

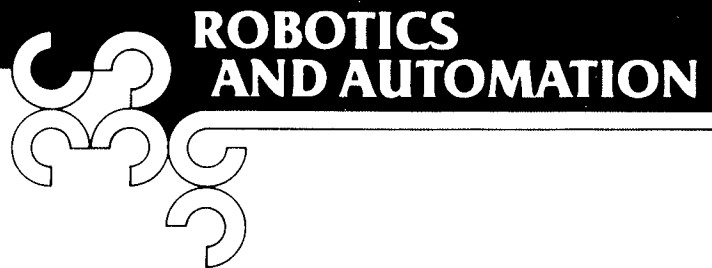
# ROBOTICS AND AUTOMATION

Volume 4, Number 1, February 1989

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# From the President

Arthur C. Sanderson  
*Rensselaer Polytechnic Institute*

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As of January 1, 1989, the **Robotics and Automation Council** has officially become the **IEEE Robotics and Automation Society**. Let me be the first to welcome you to our new Society. I believe this designation is an important recognition of the maturity and importance of our field. The Society is new and growing, and we look forward to your participation in the technical and professional activities.

In the next few months, we will elect the Administrative Committee which serves as the governing board of the new Society. The nominating committee chaired by Dr. Antal Bejczy has forwarded to me the slate of candidates based on the response to our call for nominations in the Fall edition of the newsletter. You will receive a ballot for election of the full 18 members of the Society Ad Com. The results of the election will be announced prior to the 1989 International Conference in Scottsdale. The first meeting of the new Ad Com will be held in conjunction with the Scottsdale Conference. The Ad Com is the governing board of the Society, and representation from the various interdisciplinary groups who participate in the Society is important. I urge you to take a few moments to consider your ballot and vote in the Ad Com election.

As a new Society, there are many additional ways for you to become involved with activities. A number of Technical Committees have already been formed to bring together members who share common technical interests and needs. Working with these Technical Committees, or proposing the formation of additional committees in your area, will provide an important means of participation. The Technical Committees may serve as the forum for the proposal of small workshops or symposia on specific technical topics.

As a new Society, we will also have the opportunity to establish local and regional Chapters. These Chapters will coordinate meetings among local groups of members in the Society. They provide an important means for members to get together on a regional basis, exchange ideas, and organize their own technical and social activities. A Vice President for Membership will be elected by the Ad Com in their Spring meeting, and he will coordinate the formation of local Chapters.

I also want to take this opportunity to express my personal thanks to Dr. George Bekey, who has decided to step down as Editor of the *IEEE Journal of Robotics and Automation*. As Founding Editor of the Journal, George has done an outstanding job of developing an archival journal which is now recognized internationally as a forum for the publication of high quality research results. As Associate Editor of the Journal, I have worked closely with George, and we are indebted to him for his commitment and dedication.

I am very pleased that Dr. Russell Taylor has agreed to take over as Editor of the new *IEEE Transactions on Robotics and Automation*. Russ is widely known for his research contributions in Robotics, and he brings an important breadth of experience in both theory and applications. Also, Dr. Richard Volz will assume my position as Associate Editor. Both Russ and Dick have been actively involved in the *Journal* editorial board for several years, and they bring both experience and some new perspectives to the *Transactions*.

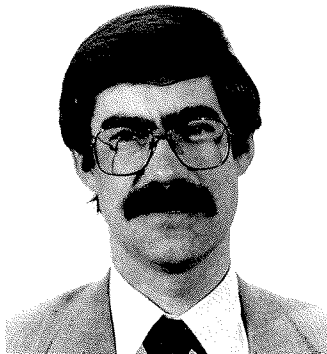
I look forward to your participation in the Society, and encourage you to send me your ideas and suggestions on how we might serve your needs as a member.

## Society News

### Taylor to Edit *Transactions*

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The *Journal of Robotics and Automation* has a new name and a new editor. As of January 1, 1989, the name of the *Journal* has been changed to *Transactions of the IEEE Robotics and Automation Society*.



Dr. Russell H. Taylor of the IBM Research Division in Yorktown Heights, N.Y. has been appointed the editor of the *Transactions*.

Dr. Taylor succeeds Prof. George Bekey of the University of Southern California, who edited the *Journal* since its establishment in 1985.

The growing interest in the field of robotics and automation has been reflected in the history of the *Journal* under Dr. Bekey's leadership.

According to Nela Rybowicz of the publications staff, the *Journal* has grown from a quarterly publication, with 236 pages in 1985 to a bi-monthly, with 784 pages budgeted for 1989. The circulation of the February 1989 issue is over 8500, including libraries and industrial subscribers as well as individuals.

Dr. Taylor received a B.E.S. degree from Johns Hopkins University in 1970 and a Ph.D. in Computer Science from Stanford in 1976.

