations; Mechanical Engineering

20090005183 NASA Johnson Space Center, Houston, TX, USA
Impact Histories of Vesta and Vestoids inferred from Howardites, Eucrites, and Diogenites
Scott, E. R. D.; Bogard, D. D.; Bottke, W. F.; Taylor, G. J.; Greenwood, R. C.; Franchi, I. A.; Keil, K.; Moskovitz, N. A.; Nesvorny, D.; [2009]; 2 pp.; In English; 40th Lunar Planetary Conference, 23-27 Mar. 2009, Houston, TX, USA; Original contains color illustrations; Copyright; Avail.: CASI: A01, Hardcopy

The parent body of the howardites, eucrites and diogenites (HEDs) is thought to be asteroid (4) Vesta [1]. However,

several eucrites have now been recognized, like NWA 011 and Ibitira, with major element compositions and mineralogy like normal eucrites but with different oxygen isotope compositions and minor element concentrations suggesting they are not from the same body [2, 3]. The discoveries of abnormal eucrites and V-type asteroids that are probably not from Vesta [see 4] raise the question whether the HEDs with normal oxygen isotopes are coming from Vesta [3]. To address this issue and understand more about the evolution of Vesta in preparation for the arrival of the Dawn spacecraft, we integrate fresh insights from Ar-Ar dating and oxygen isotope analyses of HEDs, radiometric dating of differentiated meteorites, as well as dynamical and astronomical studies of Vesta, the Vesta asteroid family (i.e., the Vestoids), and other V-type asteroids.
Author
Vesta Asteroid; Meteorites; Asteroids; Achondrites; Chronology; Meteoritic Composition

20090006003 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Science and Mathematics in Astronomy
Oral/Visual Presentation
Woolack, Edward; Jan. 30, 2009; 1 pp.; In English; National Radio Astronomy Observatory Conference, 30-31 Jan. 2009, Martinsville, WV, USA; No Copyright; Avail.: Other Sources; Abstract Only

A brief historical introduction to the development of observational astronomy will be presented. The close historical relationship between the successful application of mathematical concepts and advances in astronomy will be presented. A variety of simple physical demonstrations, hands-on group activities, and puzzles will be used to understand how the properties of light can be used to understand the contents of our universe.
Author
Astronomy; Mathematics; Science

20090006606 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Fermi (Formerly GLAST) at Six Months
Ritz, Steven M.; January 04, 2009; 1 pp.; In English; 213th Meeting of the American Astronomical Society with HAD and HEAD, 4 - 8 Jan. 2009, California, USA; No Copyright; Avail.: Other Sources; Abstract Only

The Fermi Gamma-ray Space Telescope, formerly called GLAST, is a mission to measure the cosmic gamma-ray flux in the energy range 20 MeV to more than 300 GeV, with supporting measurements for gamma-ray bursts from 8 keV to 30 MeV. In addition to breakthrough capabilities in energy coverage and localization, the very large field of view enables observations of 20% of the sky at any instant, and the entire sky on a timescale of a few hours. With its recent launch on 11 June 2008, Fermi now opens a new and important window on a wide variety of phenomena, including pulsars, black holes and active galactic nuclei, gamma-ray bursts, the origin of cosmic rays and supernova remnants, and searches for hypothetical new phenomena such as supersymmetric dark matter annihilations. In addition to early results and the science opportunities, this talk includes a description of the instruments and the mission status and plans.
Author
Fermi Gamma-Ray Space Telescope; Gamma Ray Astronomy; Gamma Ray Telescopes; Cosmic Rays; Gamma Ray Bursts; Flux; Electron Energy

90
ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20090005034 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Highly Structured Wind in Vela X-1
Kreykenbohm, Ingo; Wilms, Joern; Kretschmar, Peter; Torrejon, Jose Miguel; Pottschmidt, Katja; Hanke, Manfred; Santangelo, Andrea; Ferrigno, Carlo; Staubert, Ruediger; September 08, 2008; 12 pp.; In English; 7th INTEGRAL Workshop, 8-11 Sep. 2008, Copenhagen, Denmark; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: A03, Hardcopy

We present an in-depth analysis of the spectral and temporal behavior of a long almost uninterrupted INTEGRAL observation of Vela X-1 in Nov/Dec 2003. In addition to an already high activity level, Vela X-1 exhibited several very intense flares with a maximum intensity of more than 5 Crab in the 20 40 keV band. Furthermore Vela X-1 exhibited several off states where the source became undetectable with ISGRI. We interpret flares and off states as being due to the strongly structured wind of the optical companion: when Vela X-1 encounters a cavity in the wind with strongly reduced density, the flux will

drop, thus potentially triggering the onset of the propeller effect which inhibits further accretion, thus giving rise to the off states. The required drop in density to trigger the propeller effect in Vela X-1 is of the same order as predicted by theoretical papers for the densities in the OB star winds. The same structured wind can give rise to the giant flares when Vela X-1 encounters a dense blob in the wind. Further temporal analysis revealed that a short lived QPO with a period of 6800 sec is present. The part of the light curve during which the QPO is present is very close to the off states and just following a high intensity state, thus showing that all these phenomena are related.
Author
X Ray Binaries; Stellar Winds

