Twenty-Fourth North American Manufacturing Research Conference

The Robert H. Lurie Engineering Center

NAMRC XXIV
May 21-23, 1996
including the
Second S.M. Wu Symposium on Manufacturing Science—U.S.A. Venue
May 24, 1996

Hosted by
The University of Michigan
Ann Arbor, Michigan, USA

Sponsored by
the North American Manufacturing Research Institution
of the Society of Manufacturing Engineers
Dear Friends,

The University of Michigan is delighted to host the Twenty-Fourth North American Manufacturing Research Conference. The conference continues its historic role of providing a forum for the discussion of basic and applied research in material removal, material forming and manufacturing systems.

This year, there will be more than 80 papers presented at the conference from universities, research institutes and industrial research laboratories from around the world. All the papers have been accepted based on peer review conducted by the NAMRC/SME Scientific Committee. Featured speakers include Mr. Dennis Pawley, Executive Vice President for Manufacturing at Chrysler Corporation, who will provide some new ideas on university-industry interactions, and Professor Jim Tlusty, who will tell us about the history of machine tool research.

Immediately following the conference, there will be a symposium in honor of the late Professor S.M. Wu and his many contributions to manufacturing research and education. The conjunction of NAMRC and the Wu Symposium presents a unique opportunity for practitioners to discover what is going on in the manufacturing research community.

We wish especially to encourage our colleagues in industry to attend one or both events. Your input is a valuable and necessary component to the dialogue that takes place at these events. Be assured that we will do our best to provide a warm welcome and a productive environment.

We look forward to meeting you in Ann Arbor at NAMRC XXIV and the Wu Symposium. We believe that you will both enjoy and profit from the experience.

Sincerely yours,

Elijah Kannaney-Asho, Jr. and Yeon Koren, Co-Chair
NAMRC XXIV Organizing Committee
Program-at-a-Glance

NAMRC XXIV

Tuesday, May 21

13:00 - 17:00
Plant Tours
1. FOCUS:Hope
2. Chrysler Jefferson North Assembly Plant
17:00 - 19:00
NAMRC Registration and Reception
19:00 - 21:00
Laboratory Tour

12:00 - 13:30
Founders Lecture Luncheon
“Machine Tool Research”

13:30 - 15:00
Concurrent Technical Sessions

15:00 - 15:30
Break

15:30 - 17:00
Concurrent Technical Sessions

17:30 - 19:00
Reception at the Art Museum

19:00 - 20:00
NAMRI/SME Membership Meeting

20:00 - 21:00
ASME Production/Manufacturing Engineering Division Meeting

Wednesday, May 22

07:00 - 08:00
NAMRC Registration and Continental Breakfast

08:00 - 08:45
Opening Ceremony

08:45 - 09:30
Plenary Address

09:30 - 09:45
Break

09:45 - 10:30
Concurrent Keynote Sessions

10:30 - 12:00
Concurrent Technical Sessions

10:30 - 12:00
Concurrent Technical Sessions

12:00 - 13:30
NAMRI/SME Award Luncheon

13:30 - 15:00
Concurrent Technical Sessions

15:00 - 15:30
Break

15:30 - 17:00
Concurrent Technical Sessions

18:30 - 22:00
Conference Banquet
Summit Restaurant
Renaissance Center
Detroit

Thursday, May 23

07:00 - 08:30
NAMRC Registration and Continental Breakfast

08:30 - 10:00
Concurrent Technical Sessions

10:00 - 10:30
Break

10:30 - 12:00
Concurrent Technical Sessions

12:00 - 13:30
S.M. Wu Symposium

13:30 - 15:00
Concurrent Technical Sessions

15:00 - 15:30
Break

15:30 - 16:15
Concurrent Technical Sessions

16:15 - 17:45
Concurrent Technical Sessions

Friday, May 24

07:00 - 08:00
Registration and Continental Breakfast

08:00 - 09:30
Plenary Session

09:30 - 09:40
Break

09:40 - 11:40
Concurrent Technical Sessions

11:40 - 13:00
Buffet Luncheon with NAMRC Attendees

13:00 - 15:00
Concurrent Technical Sessions

15:00 - 15:15
Break

15:15 - 17:45
Concurrent Technical Sessions
What Is NAMRC?

NAMRC is an international forum for the presentation and critical discussion of the results of basic and applied research in material forming, material removal and manufacturing systems and controls. It is one of only a few events of its kind where technical innovations, new methods, and applications of leading-edge technology from throughout the world are shared between manufacturing research, design, engineering and production professionals from academia and industry. Because NAMRC takes place every year, the findings and breakthroughs presented here are topical and of current interest.

What Is the Wu Symposium?

