Summary of the Second Workshop on Process Planning Concepts, Representations and Architectures

Dr. Steven R. Ray

August 10-11, 1992
National Institute of Standards and Technology

Summary of the Second Workshop on Process Planning Concepts, Representations and Architectures

Steven R. Ray

August 10-11, 1992
National Institute of Standards and Technology

Workshop Objectives:

- To develop unifying mechanisms to support process planning research. (e.g. common data models, common access mechanisms)
- To position process planning research to maximize its utility and relevance to industry and potential funding sources.
- To facilitate interoperation among planning systems, and other manufacturing systems.
- To help establish a community of process planning researchers and co-workers, and encourage communication among researchers.
- To promote a dialogue between researchers and industry.
- To use and influence existing and proposed standards wherever appropriate.
- Refine the process planning infrastructure agreed to at the Texas A&M workshop.
- To endorse, and help define the role of the Process Planning Testbed at NIST.

Foundation

Data Requirements

The following elements were identified to be necessary data elements to support process planning.

- Design intent
- Product Solid Model
- Tolerances
- Surface Finish
- Material Properties
- Features and their relationships
- Customer requirements
- Relationships among:

    Process Capabilities
    Manufacturing Resources Facility model
    Feature Libraries
- Process Plans

    (need a resource-based model for control)

Architecture

- Need a definition for process planning
- Need to define the extent / scope of process planning
  (when does process planning start/finish?)
- There is a gap between dispatching and real-time scheduling
- Components of process planning include:
  - Process selection
  - Operation selection
  - Process ordering
  - Setup planning/fixtures/load & unload
  - Machine selection
  - Tool selection
- Operation planning:
  - Parameter selection
  - Cutting strategy
  - Cutter path generation
- Potential sources of information on this include:
  - CAM-I activity model
  - DCLASS taxonomies
  - Process Planning handbook (SME)
  - “Introduction to CAPP”, Chang, Wysk
  - “Expert Process Planning for Manufacturing”, Chang
  - “Computer Aided Process Planning”, Wang, Li
  - “Process Planning for World Class Manufacturing”, James Nolen
  - “Process Planning”, Curtis
  - “Manufacturing Intelligence”, Wright, Bourne
- Domains of planning:
  - Machining
  - Casting
  - Fastening
  - Forging
  - Powder Metallurgy
  - Composites
  - Sheet metal
  - Semiconductor fabrication
  - Electrical
  - Assembly
  - Inspection
  - Maintenance
  - Construction
  - Calibration

Actions:

- Write a white paper describing the components of process planning, in the domains described above.
  Barber, Harbison
- Create a repository for planning systems, design documents, test examples of parts, plans, resources, etc.
  Ray
- Provide the NIST tools and supporting documentation for both downloading, and remote execution.
  Ray
- Provide periodic summaries of relevant publications in feature recognition.
  Lichten, Regli
- Post items of interest to the process planning mailing list.
  All
- What product representation will we adopt? STEP
  Lichten, Ray, Kramer, Barnard, Gomez
- What progress is there in mapping functional and geometric features to manufacturing features?
  Lichten, Regli
- What process plan representation will we adopt? ISO model
  Ray
- What intermediate process planning representation will we adopt?
  Chang, Ray, Annap
- What will we use for a manufacturing resource model?
  Wysk, Ray
- What interfaces should be defined?
  Data interfaces for input/output - SQL, SDAI, IRDS, DARPA agents
  Sack, Ray, Brown,
- Track CAM-I work
  Ferreira
- What communication protocols should be used? - NIST will provide a suite of communication options for use within the Testbed
  Ray
- What modeling methodology should be used? (data, activity)
  Harbison
- What specification language should be used? - EXPRESS
  Harbison, Barber
- What is the level of integration between process planning and job-shop scheduling?
  Zhang

SECOND WORKSHOP ON PROCESS PLANNING CONCEPTS, REPRESENTATIONS AND ARCHITECTURES

Attendance Record

Name & Address, Telephone	Fax	Email
K. Suzanne Barber The University of Texas at Austin Austin, TX 78702 817-794-5933	817-794-5952	barber@ee.uta.edu
Karan Harbison-Briggs University Texas-Arlington CSE/ARRI 7300 Jack Newell Blvd South Fort Worth, TX 76118 817-794-5920	817-794-5952	briggs@cse.uta.edu
Lonnie A. Burnett Lawrence Associates Inc. 5100 Springfield Pike, Suite 509 Dayton, OH 45431 513-254-7950	513-254-2153	71700.1677@compuserve.com
Dave Callahan Watervliet Arsenal SMCWV-AT Bldg.20 Watervliet, NY 12189-4050 518-266-5508	518-266-4555	im@wva-emh2.army.mil
T.C. Chang School of Industrial Eng. Purdue University W. Lafayette, IN 47907-1287 317-494-5436	317-494-5448	tchang@ecn.purdue.edu
Hyuenbo Cho 302D Zachry Eng. Ctr. Department of Industrial Eng. Texas A&M University College Station, TX 77840-3131 409-845-1573		hcho@tamu.edu
Annap Derebail Dept. of Industrial Eng. Texas A&M University College Station, TX 77840-3131 409-847-8576		annap@tamu.edu