20090005035 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Multi-Satellite Observations of Cygnus X-1 to Study the Focused Wind and Absorption Dips
Hanke, Manfred; Wilms, Joern; Boeck, Moritz; Nowak, Michael A.; Schultz, Norbert S.; Pottschmidt, Katja; Lee, Julia C.; September 2008; 10 pp.; In English; 7th Microquasar Worksho, 1-5 Sep. 2008, Izmir, Turkey; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; 50OR0701; Copyright; Avail.: CASI: A02, Hardcopy

High-mass X-ray binary systems are powered by the stellar wind of their donor stars. The X-ray state of Cygnus X-1 is correlated with the properties of the wind which defines the environment of mass accretion. Chandra-HETGS observations close to orbital phase 0 allow for an analysis of the photoionzed stellar wind at high resolution, but because of the strong variability due to soft X-ray absorption dips, simultaneous multi-satellite observations are required to track and understand the continuum, too. Besides an earlier joint Chandra and RXTE observation, we present first results from a recent campaign which represents the best broad-band spectrum of Cyg X-1 ever achieved: On 2008 April 18/19 we observed this source with XMM-Newton, Chandra, Suzaku, RXTE, INTEGRAL, Swift, and AGILE in X- and gamma-rays, as well as with VLA in the radio. After superior conjunction of the black hole, we detect soft X-ray absorption dips likely due to clumps in the focused wind covering greater than or equal to 95% of the X-ray source, with column densities likely to be of several 10(exp 23) cm(exp -2), which also affect photon energies above 20 keV via Compton scattering.
Author
Cygnus Constellation; Satellite Observation; Stellar Winds; X Ray Absorption

20090005036 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Modelling a Simultaneous Radio/X-Ray Flare from Cyg X-1
Leventis, Konstantinos; Markoff, Sera; Wilsm, Joern; Nowak, Michael A.; Maitra, Dipankar; Pottschmidt, Katja; Pooley, Guy G.; Kreykenbohm, Ingo; Rotschild, Richard E.; September 2008; 5 pp.; In English; 7th Microquasar Workshop: Microquasars and Beyond, 1-5 Sep. 2008, Izmir, Turkey; Original contains color and black and white illustrations
Contract(s)/Grant(s): NNG06EO90A; Copyright; Avail.: CASI: A01, Hardcopy

The long-term monitoring campaign of Cyg X-1 has provided the detection of the first simultaneous radio/X-ray flare seen from that source. We investigate the physical characteristics of the event in terms of emission from a homogeneous, expanding blob of pair-plasma, superimposed on a baseline flux in both bands. We find that while the radio flare can be reconstructed under various configurations of a cooling blob, continuous (re)acceleration of particles inside the jet is necessary to sustain X-ray emission at the levels implied by the data, for the observed duration. We present major results of the modelling and discuss implications for the role of microquasar jets.
Author
Cygnus Constellation; Radio Emission; Flares; Astronomical Models

20090005045 Stanford Linear Accelerator Center, CA, USA
First International GLAST Symposium
Blandford, R.; January 2007; 5 pp.; In English
Contract(s)/Grant(s): DE-AC02-76SF00515
Report No.(s): DE2007-918538; SLAC/PUB-12903; No Copyright; Avail.: Department of Energy Information Bridge

No abstract available
Fermi Gamma-Ray Space Telescope; Astrophysics

20090005092 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Funds in Stochastic Gravitational Waves Generated by Compact Binary Systems Compact Data

deFreitasDinizEvangelista, Edgard; [2008]; 74 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15236-TDI/1323; Copyright; Avail.: CASI: C01, CD-ROM; A04, Hardcopy

General Relativity's equations when linearized yield solutions which describe wavy perturbations in space-time and that have quadrupolar radiation form when one utilizes the weak field approximation and considers points far from the source. Theoretically, any masses or arrangement of masses that undergo translational accelerations or that have rotation (in the case of radially asymmetrical objects, only) are able to emit gravitational waves. Nevertheless, there are four kinds of sources of special interests in Astrophysics: the periodic systems, because they present lasting and approximately constant emission profile, e.g., binary systems and rotating deformed stars; the bursts, which are characterized by sharply energetic emissions in a short time interval, as supernovae's blasts and merging of black holes; the background, which may be of cosmological kind, generated by events as the big bang, or generated by a great number of periodic or burst sources; 'chirp' sources, as non-periodic binary systems. This dissertation addresses, in particular, the background radiation generated by compact binary systems formed by neutron stars and black holes. It is studied the cosmological compact binary systems and their evolution. The aim is to calculate the background's energy spectrum when one considers the simultaneous emissions from all binaries situated at cosmological distances, that is, it will be carry out the sum of the spectra of all population of these stellar systems to obtain the total spectrum.