The Wu Symposium on Manufacturing Science is similar to NAMRC in program content and format. It was first held in 1994 to honor the late Professor S.M. (Sam) Wu who devoted more than 30 years of his professional life to the introduction and refinement of innovative approaches to the design, analysis, optimization and control of manufacturing processes and systems. A prolific writer and advisor to innumerable graduate students, Professor Wu continues to contribute to the world of manufacturing research through the legacy he passed on to all of those he touched.

Why Should You Attend These Events?

By attending these events you will:

- Gain insight on the most recent developments in material removal and forming processes, automation and control of processes and systems, equipment accuracy and precision, and many other manufacturing-related topics.
- Participate in a dialogue between industry and academia on future needs for manufacturing processes and applications.
- Learn what researchers are working toward for manufacturing in the 21st century.
- Enhance your knowledge of alternative manufacturing processes and applications.
- Make valuable contacts with other leading manufacturing researchers and professionals in academia and industry.

About NAMRI/SME

The North American Manufacturing Research Institution of the Society of Manufacturing Engineers (NAMRI/SME) is dedicated to manufacturing research and technology development. Its mission is to provide manufacturing professionals with a means to exchange ideas and share findings with leading researchers in the field of manufacturing.

NAMRI/SME is administered through the Society of Manufacturing Engineers, a professional society dedicated to serving its members and the international manufacturing community through the advancement of professionalism, knowledge and learning.

Publications

All the papers to be presented at NAMRC XXIV will be contained in either the hardbound Transactions of the North American Manufacturing Research Institution of SME-1996 or a soft bound proceedings. All registered NAMRC XXIV participants will receive one copy of each at the time of registration. Additional copies of either document may be purchased at registration for $70 and $30 respectively. After the conference, they may be purchased from the SME Publications Department (call 1-800-733-4763).

A hard-bound proceedings will also be available for the Wu Symposium. It will contain all the papers presented during the symposium, including keynote addresses. All Wu Symposium registrants will receive a copy of the proceedings.

Conference Site

The site for NAMRC XXIV and the Wu Symposium is the University of Michigan in downtown Ann Arbor, Michigan, located 40 miles west of Detroit along the banks of the Huron River. NAMRC will be held in the following University of Michigan buildings: the H. H. Dow Building, the G.G. Brown Laboratories, The Media Union, and the Chrysler Center in Ann Arbor, Michigan. The University of Michigan-College of Engineering is located on the North Campus in Ann Arbor. The Wu Symposium will take place at the Michigan League building at the University of Michigan.

Special Activities

On May 21 at 13:00, tours will be available to FOCUS:Hope, a center for advanced technologies with ultra modern machining facilities, and the Chrysler Jefferson North Assembly Plant. Transportation will be provided.
General Information

Travel
The University of Michigan is located north of Interstate Highway I-94 in Ann Arbor, Michigan. From Detroit Metropolitan Airport, take the I-94 entrance that leads West to Ann Arbor/Chicago. Airport shuttle service is available to the University of Michigan Union building and to major Ann Arbor Hotels (07:00 - 24:00 daily), $15 one way, $27 round-trip. For reservations, contact Commuter Transportation at 1-800-351-5466.

Accompanying Person's Program
A non-technical program will be provided on Wednesday, May 22, and Thursday, May 23, for visiting spouses, guests and others who do not wish to attend the technical sessions. The program will include visits to the Henry Ford Museum, Greenfield Village, the Matthaei Gardens, Gandhi Dancer (Ann Arbor historic train station), the Art Museum, the Historical Natural Museum and a walk on campus. There will also be time to shop and socialize. The program fee of $200 includes lunches, transportation and admission fees. (We reserve the right to cancel this program due to low participation.)
Lodging
Blocks of rooms have been reserved for event participants at area hotels. A schedule of rates and phone/fax numbers is listed below. Some rooms are available from May 18, 1996.

Please make your own reservations directly with the hotel of your choice by specified date to guarantee specified rate. Mention the "group name" to be included in the reduced rate room block.

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<thead>
<tr>
<th>Hotel</th>
<th>Single</th>
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<tr>
<td>Campus Inn</td>
<td>$67.00</td>
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<td>Phone: 1-800-666-8693</td>
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<td>Fax: 313-769-6222</td>
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<td>Attn: July Ranapach</td>
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<td>Sheraton Inn Ann Arbor</td>
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<td>Phone: 1-800-848-2770</td>
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<td>Fax: 313-996-8136</td>
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<tr>
<td>The University of Michigan League</td>
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<td>Phone: 313-764-3177</td>
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<td>Fax: 313-936-2505</td>
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<td>Red Roof Inn</td>
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<td>Phone: 1-800-874-9000</td>
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<td>Oxford House</td>
<td>$62.00</td>
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<tr>
<td>Phone: 313-763-3480</td>
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<td>Fax: 313-764-0091</td>
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<td>Group Name: U of M/NAMRC</td>
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<td>Reservations by April 21, 1996</td>
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Cambridge House
Phone: 313-764-5297
Fax: 313-764-1357
Group Name: NAMRC
Reservations by April 21, 1996
Attn: Guen Tandig