In 1976, he joined the Automation Research Project at IBM T. J. Watson Research Center, where he worked on robot systems and languages. He spent 1978 and 1979 doing system architecture work with IBM Advanced Manufacturing Systems in Boca Raton, and rejoined IBM Research in 1980, where he continued to pursue research in robotics. After a six month sabbatical leave at the MIT Artificial Intelligence Laboratory in 1982, he was manager of the Robot Systems and Technology Department and, subsequently, of the Automation Technology Department until September 1988. He is now forming a new research group on Medical Robotics and Augmentation Systems. His research interests include robot systems, programming languages, model-

based planning, and (most recently) the use of model-based robotic systems to augment human performance in surgical procedures.

Dr. Taylor is a senior member of the IEEE and a member of Tau Beta Pi, Phi Beta Kappa, and Sigma Xi. In addition to editing the *Transactions* he serves on the Editorial Board of the *International Journal of Research*. He has served on many panels and program committees and is a member of the Advisory Committee to the NSF Division of Information, Robotics, and Intelligent Systems. He has received several IBM awards for his work on the AML language.

Submissions to the *Transactions* should be sent to Dr. Taylor at IBM Research Division, T.J. Watson Research Center, Yorktown Heights, N.Y. 10598. His e-mail address is RHT@ibm.com.

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#### *1989 IEEE Robotics & Automation Conference*

### **"Unstructured Environments and Artificial Intelligence"**

At their meeting in January, members of the program committee finalized plans for the 1989 Conference, to be held in Scottsdale, Arizona May 15-18.

According to Program Chairman Prof. John Hollerbach of MIT, 284 papers will be presented at this year's conference, approximately the same number as were presented at the Philadelphia conference. However, since the number of submissions was considerable greater, a total of 680 submissions, the program committee was required to be more selective about acceptance. This year's acceptance rate of 42% was the "toughest yet", Hollerbach said, but was necessary to keep the conference at a manageable size as the number of submissions continues to increase. Hollerbach notes that papers were submitted from countries on every continent. While accepted papers were not restricted to the announced theme of the conference, program chairman, Hollerbach says that many of the accepted papers are related to teleoperation and other aspects of this theme.

There is also a major emphasis on control theory papers in which theoretical results are verified by experiments. Because of the sharp increase in reports of experimental results, VHS videotape players will be available in every session and there will be a separate Video Theatre with regularly scheduled presentations.

The conference will begin Monday afternoon and run through Thursday afternoon. There will be six paral-

lel tracts with a total of 72 separate sessions of four 25-minute presentations. Session chairmen will be encouraged to keep a tight schedule to allow participants to "session-hop" in order to hear as many presentations of particular interest as possible.

To help everyone keep their perspective, Dr. Steve Jacobsen of the University of Utah will speak on "The Next Generation of Disney Robots" at the Tuesday evening banquet.

Wednesday afternoon will be free so that participants can take advantage of field trips and excursions which will be available.

### Tutorials & Workshops

On Sunday and Monday morning preceding the conference four tutorials and two workshops will be held. On Friday two simultaneous all-day workshops are scheduled. The tutorials are: 'Artificial Intelligence: Techniques and Applications', James L. Crowley, Mark S. Fox, and Arthur C. Sanderson, organizers and speakers; "Theory and Application of Redundant Robots, Shaheen Ahmad and Yoshi Nakamura, organizers; 'Autonomous Mobile Robots', David Miller, organizer, and Fundamentals of Robot Vision Systems, Mohan Trivedi, organizer.

The pre-conference workshops are: (1B) "Multisensor Integration and Fusion", Ren C. Luo and Julius T. Tou, organizers; and (2C) "Task Strategy Generation and Skill Acquisition for Advanced Manipulation", Haruhiko Asada and Matthew T. Mason, organizers.

The Friday workshops are (3A) "Parallel Algorithms and Architectures in Robots", J. Barthen, A.K. Bejczy, and A. Fijany, organizers; and (3B) "Integration of A.I. and Robotic Systems", Rajkumar S. Doshi, organizer.

Registration information is in the conference announcement published in the newsletter.

### Plenary Session

#### **Mobile Robot Research in Europe**

The Plenary session of the Robotics and Automation Conference in Scottsdale will feature a panel discussion surveying European research in mobile robots. Dr. Norman Caplan of the National Science Foundation is scheduled to moderate the discussion. Other scheduled participants are Prof. Lester Gerhardt of Rensselaer Polytech-

nic Institute, Prof. George Bekey of the University of Southern California, Dr. William Hamil of Oak Ridge National Laboratory, and Dr. Robert McGhee of the Naval Postgraduate School.

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## **Scottsdale Previews!**

*Prof. George Bekey, Univ. of Southern Calif  
1989 Robotics and Automation Conference Chairman*  
The Conference Committee is arranging a full schedule of social activities and social and professional tours in Scottsdale and the Phoenix area.