Author

Binary Stars; Background Radiation; Cosmology; Stellar Evolution; Energy Spectra; Spectral Emission; Astrophysics; Gravitational Waves

20090005096 Instituto Nacional de Pesquisas Espacias, Sao Jose dos Campos, Brazil

Cosmic Ray Intensity Variation in Response to Different Magnetic Structures of Interplanetary Medium

daSilva, Marlos Rockenbach; [2008]; 149 pp.; In Portuguese; Original contains color and black and white illustrations

Report No.(s): INPE-15242-TDI/1329; Copyright; Avail.: CASI: C01, CD-ROM; A07, Hardcopy

In this work we show that the secondary cosmic ray variations (neutron and muon) depends on the solar structures observed in the interplanetary medium. We analyzed interplanetary and cosmic ray ground based observations from 2001 to 2004. For this, interplanetary magnetic field and solar wind plasma parameters data, registered by the instruments on board the Advanced Composition Explorer - ACE satellite, and ground based cosmic rays data of the neutron monitors maintained by the Bartol Research Institute of the Delaware University, USA, and the muon cintillator telescope, installed in the Observatorio Espacial do Sul - OES/RSU/INPE-MCT in Sao Martinho da Serra, Brazil, were used. We classified the interplanetary structures as: (a) Interplanetary Coronal Mass Ejection, (b) Interplanetary Shocks, (c) Magnetic Clouds, (d) Corotating Interation Regions, and (e) Complex Events. We observed that during the passage of magnetic clouds the cosmic ray decreases are more intense than during the others structures. Thereafter, the cosmic ray response to the corotating interaction regions passage are the less intense. In spite of all efforts, it is not possible to satisfactorily explain the cosmic ray response during the passage of the interplanetary structures. Several models attribute the cosmic rays decreases to the particles scattering in the magnetic field turbulent area between the shock front and the ejection.

Author

Cosmic Rays; Interplanetary Medium; Interstellar Magnetic Fields

20090005952

Birth of Massive Black Hole Binaries

Colpi, M.; Dotti, M.; Mayer, L.; Kazantzidis, S.; January 2007; 26 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-920016; SLAC-PUB-13008; No Copyright; Avail.: National Technical Information Service (NTIS)

If massive black holes (BHs) are ubiquitous in galaxies and galaxies experience multiple mergers during their cosmic assembly, then BH binaries should be common albeit temporary features of most galactic bulges. Observationally, the paucity of active BH pairs points toward binary lifetimes far shorter than the Hubble time, indicating rapid inspiral of the BHs down to the domain where gravitational waves lead to their coalescence. Here, we review a series of studies on the dynamics of massive BHs in gas-rich galaxy mergers that underscore the vital role played by a cool, gaseous component in promoting the rapid formation of the BH binary. The BH binary is found to reside at the center of a massive self-gravitating nuclear disc resulting from the collision of the two gaseous discs present in the mother galaxies. Hardening by gravitational torques against gas in this grand disc is found to continue down to sub-parsec scales. The eccentricity decreases with time to zero and when the binary is circular, accretion sets in around the two BHs. When this occurs, each BH is endowed with it own small-size

(< 0.01 pc) accretion disc comprising a few percent of the BH mass. Double AGN activity is expected to occur on an estimated timescale of < 1 Myr. The double nuclear pointlike sources that may appear have typical separation of < 10 pc, and are likely to be embedded in the still ongoing starburst. We note that a potential threat of binary stalling, in a gaseous environment, may come from radiation and/or mechanical energy injections by the BHs. Only shortlived or sub-Eddington accretion episodes can guarantee the persistence of a dense cool gas structure around the binary necessary for continuing BH inspiral.
NTIS
Birth; Black Holes (Astronomy); Galaxies

20090006002 NASA Goddard Space Flight Center, Greenbelt, MD, USA
James Webb Space Telescope: Mission Overview and Status
Greenhouse, Matthew; [2009]; 1 pp.; In English; Pittcon 2009 Conference and Exposition, 'Space Exploration in the 21 Century', 8-13 Mar. 2009, Chicago, IL, USA; No Copyright; Avail.: Other Sources; Abstract Only

Often described as the successor to the Hubble Space Telescope, the James Webb Space Telescope (JWST) is a general astrophysics mission that will be used by the international astronomy community in a manner similar to other major space observatories: HST, Chandra, and Spitzer. The JWST is being developed by NASA in partnership with the European and Canadian Space Agencies for launch during 2013. This talk will review the science goals, overall mission architecture, and development status of the JWST.
Author
James Webb Space Telescope; Astrophysics; Mission Planning; Spacecraft Launching; Space Missions

20090006608 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Using Prominence Mass Inferences in Different Coronal Lines to Obtain the He/H Abundance
Gilbert, Holly; Kilper, Gary; Alexander, David; Kucera, Therese; December 14, 2008; 1 pp.; In English; 2008 Fall AGU Conference, 14-20 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