Hampton Inn (North)
Phone: 313-996-4444
Fax: 313-996-0196
Group Name: U of M/NAMRC
Reservations by May 1, 1996
Attn: Linda Williams

Holiday Inn North
Phone: 313-769-9800
Fax: 313-761-1290
Group Name: NAMRC
Reservations by May 7, 1996
Attn: Gail Gray

Note: Prices do not include tax.

Parking
All the hotels have parking available for their guests. Shuttle services are available from each hotel to the Conference location. The University parking structures on Fletcher Street (N-13 Lot), Thayer Street (N-04 lot) and North Campus Commons on North Campus (NC-27) are available for daily parking. If you choose to park in these structures you will need a parking permit. Please specify on your registration form the number of days you will need the permit for. A parking permit will be forwarded to you with your registration confirmation. In case of loss, you may purchase a replacement permit for $5.75 per day.

Climate
The average temperature during the month of May is 60°F/17°C.
On the Internet
Current information on the NAMRC XXIV and the Second S.M. Wu Symposium is available on the Internet through the World Wide Web at the following addresses:

http://www.engin.umich.edu/program/general/namrc.html
http://www.sme.org

To Register
To register, complete the registration form at the back of this brochure and send with check, money order (U.S. funds) or credit card number to the address below. You may fax the form if you are paying by credit card. The Registration Office may be contacted from now until the end of the conference and symposium with any questions, requests or information required.

Attn: Ms. Cindy Sakstrup
NAMRC XXIV / Second S.M. Wu Symposium
U-M Conference and Seminars
G121 SQ, 600 E. Madison
Ann Arbor, MI 48109-1372
Phone: 313-764-5305 or Fax: 313-764-1557

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Michigan Technological University
Northwestern University
University of California-Berkeley

NAMRC XXIV
Technical Sessions and Programs

Tuesday, May 21

13:00 - 17:00
Plant Tours in Detroit Area
(1) FOCUS: Hope
(2) Chrysler Jefferson North Assembly Plant

17:00 - 19:00
Registration and Reception
Media Union

19:00 - 21:00
Laboratory Tours
North Campus G.O. Brown, EECs

Wednesday, May 22

07:00 - 08:00
Registration and Continental Breakfast

08:00 - 08:45
Opening Ceremony
Chrysler Center
Opening Remarks:
Elijah Kanneh-Asebu, Jr.,
Conference Co-Chair
Yoram Koren, Conference Co-Chair
Welcoming Remarks:
James J. Darden, President
The University of Michigan
Introductory Remarks:
Alvin M. Subroff, NAMRSME President

08:45 - 09:30
Plenary Address
Chrysler Center
"Partnering for World Class Manufacturing: The Changing Role of the Educator"
Dennis Pawley, Executive V.P. Manufacturing
Chrysler Corporation

09:30 - 09:45
Break
Chrysler Center Lobby

09:45 - 10:30
Three Concurrent Keynote Sessions
H. H. Dow
Taylor Alan, Ohio State University
Room 1017
Joseph Kovach, Eaton Corp.
Room 1013
Yoram Koren, University of Michigan
Room 1005
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<tr>
<th>Time</th>
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<tr>
<td>10:30 - 12:00</td>
<td>Four Concurrent Technical Sessions</td>
<td>Room 1047</td>
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- **C1: Machining Special Materials**
  - Co-Chairs: R. Stevenson, General Motors Corporation
  - M. Miller, Michigan Technological University
  - Turning (Ti-6Al-4V) Alloy with Cryogenic Cooling:
    - Z. Y. Wang, K. P. Rajakar, and J. Fan, University of Nebraska
  - Influence of Reinforcements on the Machining of Fiber Reinforced Plastics:
    - R. Ramesh, University of Washington and C. W. Wern, Portland State University
  - Full-Density Processing of Advanced Particulate Composites:
    - W. Tong, University of Nebraska

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<tr>
<th>12:00 - 13:30</th>
<th>Founders Lecture Lunch on “Machine Tool Research”</th>
<th>EECS Azriam</th>
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<tr>
<td>13:30 - 15:00</td>
<td>Four Concurrent Technical Sessions</td>
<td>Room 1047</td>
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- **S1B: Production Systems**
  - Co-chairs: A. Herman, Ford Motor Company
  - J. Raja, University of North Carolina-Charlotte
  - Application of Tabu Search to the Group Technology Clustering Problem:
    - R. Prasad and V. N. Rajan, Wichita State University
  - Automatic Guided Vehicle Flowpath Design Using Genetic Algorithms:
    - P. Kannwar and C. Han, Florida Atlantic University
  - A Framework for Production Planning and Control in a Virtual OKP Company:
    - Y. Tu, City University of Hong Kong, Hong Kong