The current (and still subject to change) plans include the following:

### **SOCIAL PROGRAM:**

**Monday evening:** No host cocktails - opening reception  
**Tuesday evening:** Dinner and entertainment at Pinnacle Peak restaurant, outside of Phoenix, with panoramic view. Approximate cost, including bus transportation, \$25

**Wednesday afternoon:** half day tour of Phoenix, including visit to Heard museum, one of the foremost museums of Indian art and culture in the West

**Wednesday evening:** Conference banquet

**Thursday evening:** open

**Friday:** All day tour of Phoenix and environs

**Saturday:** Post-conference tours, all day:

(1) Grand Canyon, cost about \$60

(2) Sedona and Oak Creek Canyon, cost about \$40

Additional local tours may be available during the week.

### **PROFESSIONAL TOURS:**

Wednesday afternoon there will be tours to Garrett Corp, to McDonnell-Douglas Helicopter Company and to Arizona State University. ASU has a manufacturing and advanced technology center with a number of robots.

### **OTHER DETAILS:**

The company which arranges the tours for us will also provide a desk at the airport and discount limo or bus service to the hotel, for about \$8.00 per person.

There will be a shuttle bus running between the conference hotel and the "overflow" hotels for the conference attendees.

The Chamber of Commerce is assisting us with registration.

A special area will be set up outdoors at the Registry Hotel during breakfast for the authors to meet each other and the session chairs. Dress will be informal; temperatures are expected to be warm (in the 80's).

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**IEEE R&A Society**  
**Policy Statement on Meeting Endorsements**

*Roger Brockett, Harvard University*  
*Meetings Coordinator*

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From time to time the IEEE Robotics and Automation Society receives requests to co-sponsor meetings from organizations which are in the planning process. What does the society receive for the use of its name? For the most part this is limited to a little publicity and some goodwill. Clearly there will be situations for which it would be inappropriate for the society to lend its name. The purpose of this note is to advertise the existing procedures.

In order to receive consideration we require that the conference be nonprofit, nonexclusive, "professional" and, most importantly, relevant. In many cases consulting the entire Ad Com about a question of co-sponsorship is unworkable. On the other hand, it seems reasonable that there should be some members of the Ad Com with enough interest to vouch for the suitability of the event. The burden is on the organizers to sell themselves to that extent. In addition, to be considered for co-sponsorship a meeting should meet the following criteria.

1. The conference must be nonprofit, open to all IEEE members, both to attend and to have their papers considered for presentation, and it must deal with robotics and/or automation.
2. The organizers must obtain a letter of endorsement from at least two members of the Ad Com and forward it along with a description of the technical thrust of the conference, the conference dates, location, etc., to the Robotics and Automation meetings coordinator.

Matters being so, the president of the society and the meetings coordinator, working together, will be empowered to approve, or disapprove, IEEE Robotics and Automation Society co-sponsorship in those cases where no financial obligation is involved. If they desire, they can withhold approval pending discussion at the next Ad

Com Meeting.

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**Ad Com Election Procedure**

*Prof. A.K. Bejczy*  
*JPL, Calif. Inst. of Technology*

The Robotics and Automation Society (RAS), as specified in the Constitution, will be managed by an Administrative Committee (Ad Com) of eighteen (18) members of the society plus members "ex-officio with vote" as specified in the Bylaws. The terms of the of the eighteen elected members of the Ad Com is for three years, with six new members elected each year. The current election is for the year June 1, 1989 through May 31, 1990. Thus, for the year starting on June 1, 1990 six new members will be elected later to replace six members elected in 1989. No Ad Com members can serve for more than two consecutive three-year terms.

The Ad Com will elect from its membership a President and Vice-Presidents as defined by the Bylaws. The President, under the direction of the Ad Com, will have general supervision of the affairs of the Society. The Ad Com may establish Standing and Technical Committees needed to cover specific functions and areas of the field of interest. As stated in the Bylaws, the Ad Com shall hold an annual meeting before May 31 each year, starting this year.

The subscribers to the *Journal of Robotics and Automation* are charter members of the new society. They will soon receive a ballot for Ad Com member election. There will be thirty-two (32) candidates on the ballot for the election of eighteen (18) Ad Com members. Please observe that there will be short turn-around time for the ballot in order to constitute the first Ad Com before the next International Conference on Robotics and Automation in Scottsdale, Arizona on May 14-19, 1989.

The names and affiliations of the 32 Ad Com candidates who will be on the ballot are listed here. The ballot will contain their short biographies and photos.