In a previous study we developed a new technique for deriving prominence mass by observing how much coronal radiation in the Fe XI1 (lambda 195) spectral line is absorbed by prominence material. In the present work we apply this method, which allows us to consider the effects of both foreground and background radiation in our calculations, to a sample of prominences absorbing in a coronal line that ionizes both H and He (h < 504 Angstroms), and a line that ionizes only H (504 Angstroms < lambda < 911 Angstroms). This approach, first suggested by Kucera et al. (1998), permits the determination of the abundance ratio [He I]/[H I] of neutral helium and hydrogen in the prominence. This ratio should depend on how the prominence is formed, on its current thermodynamic state, and on its dynamical evolution. Thus, it may provide useful insights into the formation and evolution of prominences.
Author
Solar Prominences; Helium Isotopes; Liquid Helium; Neutral Gases; Thermodynamics; Coronas; Hydrogen

20090006610 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Initial Observations of the Magnetic Field Measurements on the C/NOFS Satellite
Le, Guan; Mario, Rob; Acuna, Mario; Rowland, Doug; Bromund, Ken; Freudenreich, Henry; Martin, Steve; December 14, 2008; 1 pp.; In English; 2008 Fall AGU Conference, 14-20 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

The Vector Electric Field Instrument (VEFI) suite onboard the C/NOFS spacecraft includes a sensitive fluxgate magnetometer to measure DC and ULF magnetic fields in the low latitude ionosphere. The instrument includes a DC vector measurement at 1 sample/sec with a range of +/- 45,000 nT whose primary objective is to enable a V x B measurement that is more accurate than that provided by using a magnetic field model. These data will also be used to provide signatures of large-scale ionospheric current systems, which, when analyzed in conjunction with the C/NOFS DC electric field measurements, promise to advance our understanding of equatorial electrodynamics. The instrument also includes an AC-coupled vector measurement in the 0.05 - 8 Hz frequency range at 16 samples/sec with an output range of +/- 900 nT in order to measure small-scale current filaments and possible Alfven waves associated with plasma irregularities. We compare the Earth's magnetic field models such as the most recently updated IGRF (the International Geomagnetic Reference Field) model and the POMME (the POtsdam Magnetic Model of the Earth) model with the measurements in order to provide an in-flight 'calibration' of the data as well as compute magnetic field differences to reveal large scale ionospheric currents. Our initial results show that, on average, the POMME model accurately reproduces the C/NOFS-measured magnetic field within

20 nT in magnitude and within 0.1 deg in field direction everywhere in the low latitude ionosphere except in the region of the South Atlantic Anomaly. Initial results of the C/NOFS magnetic field measurements will be shown.
Author
Magnetic Fields; Electric Fields; Electrical Measurement; Magnetometers; Direct Current; Plasma Waves

91
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*.

20090004997 European Space Agency. European Space Operations Center, Darmstadt, Germany
The International Space Station and the Space Debris Environment: 10 Years On
Johnson, Nicholas; Klinkrad, Heiner; [2009]; 1 pp.; In English; 5th European Conference on Space Debris, 30 Mar - 2 Apr. 2009, Darmstadt, Germany; Copyright; Avail.: Other Sources; Abstract Only

For just over a decade the International Space Station (ISS), the most heavily protected vehicle in Earth orbit, has weathered the space debris environment well. Numerous hypervelocity impact features on the surface of ISS caused by small orbital debris and meteoroids have been observed. In addition to typical impacts seen on the large solar arrays, craters have been discovered on windows, hand rails, thermal blankets, radiators, and even a visiting logistics module. None of these impacts have resulted in any degradation of the operation or mission of the ISS. Validating the rate of small particle impacts on the ISS as predicted by space debris environment models is extremely complex. First, the ISS has been an evolving structure, from its original 20 metric tons to nearly 300 metric tons (excluding logistics vehicles) ten years later. Hence, the anticipated space debris impact rate has grown with the increasing size of ISS. Secondly, a comprehensive visual or photographic examination of the complete exterior of ISS has never been accomplished. In fact, most impact features have been discovered serendipitously. Further complications include the estimation of the size of an impacting particle without knowing its mass, velocity, and angle of impact and the effect of shadowing by some ISS components. Inadvertently and deliberately, the ISS has also been the source of space debris. The U.S. Space Surveillance Network officially cataloged 65 debris from ISS from November 1998 to November 2008: from lost cameras, sockets, and tool bags to intentionally discarded equipment and an old space suit. Fortunately, the majority of these objects fall back to Earth quickly with an average orbital lifetime of less than two months and a maximum orbital lifetime of a little more than 15 months. The cumulative total number of debris object-years is almost exactly 10, the equivalent of one piece of debris remaining in orbit for 10 years. An unknown number of debris too small to be tracked and cataloged have also been generated, but normally with even shorter orbital lifetimes. Finally, eight collision avoidance maneuvers have been performed to avoid potential collisions between ISS and large, tracked space debris. The most recent such maneuver was accomplished by ESA's Automated Transfer Vehicle, the Jules Verne, just three months before the 10th anniversary of the launch of ISS's first element.
Author
International Space Station; Space Debris; Aerospace Environments; Manned Space Flight; Spacecraft Maneuvers

20090005030 NASA Goddard Space Flight Center, Greenbelt, MD, USA
A Direct Path to Finding Earth-Like Planets
Heap, Sara R.; Linder, Don J.; January 04, 2009; 1 pp.; In English; No Copyright; Avail.: Other Sources; Abstract Only