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| 13:30 - 15:00 | Four Concurrent Technical Sessions | Room 1047 |

- **S1A: Machining Systems Measurement**
  - Co-chairs: J. Sheridan, National Center for Manufacturing Sciences
  - P. M. Ferreira, University of Illinois at Urbana-Champaign
  - Contact Force Control for Continuous Scanning Coordinate Measuring Machines:
    - C. T. Gallagher and T. R. Kurfess, Georgia Institute of Technology

- **C2: Machining Processes**
  - Co-Chairs: P. Bandyopadhyay, General Motors Corporation
  - S. Y. Liang, Georgia Technological University
  - Flute Geometry Generation and Severity Ratio Analysis in Helical Groove Machining:
    - H.-C. Chyan and K. F. Ehmann, Northwestern University
  - The Use of High Speed Machining for the Manufacture of Hardened Steel Dies:
    - R. C. Dowes and D. A. Aspinwall, University of Birmingham
  - Some Advantages of Down Milling:
    - M. Pogacnik and J. Kopac, University of Ljubljana, Slovenia

15
Surface Classification and Model Construction Based on Processing Position Vectors and Unit Normal Vectors, H. Aoyama and I. Inasaki, Keio University, Japan

15:00 - 15:30 Break H. H. Dow Lobby

15:30 - 17:30 Five Concurrent Technical Sessions H. H. Dow

CS1: Machining Operations Room 1017

Co-Chairs: S. Wayne, Valomite Inc.
M. A. Elbestawi, McMaster University

A Quantitative Energy-Based Method for Predicting Stability Limit as a Direct Function of Spindle Speed for High-Speed Machining, W. J. Endres, University of Michigan

Chip-Groove Effects on Multiple Tool-wear Parameters in Machining, P. X. Li and J. S. Jawahir, University of Kentucky, X.D. Fung, Iowa State University, E. L. Exner, Ford Motor Co.

Testing of Turning Inserts in Relation to Efficient Chip Control, W. Grezisik and P. Bernat, Technical University, Poland

CS2: Non-conventional Machining Room 1013

Co-Chairs: S. Athawale, Ford Motor Company
D. A. Lucco, Oklahoma State University

The Influence of Abrasive Grain Size Distribution Parameters on the Abrasive Water Jet Machining Process, A. W. Mombert, WoMA Apparatebau GmbH, Germany, R. Kovacevic, University of Kentucky, D. Pfeffer and R. Schumann, Chemnitz University of Technology, Germany

A Study on Deep Hole Metal Boring with Abrasive-Waterjets, M. Hashish, Quest Integrated, Inc.


CS3: Numerical Simulations Room 1006

Co-Chairs: G. Lucas, Alcan Rolled Products Company
T. R. Chandrupatla, Rowan College of New Jersey

Numerical Simulation of Cladding Process in Bimetallic Rod Extrusion, M. Yoshino and T. Shinakoshi, Oklahoma State University
Application of the Linearized Perturbations Technique to Finite Element Results for the Prediction of Localized Necking in Sheet Metalforming Simulation, N. Boudeau and J. C. Gelin, Universite de Franche-Comte, France

Inhomogeneity of Deformation in Plane Strain Bulk Metal Forming Processes, D.-F. Chang, Weirton Steel, W. R. D. Wilson, Northwestern University

S3A: Environmental Manufacturing

Co-Chairs: J. M. Panetta, Ford Motor Company
G. Wiers, University of Florida-Gainesville

Disassembly Model for Recycling — Personal Computer, H. C. Zhang and T.-C. Kuo, Texas Technological University

Use of a Reprocessability Index System for the Environmental Scoring of Rotational Parts, C. J. Wentland, W. W. Olson and J. W. Sutherland, Michigan Technological University

Shearing of Automotive Grade Polypropylene and Acrylonitrile-Butadiene-Styrene to Facilitate Recycling, K. K. Philips, Ford Motor Company, W. W. Olson and J. W. Sutherland, Michigan Technological University

S3B: Measurement and Inspection

Co-Chairs: N. Well, National Center for Manufacturing Sciences
S. N. Melkote, Georgia Institute of Technology

Tolerance Synthesis in a Product Design System, U. Roy and B. Bhardwaj, Syracuse University

Automated Inspection of Coaxiality Requirements, C. Waters and U. Roy, Syracuse University