## Ad Com Candidates

John Baillieul., Boston Univ.  
 Antal K. Bejczy, JPL, Cal. Tech  
 George A. Bekey, Univ. So. Cal.  
 Wayne J. Book, Georgia Tech.  
 Norman Caplan, NSF  
 Alan Desrochers, RPI  
 Rui J.P. deFigueiredo, Rice Univ.  
 Toshio Fukuda, Science Univ., Tokyo  
 Lester A. Gerhardt, RPI  
 Stanley B. Gershwin, MIT  
 Leonard S. Haynes, Intelligent Automation, Inc.  
 Gerhard Hirzinger, DFVLR, West Germany  
 Yu-Chi Ho, Harvard Univ.  
 John M. Hollerbach, MIT  
 John F. Jarvis, AT&T Bell Labs  
 Takeo Kanade, CMU

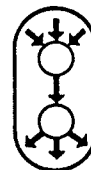
Pradeep K. Khosla, CMU  
 Richard Klafter, Temple Univ.  
 A.J. Koivo, Purdue Univ.  
 C. S. George Lee, Purdue Univ.  
 James C. Lin, Univ. of Ill., Chicago  
 J.Y.S. Luh, Clemson Univ.  
 Charles P. Neuman, CMU  
 Richard P. Paul, Univ. of Penn.  
 G.V.S. Raju, Ohio Univ.  
 George N. Saridis, RPI  
 Wesley E. Snyder, N.C. State Univ.  
 Harry E. Stephanou, G. Mason Univ.  
 Tzyh-Jong Tarn, Washington Univ.  
 Russell H. Taylor, IBM, TJ Watson Research Center  
 Walter J. Trybula, G.E. Electronics & Automation  
 Charles R. Weisbin, ORNL

## History Repeats Itself . . . Again



INNS

**1989 IEEE/INNS International Joint  
 Conference  
 on Neural Networks  
 June 19-22  
 Sheraton Washington Hotel**



Once again, theory is becoming reality in the field of neurocomputing, and IJCNN89 is at the forefront of this revolution in information processing. Hear and meet the leading experts in the neurocomputing field during the industry's largest conference. IJCNN89 covers the full spectrum of neurocomputing, from the theoretical to the practical, with something for everyone.

- **Plenary Sessions:** Scheduled speakers are Shun-ichi Amari, Patricia Churchland and Terrence Sejnowski.
- **Technical Sessions:** 16 sessions reporting the latest advances in neural network theory, hardware, and applications, chaired by leading neural network experts.
- **Tutorials:** Preceding the conference, 14 subjects will be presented by leading experts. Tutorial attendance is limited.

- **Exhibits:** See how theory is rapidly being transformed into reality as the latest innovations in neurocomputers, neurosoftware, and applications are demonstrated at the industry's largest trade show.
- **Poster Sessions:** Authors presenting their papers in an informal setting.

IJCNN89 is an international gathering devoted to the science and technology of neurocomputing in industry, academia and government and is jointly sponsored by the Neural Networks Committee of the IEEE and by the International Neural Networks Society.

For complete registration information and a detailed brochure, call (619) 453-6222 or write to Nomi Feldman, Conference Coordinator, 3770 Tansy Street, San Diego, CA 92121

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## News from Research Institutes

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### University of Darmstadt

*We would like to correct two errors in our description of the robotics research programs at the University of Darmstadt, West Germany. Robotics research at the University of Darmstadt is conducted by two separate groups, only one of which was described in the Fall '88 Newsletter.*

*Work at the Institute of Automatic Control, Laboratory for Control Systems Theory, was described in the earlier report. However, the director of that group is Prof. H. Tolle, not Prof. Rolf Isermann.*

*Prof. Isermann is director of the Laboratory for Control Engineering and Process Automation. He submitted the following description of his group's work.*

Current research activities of the Laboratory concerning industrial robots comprise

- adaptive control of robots
- computer-aided design of robot control [systems]
- failure diagnosis on robots.

The positional accuracy and the speed of robots is limited mainly by the elasticity of the mechanical system, nonlinear effects like friction, and backlash in the gears, and by coupling forces. To improve the dynamical behavior of a robot, these effects have to be compensated by the controller. One goal of our work is to create a program package for the computer-aided design of advanced controllers, individually tailored for any given robot.

Early detection of damage in motors, gears, bearings or sensors is another point of our work. Currently we are developing methods to detect failures of the systems by analyzing the differences between the behavior of the real system and a mathematical model.

A common base of our projects is the creation of tools for the derivation of exact mathematical models of individual robots by means of parameter estimation methods."

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### Technical University of Braunschweig

**Institute of Robotics and Computer Control**  
Hamburger Strasse 267, D-3300 Braunschweig, FRG  
Director: Dr. Friedrich M. Wahl

Since its establishment in 1986, the institute has offered courses in robotics, computer vision, and AI to students in computer science and electrical and mechanical engineering.

Current research activities are concentrated in the following areas:

Kinematic and dynamic simulation of robot work cells. A powerful modular universal robot simulator URSI, together with an interactive modeller for polyhedra INTERPOL and a robot modeling system, allows interactive modeling, programming and simulation of robot work cells on PC-based high-end workstations.

Development of a new C-based robot control language ZERO, offering facilities especially for sensor-driven applications in different operating system environments for a multitude of commercially available arms.

Collision avoidance techniques based on new geometrical representations of robots and environments, integrating sensor information.