As envisaged by the 2000 astrophysics decadal survey panel: The main goal of Terrestrial Planet Finder (TPF) is nothing less than to search for evidence of life on terrestrial planets around nearby stars . Here, we consider how an optical telescope paired with a free-flying occulter blocking light from the star can reach this goal directly, without knowledge of results from prior astrometric, doppler, or transit exoplanet observations. Using design reference missions and other simulations, we explore the potential of TPF-O to find planets in the habitable zone around their central stars, to spectrally characterize the atmospheres of detected planets, and to obtain rudimentary information about their orbits. We emphasize the importance of ozone absorption in the UV spectrum of a planet as a marker of photosynthesis by plants, algae, and cyanobacteria.
Author
Planet Detection; Telescopes; Terrestrial Planets; NASA Space Programs

20090005174 Washington Univ., Saint Louis, MO, USA

Solid State Studies of the Radiation Histosy of Lunar Samples

Crozaz, G.; Haack, U.; Hair, M.; Hoyt, H.; Kardos, J.; Maurette, M.; Miyajima, M.; Seitz, M.; Sun, S.; Walker, R.; Wittels, M.; Woolum, D.; Science; January 30, 1970; Volume 167, No. 3918, pp. 563-566; In English; Original contains black and white illustrations; Copyright; Avail.: Other Sources

ONLINE: http://dx.doi.org/10.1126/science.167.3918.563

Particle track densities up to greater than 3 x 10(exp 9) per square centimeter have been measured in different samples. Rocks 17, 47, 57, and 58 have VH (Z greater than 22) galactic cosmic ray ages of 11, 14, 28, and 13 x 10(exp 6) years, respectively. Rock 57 has a calculated erosion rate of approximately less than 10(exp -7) centimeter per year. Near-surface track versus depth data in rock 17 can be fit with solar flare particles that have a differential energy spectrum alpha E(exp -s); lunar samples can be used to study the history of solar activity. The uranium in the crystalline rocks occurs principally in small regions less than 10 to approximately equal to 100 micrometers in size. The (low) thermoluminescence of the fines increases with depth in core 10004. With one possible exception, x-ray studies have not shown pronounced radiation damage effects. The total energy release upon heating is small up to 900 C and occurs in three broad regions.

Author

Lunar Geology; Apollo 11 Flight; Lunar Rocks; Particle Tracks; Lunar Surface

20090005954 Stanford Linear Accelerator Center, CA, USA; Stanford Univ., Stanford, CA USA

Clumping Effects on Non-Thermal Particle Spectra in Massive Star Systems

Reimer, A.; January 2007; 3 pp.; In English

Contract(s)/Grant(s): DE-AC02-76SF00515

Report No.(s): DE2007-919434; SLAC-PUB-12982; No Copyright; Avail.: Department of Energy Information Bridge

Observational evidence exists that winds of massive stars are clumped. Many massive star systems are known as non-thermal particle production sites, as indicated by their synchrotron emission in the radio band. As a consequence they are also considered as candidate sites for non-thermal high-energy photon production up to gamma-ray energies. The present work considers the effects of wind clumpiness expected on the emitting relativistic particle spectrum in colliding wind systems, built up from the pool of thermal wind particles through diffusive particle acceleration, and taking into account inverse Compton and synchrotron losses. In comparison to a homogeneous wind, a clumpy wind causes flux variations of the emitting particle spectrum when the clump enters the wind collision region. It is found that the spectral features associated with this variability moves temporally from low to high energy bands with the time shift between any two spectral bands being dependent on clump size, filling factor, and the energy-dependence of particle energy gains and losses.

NTIS

Massive Stars; Collisions; Clumps

20090005963 NASA Goddard Space Flight Center, Greenbelt, MD, USA

NASA Standard for Models and Simulations: Credibility Assessment Scale

Babula, Maria; Bertch, William J.; Green, Lawrence L.; Hale, Joseph P.; Mosier, Gary E.; Steele, Martin J.; Woods, Jody; January 05, 2009; 18 pp.; In English; AIAA Aerospace Sciences Meeting, 5-9 Jan. 2009, Orlando, FL, USA; Original contains color and black and white illustrations; No Copyright; Avail.: CASI: A03, Hardcopy

As one of its many responses to the 2003 Space Shuttle Columbia accident, NASA decided to develop a formal standard for models and simulations (M&S). Work commenced in May 2005. An interim version was issued in late 2006. This interim version underwent considerable revision following an extensive Agency-wide review in 2007 along with some additional revisions as a result of the review by the NASA Engineering Management Board (EMB) in the first half of 2008. Issuance of the revised, permanent version, hereafter referred to as the M&S Standard or just the Standard, occurred in July 2008. Bertch, Zang and Steeleiv provided a summary review of the development process of this standard up through the start of the review by the EMB. A thorough recount of the entire development process, major issues, key decisions, and all review processes are available in Ref. v. This is the second of a pair of papers providing a summary of the final version of the Standard. Its focus is the Credibility Assessment Scale, a key feature of the Standard, including an example of its application to a real-world M&S problem for the James Webb Space Telescope. The companion paper summarizes the overall philosophy of the Standard and an overview of the requirements. Verbatim quotes from the Standard are integrated into the text of this paper, and are indicated by quotation marks.