17:30 - 19:00 Reception at the Art Museum
19:00 - 20:00 NAMRI/SME Membership Meeting
20:00 - 21:00 ASME Production/Manufacturing Engineering Division Meeting

Thursday, May 23

08:30 - 10:00 Four Concurrent Technical Sessions

S4: Drilling

Co-Chairs: J. Agapitou, General Motors Corporation
E. Salisbury, Iowa State University

Influence of Workpiece Exit Angle on Burr Formation in Drilling Intersecting Holes, J. Smein, D. Dornfeld and I. Park, University of California-Berkeley

A Calibration Procedure for Fundamental Oblique-Cutting Model Coefficients Based on a Three-Dimensional Mechanistic Drilling Force Model, V. Chaudhuradharam, S. G. Kapoor and R. E. DeVor, University of Illinois at Urbana-Champaign


S4: Forging

Co-Chairs: L. G. Hector, Alcoa Laboratories
K. Weinmann, Michigan Technological University

Determination of Fatigue Properties of Die Steels for Hot Forging, V. Vinciguerra, M. Knorr, T. Akinis and R. Shivarpi, Ohio State University

Increasing Tool Life Quantity in Die Forging: Chances and Limits of Tribological Measures, E. Dooge, C. Romanowski and R. Seidel, University of Hannover, Germany

Multi-stage Cold Forging Process Design with A* Searching Algorithm, H.-S. Kim and Y.-T. Im, KAIST, Korea
Co-Chairs: T. S. Babkin, Motorola
M. Philpot, University of Illinois at Urbana-Champaign

Intelligent Scheduling and Control of Flexible Manufacturing Systems, F. F. Chen, D. Wu, Florida International University, and R. R. Henry, University of Louisiana

Computer Aided Process Planning System for Block Assembly Shop Using Case-Based Reasoning, K. K. Cho, K. R. Ryu, Pusan National University, H. R. Choi, Dong-A University, J. Oh, Pusan National University, S. T. Yun, Hyundai Heavy Industries Co., Ltd., Korea

An Approach to Dynamic Mesh Adjustment for Finite Element Analysis of Machines, L. Wang, Toyo Jaishi University of Technology, and T. Moriwaki, Kobe University, Japan

Co-Chairs: W. M. Faitel, Lamb Technicon
J. I. Mou, Arizona State University

CAM System for Multi-Axis Machining with Non-Rotating Tools, M. Kohya, Fukuoka Industrial Technology Center, M. Shimada, Toyota Central Research and Development Labs., Inc., H. Suzuki, Kyushu Institute of Technology, and M. Sato, Makino Milling Machine Co., Ltd., Japan

Design of the 5 Axis Machining Center, C. H. Kang, H. Tanaka and T. Ishida, Tong-il Heavy Inc. Co., Ltd., Korea

Block Removal Method for Rough Cutting with a Multi-Axis CNC Machine Tool, H. Korenawa, N. Yasuhara, A. Hayashi and H. Suzuki, Kyushu Institute of Technology, Japan

10:00 - 10:30 Break  H. H. Dow Lobby

Co-Chairs: M. D. Elwell, Caterpillar Inc.
R. Kovacevic, University of Kentucky

Effect of Wheel Wear in Grinding of Structural Ceramics, K. Li and T. W. Liao, Louisiana State University, G. P. Fang and J. E. Mayer, Jr., Texas A&M University

A Correlation Between Cutting Process and Dynamics of the Machine-Tool System in Grinding, C. David and G. Wassecke, Institute of Manufacturing & Production Eng., Germany


Co-Chairs: M. L. Devenport, Alcoa
J. Gao, Northwestern University Laboratories

Dimensional Control in Sheet Metal Forming via Active Binder Force Adjustment, A. Adamson, A. G. Ulsoy, University of Michigan, and M. Denner, Ford Motor Company

Modeling the Influence of Plastic Strain on Boundary Friction in Sheet Metal Forming, H-C. Shih, P. K. Saha and W. R. D. Wilson, Northwestern University


Co-Chairs: R. Furness, Ford Motor Company
G. M. Zhang, University of Maryland-College Park

Adaptive Feedforward Control for Periodic Disturbance Rejection with Application to Machining Processes, A. R. Keshani, University of Dayton, J. W. Sutherland, Michigan Technological University

An On-Line Estimation of the Transfer Function for the Cutting Process, S. Dolinek and J. Peklenik, University of Ljubljana, Slovenia

55B: Fixture Design  Room 1010


Optimal Fixture Configuration Design for Sheet Metal Assembly with Springback. W. J. Cai and S. J. Hu, University of Michigan

Application of Simultaneous Engineering Concept to the Development of a Co-Operative Fixture Design System. U. Roy and J. Liu, Syracuse University