Development of dedicated formula manipulation systems, e.g., for automatic generation of the inverse kinematics and dynamics equations of arbitrary robot structures.

High-speed and low-cost range data acquisition techniques for industrial work pieces by time-space-encoding methods ('depth eye for robots'). Acquisition of 3-D coordinates of flexible line-like objects by tri-illumination approach and development of fast correspondence algorithms.

Development of analysis techniques for grey level images and range data for model-based object recognition and scene interpretation as well as pose estimation for robot applications.

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### Technical University of Berlin

**Institute for Technical Computer Science,  
Real-Time Systems and Robotics Group** Computer  
Science Department, FR 2-2, Franklinstr. 28/29, D-1000  
Berlin 10  
Electronic Mail: hommell at db0tui11.bitnet  
Director: Gunter Hommel

The Real-Time Systems and Robotics Group at the Technical University of Berlin is involved in both teaching and research. Its teaching program contains an introductory lecture on system programming for undergraduate students and two courses on real-time systems and robotics for graduate



students of computer science and engineering. Areas of research are:

- Automatic generation of programs for manufacturing cells: Given a CAD description of an object to be manufactured and given a set of machines providing basic manufacturing functions, the system to be developed will generate programs to control these machines. The focus of this research is to provide software for cooperating machines, especially for cooperating robots, and to take care of fault-tolerant system operation.

- New techniques in acoustical holography: Based on broadband ultrasonic transducers a sensory system providing spatial resolution in the order of millimeters in both axial and lateral directions has been developed and experimentally tested. Sophisticated signal processing methods have been used to gain high resolution. Possible applications range from stand-alone sensors for object localization to its use in multi-sensor systems.

- A research project was set up between the University of Southern California, the University of Belgrade, and our institute in order to integrate the so-called Belgrade-USC-hand and our ultrasonic sensor as well as additional sensory equipment into a high-level programming environment. The goal here is to make the complex programming of multi-fingered hands as easy a task as possible.

- Reverse solution of the kinematic equation: An expert system that provides closed solutions for most of the mechanisms relevant in the industry has been developed. The current focus is on two problems: First to deepen the theoretical understanding in order to solve an even wider class of kinematic structures. Secondly, to derive optimal solutions with respect to the degree of the determining equations, the complexity and the numerical stability of the solutions.

- Geometric algorithms for collision avoidance: Geometric algorithms are a necessary part of task level programming systems. Algorithms for collision detections, path planning and path optimization are developed; in this connection, the general case of several kinematic structures in a common workspace is considered. The developed algorithms are predominantly based on methods from computer algebra and computational geometry.

- Event-oriented knowledge representation for real-time planning: A system has been developed that allows planning of simple robot tasks. The knowledge of the environment and the capabilities of the robot are represented in an event-oriented notation which has been derived from scripts. The scripts have been enhanced by concepts from temporal and modal logic. The representation distinguishes strictly between causal and temporal dependencies.

Some of those topics are joint projects with the German National Research Center for Computer Science (GMD). Dr. Hommel is also the head of this new research group in GMD, which covers the field of computer science methods in automation.

## New Products

### If the Glove Fits...

VPL Research, Inc. has announced a lightweight glove input device that senses hand gesture, position, and orientation in real time. The *DataGlove*<sup>TM</sup> Model 2 System is connected to a Control Unit which can output user-dependent calibrated records of hand gestures for use in many applications. The system incorporates a 3Space Isotrak from Polhemus Navigations Science Division, McDonnell Douglas Electronics Co.

Additional software is available which enables the user to develop a library of gestures, create solid model simulations of complex articulated objects, and to manipulate these objects in real time.

According to Harold R. Elgie of VPL, "People in the robotics industry have found the DataGlove to be an intuitive way to train robot arms/manipulators. It's sort of the robotics equivalent of 'What You See Is What You Get' microprocessors."

Other applications include productivity of computer workstations, biomedical applications, human factors engineering, tools for handicapped users, and telerobotics.

A standard glove configuration which monitors the position and attitude of the hand and 10 major joints of the fingers costs \$8800.

For more information contact:

VPL Research, Inc.

656 Bair Island Road, Suite 304

Redwood City, CA 94063

Tel: (415)361-1710

# CALLS FOR PAPERS

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**Third ORSA/TIMS Conference on Flexible Manufacturing Systems** Massachusetts Inst. of Technology, Cambridge MA., August 14-16, 1989.

Submissions should be sent by February 10, 1989 to: **Kathy Stecke**, Univ. of Michigan, Grad. School of Business Administration, Ann Arbor MI 48109-1234, Tel(313)763-0485, or **R. Suri**, Univ. of Wisconsin, Industrial Eng. Dept., Madison, WI 53706 Tel(608)262-5536.