Derived from text

Simulation; Columbia (Orbiter); General Overviews; Technology Assessment; NASA Space Programs; Standards

20090005996 NASA Glenn Research Center, Cleveland, OH, USA

The Effect of Simulated Lunar Dust on the Absorptivity, Emissivity, and Operating Temperature on AZ-93 and Ag/FEP Thermal Control Surfaces

Gaier, James R.; Siamidis, John; Panko, Scott R.; Rogers, Kerry J.; Larkin, Elizabeth M. G.; December 2008; 21 pp.; In English; Original contains color and black and white illustrations

Contract(s)/Grant(s): WBS 936374.04.08.03

Report No.(s): NASA/TM-2008-215492; E-16723; Copyright; Avail.: CASI: A03, Hardcopy

JSC-1AF lunar simulant has been applied to AZ-93 and AgFEP thermal control surfaces on aluminum or composite substrates in a simulated lunar environment. The temperature of these surfaces was monitored as they were heated with a solar simulator and cooled in a 30 K coldbox. Thermal modeling was used to determine the absorptivity ( ) and emissivity ( ) of the thermal control surfaces in both their clean and dusted states. Then, a known amount of power was applied to the samples while in the coldbox and the steady state temperatures measured. It was found that even a submonolayer of simulated lunar dust can significantly degrade the performance of both white paint and second-surface mirror type thermal control surfaces under these conditions. Contrary to earlier studies, dust was found to affect as well as . Dust lowered the emissivity by as much as 16 percent in the case of AZ-93, and raised it by as much as 11 percent in the case of AgFEP. The degradation of thermal control surface by dust as measured by / rose linearly regardless of the thermal control coating or substrate, and extrapolated to degradation by a factor 3 at full coverage by dust. Submonolayer coatings of dust were found to not significantly change the steady state temperature at which a shadowed thermal control surface will radiate.

Author

Lunar Dust; Lunar Environment; Lunar Soil; Absorptivity; Emissivity; Operating Temperature; Thermal Control Coatings; Control Surfaces

20090006015 Stanford Linear Accelerator Center, CA, USA

Organizing the Extremely Large LSST Database for Real-Time Astronomical Processing

Becla, J.; Lim, K. T.; Monkewitz, S.; Nieto-Santisteban, M.; Thakar, A.; Nov. 2007; 4 pp.; In English

Report No.(s): DE2007-919415; SLAC-PUB-12962; No Copyright; Avail.: Department of Energy Information Bridge

The Large Synoptic Survey Telescope (LSST) will catalog billions of astronomical objects and trillions of sources, all of which will be stored and managed by a database management system. One of the main challenges is detections have to be cross-correlated with the huge historical catalogs, and then further processed to prune false alerts. This paper explains the challenges, the implementation of the LSST Association Pipeline and the database organization strategies we are planning to use to meet the real-time requirements, including data partitioning, parallelization, and pre-loading.

NTIS

Astronomy; Data Base Management Systems; Data Bases; Real Time Operation; Surveys; Telescopes

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.

20090005029 NASA Goddard Space Flight Center, Greenbelt, MD, USA

Recent Studies of the Behavior of the Sun's White-Light Corona Over Time

SaintCyr, O. C.; Young, D. E.; Pesnell, W. D.; Lecinski, A.; Eddy, J.; December 13, 2008; 1 pp.; In English; Copyright; Avail.: Other Sources; Abstract Only

Predictions of upcoming solar cycles are often related to the nature and dynamics of the Sun's polar magnetic field and its influence on the corona. For the past 30 years we have a more-or-less continuous record of the Sun's white-light corona from groundbased and spacebased coronagraphs. Over that interval, the large scale features of the corona have varied in what we now consider a 'predictable' fashion--complex, showing multiple streamers at all latitudes during solar activity maximum; and a simple dipolar shape aligned with the rotational pole during solar minimum. Over the past three decades the white-light corona appears to be a better indicator of 'true' solar minimum than sunspot number since sunspots disappear for months (even years) at solar minimum. Since almost all predictions of the timing of the next solar maximum depend on the timing of solar minimum, the white-light corona is a potentially important observational discriminator for future predictors. In this contribution we describe recent work quantifying the large-scale appearance of the Sun's corona to correlate it with the sunspot record, especially around solar minimum. These three decades can be expanded with the HAO archive of eclipse photographs which, although sparse compared to the coronagraphic coverage, extends back to 1869. A more extensive

understanding of this proxy would give researchers confidence in using the white-light corona as an indicator of solar minimum conditions.
Author
Solar Corona; Solar Activity; Solar Cycles

20090005999 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Status of Terra and Aqua MODIS Instruments
Xiong, Xiaoxiong; Wenny, Brian N.; Kuyper, James; Salomonson, Vicent; Barmes. William; December 14, 2008; 1 pp.; In English; American Geophysical Union Conference, 14-19 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