An Object Oriented Concept for Generic Robotic Gripper Design and Application. Z. Katt and J. Huang, Rand Afrikaans University, South Africa

12:00 - 13:30 NAMRI/SME Award Luncheon  Media Union

13:30 - 15:00 Four Concurrent Technical Sessions  H. H. Dow

56A: Surface Texture  Room 1017

Co-Chairs: C. H. Shen, General Motors Corporation. R. Williams, University of Nebraska-Lincoln

A 3-D Surface Texture Model for Peripheral Milling with Cutter Runout Using Neural Network Modules and Splines. G. A. Stark and A. R. Thangaraj, Michigan Technological University

Characterization of the Surface Texture Formed During the Machining of Ceramics. G. M. Zhang, S. J. Ng, D. T. Le and L. S. Job, University of Maryland-College Park

Machining of Parametric Surfaces Using De Casteljau-type Subdivision. M. A. E. Gadalla, University of Western Ontario, Canada, and W. H. ElMaraghy, University of Windsor, Canada
Integration of Automated Process Planning System with CAM Software, D. N. Sormaz, Ohio State University, B. Khoshnevis and J.-H. Han, University of Southern California

Convection Pattern and Weld Pool Shape During Conduction-Mode Dual Beam Laser Welding, T.-C. Chen and E. Kannwischer, Jr., University of Michigan

An Experimental Study of Laser Cutting of a Thick Steel Plate Using a Line Beam, G. Venkitachalam and P. A. Molian, Iowa State University

Technology Oriented Off-line Programming for 3D Laser Material Processing, F. Backes, M. Geiger and V. Franke, University of Erlangen-Nuremberg, Germany

18:30 - 22:00 Conference Banquet

Summit Restaurant, Renaissance Center, Detroit
**Second S.M. Wu Symposium on Manufacturing Science—USA Venue**
*May 24, 1996*

**Organizing Committee**

<table>
<thead>
<tr>
<th>Co-Chair</th>
<th>University of Michigan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jun Nio</td>
<td>University of Michigan</td>
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<tr>
<td>S. Jack Hu</td>
<td>University of Michigan</td>
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**Committee Members**

<table>
<thead>
<tr>
<th>R. E. DeVor</th>
<th>University of Illinois at Urbana-Champaign</th>
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<tbody>
<tr>
<td>S. G. Kapoor</td>
<td>University of Illinois at Urbana-Champaign</td>
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<tr>
<td>K. F. Ehrmann</td>
<td>Northwestern University</td>
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<tr>
<td>Jan Shi</td>
<td>University of Michigan</td>
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<tr>
<td>Elias Kannatey-Asiibu, Jr.</td>
<td>University of Michigan</td>
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<tr>
<td>Yoram Koren</td>
<td>University of Michigan</td>
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<td>A. Galip Ubov</td>
<td>University of Michigan</td>
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<tr>
<td>Herisa G. Kamil</td>
<td>University of Michigan</td>
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<tr>
<td>Susan M. Clair</td>
<td>University of Michigan</td>
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<td>Elaine Wu Stephenson</td>
<td>University of Michigan</td>
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**Program Committee**

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<thead>
<tr>
<th>D. A. Dornfeld</th>
<th>University of California—Berkeley</th>
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<tbody>
<tr>
<td>K. P. Raju</td>
<td>University of Nebraska—Lincoln</td>
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<tr>
<td>Y. Shin</td>
<td>Purdue University</td>
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<tr>
<td>J. W. Sutherland</td>
<td>Michigan Technological University</td>
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<tr>
<td>K. A. Stelson</td>
<td>University of Minnesota</td>
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<tr>
<td>Y. Chen</td>
<td>University of Michigan—Dearborn</td>
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<tr>
<td>Y. L. Yao</td>
<td>Columbia University</td>
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<tr>
<td>B. S. Y. Tsai</td>
<td>Industrial Technology Research Institute</td>
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<tr>
<td>R. X. Du</td>
<td>University of Windsor, Canada</td>
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<td>S. Fujii</td>
<td>Kobe University, Japan</td>
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<tr>
<td>J. Hsu</td>
<td>Ford Motor Company</td>
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<tr>
<td>R. J. Furness</td>
<td>General Motors Corporation</td>
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<tr>
<td>E. DeMeter</td>
<td>Pennsylvania State University</td>
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<tr>
<td>H. P. B. Wang</td>
<td>Florida A&amp;M and Florida State University</td>
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**Friday, May 24, 1996**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>07:00 - 08:00</td>
<td>Registration and Continental Breakfast</td>
</tr>
<tr>
<td>08:00 - 09:30</td>
<td>Plenary Session</td>
</tr>
<tr>
<td>09:30 - 09:40</td>
<td>Break</td>
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<tr>
<td>09:40 - 13:40</td>
<td>Three Concurrent Technical Sessions</td>
</tr>
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</table>