**IEEE International Workshop on Intelligent Robots and Systems: Autonomous Mobile Robots and their Applications.** Tsukuba, Japan, August 24-26, 1989. *Cosponsored* by the IEEE Industrial Electronics, and System, Man, & Cybernetics Societies, the Robotics Society of Japan, and the New Technology Foundation and conducted in cooperation with the IEEE Robotics & Automation Society.

**Submissions:** Submit 4 copies of an 800 word summary to: **Prof. Shin'ichi Yuta**: Robotics Society of Japan, Institute of Information Science & Electronics, Tsukuba, 305 JAPAN, Phone (0298)53-5509.

**Fourth International Symposium on Intelligent Control.** September 24-26, 1989, Albany NY. Sponsored by The IEEE Control Society

## First Call for Papers

Topics of interest include Control, Machine Intelligence, Architectures and Tools, and Applications.

Authors should submit extended summaries or (preferably) full papers before **April 1** to: **Prof. K. P. Valavanis**, Robotics Laboratory, Department of ECE, Boston MA 02115, (617)437-2164, (617)437-3046.

Proposals for tutorials and invited sessions should be mailed by **May 1** to: **Prof. A.A. Desrochers**, Department of ECE, Rensselaer Polytechnic Institute, Troy NY 12180-3590, (518)276-6718.

**Fourth International Conference on CAD/CAM: Robotics and Factories of the Future.** December 19-22, 1989, New Delhi INDIA. Sponsored

by Indian Institute of Technology and International Society for Productivity Enhancement (SPIE).

## First Call for Papers

The Conference theme is C4 (CAD/CAM/CAE/CIM) Integration, Robotics and Factory Automation for improved productivity and cost containment. Three copies of abstracts of about 200 words in English should be sent by **February 28, 1989** to **Prof. K.K. Pujara**, Mechanical Engineering Department, Indian Institute of Technology, Delhi, New Delhi-110016 INDIA.

Persons interested in organizing sessions for the conference should contact **Dr. R. Sagar** at the same address.

**CIM: A Key to U.S. Industrial Survival?: Symposium on Advanced Manufacturing**, September 25-28, 1989 Sponsored by the Center for Robotics & Manufacturing Systems and the Office of Engineering Continuing Education and Extension. University of Kentucky in cooperation with the IEEE.

The conference theme will explore two aspects of CIM for the 1990's: removing the mystique from an evolving technology with a showcase of practical applications; and selection of the proper applications to establish your company as a competitive leader in a global economy.

Two workshops: "Manufacturing with Composites" and "Machine Vision" will be included in the program.

Noncommercial presentations on new concepts and innovative applied papers in all areas of manufacturing processes are encouraged. Exhibits are an integral part of this symposium and provide an excellent opportunity for companies to display both products.

Four copies of abstracts should be submitted by March 27, 1989. Send abstracts and requests for information to: **Juanita B. Graves**, Conference Coordinator, Center for Robotics & Manufacturing Systems, Breckinridge Hall, University of Kentucky, Lexington, Kentucky 40506-0056, (606)257-3973.

**1990 IEEE Robotics and Automation Conference.** The 1990 IEEE Robotics and Automa-

tion Conference will be held May 13-18, at the Hyatt Regency, Cincinnati, Ohio.

The conference theme will be "Intelligent Automation and Robotics." Areas of specific interest will include: Automation systems, Intelligent robot systems, Artificial intelligence in automation and robotics, Robot sensing, Mobile robots, Teleoperation and teleautomation, Micro electro-mechanical devices and systems, and Applications in industry and elsewhere.

Papers of 15 to 20 page length in 12 pt. type are encouraged, and will be due on October 15, 1990.

Only papers 30 pages and under in length will be accepted. The full call for papers will be released at the 1989 conference in Arizona. The 1990 conference officers are: Richard A. Volz, General Chairperson; Antti Koivo, Program Chairperson; Harry Hayman, Treasurer; and Ernest L. Hall, Local Arrangements Chairperson.

Begin planning your papers for 1990 now.

**Send Calls for Papers and other announcements to the editors by May 20 to insure inclusion in the June Newsletter. The e-mail address is wes@ecelet.ncsu.edu. Send hard copy confirmation, also!**

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## Letters

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### Transferring Robotics Technology

I read the column "From the Editor" in the Fall 1988 issue of the Newsletter and the followup column about Gerd Hirzinger with great interest. I worked at the same lab as the editor did several years ago (Hirzinger's in fact) and second his observations.

Allow me to advance another avenue for research plus technology transfer, namely, that which we have at the Draper Labs. Like the German labs, we have a staff of professionals of which I am one, but we also have students from MIT whose thesis work I supervise. The students have access to my professional colleagues and most of the Lab's facilities. Basic and applied research is done mainly by the students. In addition, the professionals maintain a consulting practice in which we work on extended projects with industry, mostly on design for

assembly, automation assessments of new products, and concept designs and economic analyses of automation systems. This consulting practice puts all the research results to test and reveals both their shortcomings and new opportunities for additional research. The relevance of this research is more or less guaranteed, although it is up to us to identify and emphasize its generic value and content.