Currently, two nearly identical MODIS instruments are operating in space: one on the Terra spacecraft launched in December 1999 and another on the Aqua spacecraft launched in May 2002. MODIS has 36 spectral bands with wavelengths covering from visible (VIS) to long-wave infrared (LWIR). Since launch, MODIS observations and data products have contributed significantly to studies of changes in the Earth system of land, oceans, and atmosphere. To maintain its on-orbit calibration and data product quality, MODIS was built with a comprehensive set of on-board calibrators, consisting of a solar diffuser (SD) and a solar diffuser stability monitor (SDSM) for the reflective solar bands (RSB) and an on-board blackbody (BB) for the thermal emissive bands (TEB). Both instruments have demonstrated good performance. The primary Level 1 B (LIB) data products are top of the atmosphere (TOA) reflectance for RSB and radiance for TEB This paper provides an overview of MODIS calibration methodologies, activities, lifetime on-orbit performance and challenging issues for each MODIS, the impact on LIB product quality, and lessons learned for future sensors such as the NPOESS VIIRS.
Author
MODIS (Radiometry); Aqua Spacecraft; Terra Spacecraft; Spectral Bands; Imaging Spectrometers; Calibrating; Reflectance; Infrared Radiation

20090006017 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Development of Solar Wind Model Driven by Empirical Heat Flux and Pressure Terms
Sittler, Edward C., Jr.; Ofman, L.; Selwa, M.; Kramar, M.; December 12, 2008; 1 pp.; In English; American Geophysical Union Conference, 12-21 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We are developing a time stationary self-consistent 2D MHD model of the solar corona and solar wind as suggested by Sittler et al. (2003). Sittler & Guhathakurta (1999) developed a semiempirical steady state model (SG model) of the solar wind in a multipole 3-streamer structure, with the model constrained by Skylab observations. Guhathakurta et al. (2006) presented a more recent version of their initial work. Sittler et al. (2003) modified the SG model by investigating time dependent MHD, ad hoc heating term with heat conduction and empirical heating solutions. Next step of development of 2D MHD models was performed by Sittler & Ofman (2006). They derived effective temperature and effective heat flux from the data-driven SG model and fit smooth analytical functions to be used in MHD calculations. Improvements of the Sittler & Ofman (2006) results now show a convergence of the 3-streamer topology into a single equatorial streamer at altitudes > 2 R(sub S). This is a new result and shows we are now able to reproduce observations of an equatorially confined streamer belt. In order to allow our solutions to be applied to more general applications, we extend that model by using magnetogram data and PFSS model as a boundary condition. Initial results were presented by Selwa et al. (2008). We choose solar minimum magnetogram data since during solar maximum the boundary conditions are more complex and the coronal magnetic field may not be described correctly by PFSS model. As the first step we studied the simplest 2D MHD case with variable heat conduction, and with empirical heat input combined with empirical momentum addition for the fast solar wind. We use realistic magnetic field data based on NSO/GONG data, and plan to extend the study to 3D. This study represents the first attempt of fully self-consistent realistic model based on real data and including semi-empirical heat flux and semi-empirical effective pressure terms.
Author
Magnetohydrodynamics; Solar Wind; Solar Activity Effects; Two Dimensional Models; Solar Magnetic Field; Solar Corona

20090006612 NASA Goddard Space Flight Center, Greenbelt, MD, USA
Topological Origins of the Slow Solar Wind
Antiochos, Spiro; December 14, 2008; 1 pp.; In English; 2008 Fall AGU Conference, 14-19 Dec. 2008, San Francisco, CA, USA; No Copyright; Avail.: Other Sources; Abstract Only

Although the slow solar wind has been studied for decades with both in situ and remote sensing observations, its origin is still a matter of intense debate. In the standard quasi-steady model, the slow wind is postulated to originate near coronal

hole boundaries that define topologically well-behaved separatrices between open and closed field regions. In the interchange model, on the other hand, the slow wind is postulated to originate on open flux that is dynamically diffusing throughout the seemingly closed-field corona. We argue in favor of the quasi-steady scenario and propose that the slow wind is due to two effects: First, the open-closed boundary is highly complex due to the complexity of the photospheric flux distribution. Second, this boundary is continuously driven by the transport of magnetic helicity from the closed field region into the open. The implications of this model for the structure and dynamics of the corona and slow wind are discussed, and observational tests of the mode

Author

Coronal Holes; Coronas; Solar Wind; Topology

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Systematic Independent Validation of Inner Heliospheric Models