SECOND WORKSHOP ON PROCESS PLANNING CONCEPTS, REPRESENTATIONS AND ARCHITECTURES

Attendance Record

Name & Address, Telephone	Fax	Email
Allison Barnard Feeney NIST Bldg.220,Rm.A127 Gaithersburg, MD 20899 301-975-3181	301-258-9749	barnard@cme.nist.gov
Shaw C. Feng NIST Bldg.220, Rm.A127 Gaithersburg, MD 20899 301-975-3551	301-975-9749	feng@cme.nist.gov
Placid Ferreira Univ. of Ill. at Urbana Champaign Dept. of Mech. & Ind. Eng. MC-244 Urbana, IL 61801 217-333-0639		placid@uxh.cso.uiuc.edu
Richard Fink SDRC 2250 E. Imperial Hwy Suite 340 El Segundo, CA 90245 310-322-8800	310-322-2916	
Richard J. Gerth Ohio University 277 Stocker Athens, OH 45701-2979 614-593-1545	614-593-4684	gerth@bobcat.ent.ohiou.edu
Lt. Mary Gomez WL/MTIB WPAFB OH 45453-6533 513-255-7371	513-476-4420	gomezma@mlgate.ml.wpafb.af.mil
Satyandra Gupta Mech. Eng. Dept. University of Maryland College Park, MD 20742 301-405-2717	301-405-6707	skgupta@cs.umd.edu

SECOND WORKSHOP ON PROCESS PLANNING CONCEPTS, REPRESENTATIONS AND ARCHITECTURES

Attendance Record

Name & Address, Telephone	Fax	Email
Shahrukh A. Irani University of Minnesota Dept. of Mech. Eng. 125 Mechanical Eng. 111 Church St. S.E. Minneapolis, MN 55455 612-626-7815	612-624-1398	shahrukh@vx.acs.umn.edu
Bob Isgro Dept. of Army Watervliet Arsenal SMCWV-ATD Bldg.20 Watervliet, NY 12189-4050 518-266-4556	518-266-4555	
Thomas Kramer Robot Systems Division Rm.B-124, Bldg.220 NIST Gaithersburg, MD 20899 301-975-3518	301-990-9688	kramer@cme.nist.gov
Seongkyu Lee Dept. of Ind. Eng. Texas A&M University College Station, TX 77843 409-845-5199		seong@cs.tamu.edu
Larry Lichten Computer Science Dept. California State University Northridge 18111 Nordhoff St. Northridge, CA 91330 818-885-3942	818-885-2140	lichten@ms.secs.csun.edu
Richard Linn Industrial and Mfg. Systems Eng. Dept. Iowa State University 205, Engineering Annex Ames, Iowa 50011 515-294-0121	515-294-3524	n1.rjl@isumvs.iastate.edu

SECOND WORKSHOP ON PROCESS PLANNING CONCEPTS, REPRESENTATIONS AND ARCHITECTURES

Attendance Record

Name & Address, Telephone	Fax	Email
Mark Luce NIST Bldg. 220, Rm A127 Gaithersburg, MD 20899 301-975-2802	301-258-9749	luce@cme.nist.gov
Daniel M. Min NIST Bldg. 220, Rm.A127 Gaithersburg, MD 20899 301-975-3512	301-258-9749	min@cme.nist.gov
Ravi Mittal Industrial Eng. Dept North Carolina State University Box 7906 Raleigh, NC 27695 919-515-5187	919-515-5281	mittal@cadcam.ie.ncsu.edu
Dana Nau Computer Science Dept. Univ. of Maryland College Park, MD 20742 301-405-2684	301-405-6707	nau@cs.umd.edu
Charlie Parks ISE Dept. Ohio University Athens, OH 45701-2979 614-593-1540	614-593-4684	cparks@bobcat.ent.ohiou.edu
Luis Rabelo Ohio University Rm.274, Stocker Center Athens, OH 45701 614-593-1542	614-593-4684	rabelo@bobcat.ent.ohiou.edu
Steven R. Ray NIST Bldg.220, Rm.A127 Gaithersburg, MD 20899 301-975-3524	301-258-9749	ray@cme.nist.gov

SECOND WORKSHOP ON PROCESS PLANNING CONCEPTS, REPRESENTATIONS AND ARCHITECTURES

Attendance Record

Name & Address, Telephone	Fax	Email
William C. Regli University of Maryland Dept. of Computer Science College Park, MD 20742 301-405-2717	301-405-6707	regli@cs.umd.edu
Aristides A.G. Requicha Computer Science Dept. University of Southern California Los Angeles, CA 90089-0781 213-740-4502		requicha@lipari.usc.edu
Chuck Sack United Technologies Research Center MS #129-48 Silver Lane East Hartford, CT 06108 203-727-7170		cfs@utrc.utc.com
Ezat T. Sanii N.C. State University Dept. of Industrial Eng. Box 7906 Raleigh, N.C. 27695 919-515-7196		sanii@eos.ncsu.edu
Yin-Lin Shen Academic Center T703 CMEE Dept. George Washington University Washington, D.C. 20052 202-994-5995	202-994-0238	shen@seas.gwu.edu
Dusan Sormaz University of Southern California ISE Department, GER 240 Los Angeles, CA 90089 213-740-4883		sormaz@lipari.usc.edu

SECOND WORKSHOP ON PROCESS PLANNING CONCEPTS, REPRESENTATIONS AND ARCHITECTURES

Attendance Record

Name & Address, Telephone	Fax	Email
Jan Vandenbrande EDS/Unigraphics-CAM 10824 Hope Str. Cypress, CA 90630 714-952-5617	714-952-5734	jan@camhpp12.mdcbbs.com
Ben Wang 4130 E.B. University of Iowa Iowa City, IA 52242 319-335-5938	319-335-5777	indwang1@icaen.uiowa.edu
Rick Wysk 241 C. Zachry Eng. Ctr. Dept. of Ind. Eng. Texas A&M University College Station, TX 77843-3131 409-845-5407	409-847-9005	wysk@ieman.tamu.edu
Hong-Chao Zhang Dept. of Industrial Eng. Texas Tech. University 806-742-0885		zhang@ttacs1.ttu.edu