**WA3: Manufacturing Process Planning & Simulation**

<table>
<thead>
<tr>
<th>Co-chairs</th>
<th>Ford Motor Company</th>
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<tbody>
<tr>
<td></td>
<td>D. VandenBosche, Chrysler Corporation</td>
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<tr>
<td>A Study on a Distributed Simulation for the Evaluation of Large Manufacturing System</td>
<td>S. Fuji, Y. Kidani and A. Ogna, Kobe University, Japan</td>
</tr>
<tr>
<td>A Study of a Dual Reasoning CAPP System with Explanation Ability</td>
<td>D. Liu and K. Stelton and S. Benjaafar, University of Minnesota</td>
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<tr>
<td>Sensitivity Analysis in Manufactured Part Modeling for Automotive Space-Frames</td>
<td>Y. Wang and S. Gupta, University of Maryland</td>
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<tr>
<td>Session</td>
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<tr>
<td>WB1</td>
<td>Machining Processes</td>
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<tr>
<td></td>
<td>Effects of a Honed Cutting Edge in Machining</td>
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<td></td>
<td>Burr Sensing Using a Capacitance Sensor</td>
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<td>Application of a Magnetostriction Based Cutting Tool Micropositioner for Non-Circular Turning</td>
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<td>Chip Load in Milling with Radial Cutter Runout</td>
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<tr>
<td>W31</td>
<td>Control of Machining Systems</td>
</tr>
<tr>
<td></td>
<td>Real-Time Compensation System for Cutting-Force Induced Errors</td>
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<td></td>
<td>Modeling of Machine Tool Axes for Openness</td>
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<td>CoLocated Sensor Design for Magnetic Bearing Control</td>
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<td>A 2-D Planar Motor Based Machine Tool Motion System as Applied to Improving Surface Quality in End Milling</td>
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<td>11:40 - 13:00</td>
<td>Lunch</td>
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<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Co-Chairs</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA2</td>
<td>Assembly, Disassembly and Tolerance Analysis</td>
<td>R. Ustün, Chrysler Corporation, M. Iannucci, VSA, Inc.</td>
<td>Hungary</td>
</tr>
<tr>
<td></td>
<td>Relating Process and Product Tolerance for Three-Dimensional Tube Bending</td>
<td>K. Stelson and H. Lou, University of Minnesota</td>
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<td></td>
<td>Tolerance Design Methodology</td>
<td>T. Chang, University of Wisconsin-Milwaukee</td>
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<td></td>
<td>Optimization of Process Distribution Adjustment Based on Measurement Data</td>
<td>D. Khorad, J. Shi and J. Ni, University of Michigan</td>
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<td></td>
<td>Diagnostics in Disassembly Unscreeing Operations</td>
<td>D. Apley, University of Michigan, G. Seliger, L. Vorn, Technical University of Berlin, Germany, and J. Shi, University of Michigan</td>
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<tr>
<td>WA2</td>
<td>Drills and Drilling Processes</td>
<td>W. De Vries, Rensselaer Polytechnic Institute, D. Stephenson, General Motors Corporation</td>
<td>Michigan</td>
</tr>
<tr>
<td></td>
<td>An Experimental Study of Exit Burrs and Hole Quality for Twist Drilling</td>
<td>R. Furness and W. Lander, Ford Motor Company</td>
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<td></td>
<td>An Experimental Investigation of Chip Morphology in Drilling</td>
<td>S. Baxter, W. Olson and J. Sutherland, Michigan Technological University</td>
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<td></td>
<td>A Mechanistic Model to Predict the Cutting-Force System for Arbitrary Drill Point Geometry</td>
<td>V. Chandrasekharan, S. Kapoor and R. DeVor, University of Illinois at Urbana-Champaign</td>
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<tr>
<td></td>
<td>On the Cutting-in Forces of Improperly Mounted Twist Drill</td>
<td>T. Zhijie, University of Palermo, Italy</td>
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</tbody>
</table>
**WC2: Machine Tool Dynamics & Dynamic System Modeling**

Co-Chairs: F. Tidaback, Boeing Commercial Airplane-Wichita
G. Ronitto, Sigmaw Machine Systems

An Experimental Investigation into the Effect of Joint Conditions on Structural Damping with Application to Machine Tools, T. Cao, Y. Zheng and J. Sutherland, Michigan Technological University

Development of a New Identification and Control Strategy of Dynamic Stability in Turning, C. Nicolaescu, The Royal Institute of Technology

Active Vibration Control of Machine Tools, Z. Geng, Robotronics, Inc.