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This presentation is the first in a series which will provide independent validation of community models of the outer corona and inner heliosphere. In this work we establish a set of measures to be used in validating this group of models. We use these procedures to generate a comprehensive set of results from the Wang- Sheeley-Arge (WSA) model which will be used as a baseline, or reference, against which to compare all other models. We also run a test of the validation procedures by applying them to a small set of results produced by the ENLIL Magnetohydrodynamic (MHD) model. In future presentations we will validate other models currently hosted by the Community Coordinated Modeling Center(CCMC), including a comprehensive validation of the ENLIL model. The Wang-Sheeley-Arge (WSA) model is widely used to model the Solar wind, and is used by a number of agencies to predict Solar wind conditions at Earth as much as four days into the future. Because it is so important to both the research and space weather forecasting communities, it is essential that its performance be measured systematically, and independently. In this paper we offer just such an independent and systematic validation. We report skill scores for the model's predictions of wind speed and IMF polarity for a large set of Carrington rotations. The model was run in all its routinely used configurations. It ingests line of sight magnetograms. For this study we generated model results for monthly magnetograms from the National Solar Observatory (SOLIS), Mount Wilson Observatory and the GONG network, spanning the Carrington rotation range from 1650 to 2068. We compare the influence of the different magnetogram sources, performance at quiet and active times, and estimate the effect of different empirical wind speed tunings. We also consider the ability of the WSA model to identify sharp transitions in wind speed from slow to fast wind. These results will serve as a baseline against which to compare future versions of the model

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Heliosphere; Magnetic Signatures; Magnetohydrodynamics; Solar Wind; Forecasting; Models; Magnetohydrodynamic Simulation

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Cluster/Peace Electrons Velocity Distribution Function: Modeling the Strahl in the Solar Wind

Vinas, Adolfo Figueroa; Gurgiolo, Chris; Goldstein, Melvyn L.; December 14, 2008; 1 pp.; In English; American Geophysical Union, 14-21 Dec. 2008, San Francisco, CA, USA; Copyright; Avail.: Other Sources; Abstract Only

We present a study of kinetic properties of the strahl electron velocity distribution functions (VDF's) in the solar wind. These are used to investigate the pitch-angle scattering and stability of the population to interactions with electromagnetic (whistler) fluctuations. The study is based on high time resolution data from the Cluster/PEACE electron spectrometer. Our study focuses on the mechanisms that control and regulate the pitch-angle and stability of strahl electrons in the solar wind; mechanisms that are not yet well understood. Various parameters are investigated such as the electron heat-flux and temperature anisotropy. The goal is to check whether the strahl electrons are constrained by some instability (e.g., the whistler instability), or are maintained by other types of processes. The electron heat-flux and temperature anisotropy are determined by fitting the VDF's to a spectral spherical harmonic model from which the moments are derived directly from the model coefficients.

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Distribution Functions; Electrons; Solar Wind; Velocity Distribution; Models

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SWCX Emission from the Helium Focusing Cone - Model to Data Comparison

Koutroumpa, D.; Collier, M. R.; Kuntz, K. D.; Lallement, R.; Snowden, Steven L.; [2009]; 18 pp.; In English; Original contains poor quality, truncated or crooked pages; Copyright; Avail.: CASI: A03, Hardcopy

A model for heliospheric solar wind charge exchange (SWCX) X-ray emission is applied to a series of XMM-Newton observations of the interplanetary focusing cone of interstellar helium. The X-ray data are from three coupled observations of the South Ecliptic Pole (SEP, to observe the cone) and the Hubble Deep Field-North (HDFN. to monitor global variations of the SWCX emission due to variations in the solar wind) from the period 24 November to 15 December 2003. There is good qualitative agreement between the model predictions and thc data with the maximum SWCX flux observed at an ecliptic longitude of approx. 72deg, consistent with the central longitude of the He cone. We observe a total excess of 2.1 +/- 1.3 LU in the O VII line and 2.0 +/- 0.9 LU in the 0 VIII line. However. the SWCX emission model, which was adjusted for solar wind conditions appropriate for late 2003, predicts an excess from the He cone of only 0.5 LU and 0.2 LU, respectively, in the O VII and O VIII lines. We discuss thc model to data comparison and provide possible explanations for the discrepancies. We also qualitatively reexamine our SWCX n~ocicl predictions in the 1/4 keV band with data from the ROSAT All-Sky Survey towards the North and South Ecliptic Poles, when the He cone was probably first detected in soft X-rays.

Author

Solar Wind; Heliosphere; Charge Exchange; Wind Velocity; Wind Direction; Interstellar Gas; Helium

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *51 Life Sciences*; on human beings see 52 Aerospace Medicine. For theory see *73 Nuclear Physics*.

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Radiation Shielding at High-Energy Electron and Proton Accelerators

Rokni, S. H.; Cossairt, J. D.; Liu, J. C.; Dec. 2007; 37 pp.; In English

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Report No.(s): DE2007-921011; FERMILAB/PUB-07-608-ESH; SLAC/PUB-13033; No Copyright; Avail.: Department of Energy Information Bridge

The goal of accelerator shielding design is to protect the workers, general public, and the environment against unnecessary prompt radiation from accelerator operations. Additionally, shielding at accelerators may also be used to reduce the unwanted background in experimental detectors, to protect equipment against radiation damage, and to protect workers from potential exposure to the induced radioactivity in the machine components. The shielding design for prompt radiation hazards is the main subject of this chapter.

NTIS

Electron Accelerators; Protons; Radiation Shielding; Shielding

Subject Term Index

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