We have found that pure knowledge is almost impossible to transfer to industry. We can transfer people, namely the students, or physical hardware, such as sensors and Remote Center Compliances, or we can do specific contract work. Only foreign industry, mostly Japanese, is prepared to seek out the knowledge itself.

I believe that structural differences between American and foreign industries are responsible for these differences in behavior. I can speak knowledgeably of automobile companies, which are the heaviest users of robots.

Foreign automobile companies, especially Japanese, tend to buy their commodity car components and build their own automation systems. American car companies show the opposite characteristic: they build their own components and buy their automation, mostly through legalistic contract arrangements. This strategy creates an arms-length relationship after the product is designed when in fact the requirements of good product-process design coordination requires the closest of "concurrent design" relationships.

Companies that build their own automation understand the needs and shortcomings that research might fill, so they are more likely to sponsor such research. They may even find it economically attractive to do so instead of trying to maintain a research infrastructure of their own. Buyers of technology, on the other hand, depend on the marketplace to create products. This market, however, lacks close coupling to the immediate needs of its customers and is made of small and underfunded companies that cannot fund research. Companies that buy their automation also fail thereby to gain a competitive edge since others can buy the same things and easily keep up.

Significantly, most companies that make their own robots (such as VW and Sony), and use them very successfully in-house, fail when they try to sell them outside. The two markets are very different: the outside market requires expensive hand-holding and tailoring of the robot, making the sale unprofitable, as Automatix

found out. The same hand-holding in-house is easily identified as a valuable improvement in the product or the factory, and the value flows to the in-house bottom line, generating the profit that is missing in the outside market. This dynamic is consistent with the other factors that make in-house automation builders value and use research.

*Daniel E. Whitney  
The Charles Stark Draper Laboratory, Inc.  
Cambridge, Massachusetts*

### Join the IEEE Robotics & Automation Society!

Subscribers to the *IEEE Journal of Robotics and Automation*, now the *IEEE Transactions on Robotics & Automation*, are the charter members of the IEEE Robotics & Automation Society. Since this newsletter goes to those same people, most of you who are reading this are already "among the elect".

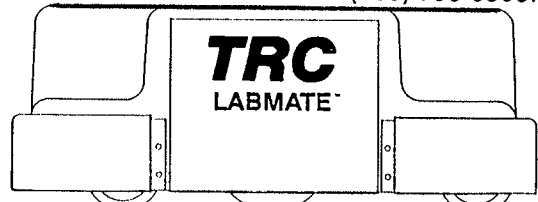
However, occasionally people find things on their desks and wonder where they came from. If that's what happened to you and you'd like to know more, you are cordially invited to join the IEEE Robotics & Automation Society.

For IEEE members, society membership currently costs only \$15. This membership fee includes the bi-monthly *Transactions*, this newsletter, announcements of conferences and workshops, and other society benefits.

For more information, call the IEEE Service Center, (201)981-0060, ext. 5530.

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#### Plenary Speakers

Prof. K.-J. Aström, Lund Institute of Technology  
"Intelligent Process Control"

Dr. J. L. Flanagan, AT&T Bell Laboratories  
"Coding and Recognition of Information Signals: Speech, Image, Wideband Audio"

**Registration deadline is April 1.**

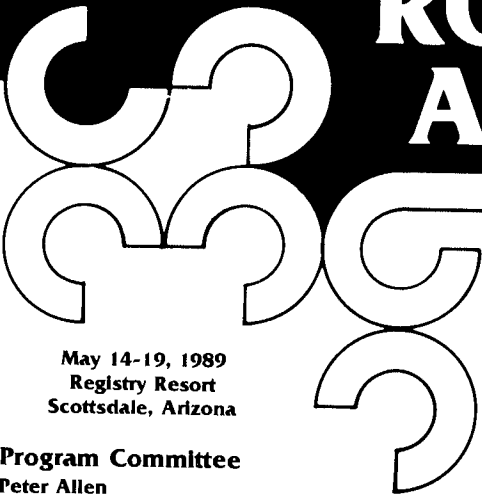
For registration information, write or call:  
Conference, Systems Research Center