Time Series Modeling in CT Detector Assembly, T. Chou, Chang Gung College and T. Chang, University of Wisconsin-Milwaukee

**15:00 - 15:15 Break**

**Concourse**

**15:15 - 17:15 Three Concurrent Technical Sessions**

**WA3: Fixture Design & Analysis**

Co-Chairs: E. DeMener, Pennsylvania State University
W. Faitel, Lamb Technicon

Effect of Clamping Sequence on the Surface Flatness During Fixturing of Flexible Workpieces, P. Chandra, S. Athavale, R. Devce and S. Kapoor, University of Illinois at Urbana-Champaign

Quick Estimation of Reaction Forces for Prediction of Machining Fixture Quality, M. Reama and S. Melkote, Georgia Institute of Technology

Visibility Analysis and Synthesis for Assembly Fixture Certification Using Theodolite Systems, H. Chen and S. J. Hu, University of Michigan

Fixture Failure Diagnosis for Sheet Metal Assembly with Consideration of Measurement Noise, D. Cegiareck, University of Michigan

**WC3: Non-traditional Manufacturing**

Co-Chairs: D. Holt, Perceptron Inc.
C. Koh, Nanyang Technical University-Singapore

Modeling of Workpiece Temperature with Plasma Heating for Thermally Enhanced Machining Processes, C. Lesnick, Y. Shin, and E. Incropera, Purdue University

Improvement of Chip Breaking in Machining Low Carbon Steel by Cryogenically Precooling the Workpiece, Y. Ding and S. Hong, Wright State University

Analysis and Design of Thermally Excited Leadless Solder Joints Using Finite Element Method, B. Prasad, Utah State University, and S. Bose, University of Texas-Pan American

A Comparative Analysis of 2D and 3D Bearing Area Curves, A. Cellary and M. Wieczorek, Politechnika Poznanska, Poland, and K. Ehmann, Northwestern University

**WC4: Surfacing & Form Error Evaluation in Machining**

Co-Chairs: J. Mou, Arizona State University
J. Bosch, Giddings & Lewis

Rapid Cylindrical Surface Measurement Using Laser Optics, R. Du, Y. Pan, W. North and G. Qin, University of Windsor

Evaluation of Circularity Error Using Optimization, S. Cheraghi and M. Wang, Wichita State University

Probabilistic Regression Models to Predict Surface Finish Parameters in Fine Turning of Steel, A. Shuaib, S. Selim and M. Ahmad, King Fahd University of Petroleum and Minerals

Cutting Error Calculation in NC Machining of Non-Expandable Ruled-Surface, D. Zheng, B. Ren, J. Jiao and Y. Liu, Harbin Institute of Technology
# Registration Form:

**NAMRC XXIV, MAY 21-23, 1996**
2nd S.M. WU SYMPOSIUM, MAY 24, 1996

**Please Print or Type:**
(Dr., Mr., Ms.)

First Name ___________________________ Last Name ___________________________

Organization ___________________________

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City ____________________________ State/Province ____________________________

Zip/Postal Code ___________________________ Country ____________________________

Phone ( ) ___________________________ FAX ( ) ___________________________

E-mail ___________________________

**Special Meal Requirements**

<table>
<thead>
<tr>
<th>Early (Before 5/10)</th>
<th>Regular (After 5/10)</th>
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<tbody>
<tr>
<td>I. NAMRC + S.M. WU</td>
<td>$415</td>
</tr>
<tr>
<td>May 21-24, 1996 (401923)</td>
<td></td>
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<tr>
<td>II. NAMRC XXIV</td>
<td>$300</td>
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<tr>
<td>MAY 21-23, 1996 (401922)</td>
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<tr>
<td>Student or retiree registration</td>
<td>$100</td>
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<tr>
<td>One day registration</td>
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<td>(Which Day)</td>
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**ADDITIONAL ACTIVITIES**

- Must register in advance:
  - Plant tours in Detroit (check one) $50
    - FOCUS:Hope
    - Chrysler Jefferson North Assembly Plant
  - Accompanying Person Program $200
    - Person's Name
  - Accompanying Person Program (1 Day) $100
    - Person's Name
    - Greenfield Village and Henry Ford Museum - May 22
    - A day around Ann Arbor - May 23
  - Additional NAMRC Transactions copy $30
  - Additional NAMRC Proceedings copy $30

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- Yes
- No

**Number of Days**

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Attn: Cindy Sakstrup
NAMRC XXIV/2nd S.M. Wu Symposium
G121 SQ, 600 E Madison
Ann Arbor, MI 48109-1372 (USA)

**Guest Lunch for NAMRC (P.S. indicate day(s)):**
- $40/Day
- □ Wednesday, May 22
- □ Thursday, May 23

**Guest Banquet for NAMRC**
- □ Thursday, May 23
- $80

Code: ____________