A. V. Williams Bldg. (115), University of Maryland  
College Park, Maryland 20742, (301) 454-7986.

# Calendar

Date	Event	Place	Sponsors/Info
Mar 13-16	3rd Topical Meeting on Robotics & Remote Systems	Charleston SC	Amer. Nuclear Soc., U.S. Dept. Energy, Robotics International of SME Contact: Joseph S. Byrd, Gen. Chair, E.I. Du Pont de Nemours & Co., Savannah River Laboratory, Aiken SC 29808 Tel:(803)725-3527 (FTS)239-3527
Mar. 20-22	IEEE Workshop on Visual Motion	Irvine California	Contact: Ellen Hildreth, Artificial Intelligence Lab., 545 Technology Sq., Cambridge, MA 02139, or Ramesh Jain, Elect. Eng. & Comp. Sci., Univ. of Mich., Ann Arbor MI 48109-2122.
Mar. 27-April 1	Applications of AI VII	Orlando, Fla.	IEEE Computer Soc. and Systems, Man, & Cybernetics Soc., and Int. Soc. for Optical Engineering (SPIE) in coop. with IEEE Computer Soc.
May 14-19	IEEE Int. Conf. on Robotics & Automation	Scottsdale, Arizona	IEEE Robotics & Automation Society See Announcement
May 27-31	Int. Conf. on Pattern Recognition	Atlantic City, NJ	IEEE Computer Soc., PAMI TC Contact: Herbert Freeman, Rutgers University, Hill Center, New Brunswick, NJ 08903, (201) 932-4208
June 18-21,	Int. Joint Conf. on Neural Networks	Washington, D.C.	IEEE and INNS Contact: Nomi Feldman, Conf. Coordinator, (619)453-6222 See Announcement
July 16-29	NATO Advanced Study Institute on Active Perception & Robot Vision	Maratea, Italy	Contact: Arun Sood / Harry Wechsler, George Mason Univ., Fairfax VA 22030; (703)323-2318; Internet: ASOOD@GMUVAX.GMU.EDU; Bitnet: ASOOD@GMUVAX
[B]Aug. 14-15	3rd ORSA/TIMS Conf. on Flexible Manufacturing Systems	MIT, Cambridge, Mass.	Conducted in cooperation with the IEEE Robotics & Automation Society. Contact: Stephen C. Graves, Conference Chairman, Massachusetts Institute of Technology, Sloan School of Management, Cambridge MA 02139, (617)253-6602.
Aug. 24-26,	IEEE Int. Workshop on Intelligent Robots and Systems	Tsukuba JAPAN	Cosponsored by the IEEE Industrial Electronics, and System, Man, & Cybernetics Societies, the Robotics Society of Japan, and the New Technology Foundation and conducted in cooperation with the IEEE Robotics & Automation Society. Contact: Prof. Shin'ichi Yuta: Robotics Society of Japan, Institute of Information Science and Electronics, Tsukuba, 305 JAPAN, Phone (0298)53-5509.
Sept. 18-21	IFAC International Workshop on Decisional Structures in Automated Manufacturing	Genoa, ITALY	Contact: Prof. Agostino Villa: Dipartimento di Tecnologi e Sistemi, di Produzione Politecnico, Torino, Acorso Duca degli Abruzzi, 24, I - 10129 Torino (Italy), Phone (39) 11-556 7969; Telex: 220646 POLITO I; Telefax (39) 11-556 7991
Sept. 25-27	4th Inter. Symposium on Intelligent Control	Albany NY	IEEE Control Systems Society. Contact: A. A. Desrochers, Rensselaer Polytechnic Institute, or K.P. Valavanis, Northeastern University. See Calls for Papers.
Sept. 25-28	Lexington, Kentucky	Symposium on Advanced Manufacturing	University of Kentucky in coop. with IEEE. Contact: Juanita Graves (606)257-3973. See Calls for Papers
May 13-18, '90	IEEE Inter. Conf. on Robotics & Automation	Cincinnati, Ohio	IEEE Robotics & Automation Soc. See Calls for Papers.

# ROBOTICS AND AUTOMATION



May 14-19, 1989  
Registry Resort  
Scottsdale, Arizona

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Local Arrangements: **A.L. Pal**, Arizona State University

Monday Noon, May 15, 1989 to  
Thursday Afternoon, May 18, 1989

## CONFERENCE

Specific Topics to be discussed include, but are not limited to the following:

Architectures, simulators, and systems  
Artificial intelligence and task planning  
Control of position and force  
Dextrous grasping, haptics and tactile sensing  
Industrial Applications  
Kinematics and dynamics  
Locomotion  
Mechanical Design  
Mobile Robots  
Non-visual sensing and sensor fusion  
Path planning and collision avoidance  
Telerobotics  
Unstructured environments: space, undersea, nuclear plants  
Vision

The following invited sessions are being organized:

1. Bilateral Systems and Human Robot Interaction  
Organizer: **H. Kazerooni**, University of Minnesota
2. Control of Flexible Manipulators  
Organizer: **S. Yurkovich**, Ohio State University
3. Dynamics-Based Control of Robots  
Organizers: **E. Colgate and N. Hogan**, MIT
4. Integration of Sensory Information  
Organizer: **H. Durrante-Whyte**, University of Oxford
5. Redundant Robots  
Organizer: **H. Seraji**, JPL
6. Research in Autonomous Robotics for Hazardous, Unstructured Environments  
Organizer: **C. Welsblin**, Oak Ridge National Laboratory
7. Robot Safety  
Organizers: **A. Kolvo**, Purdue University and **J. Graham**, University of Louisville
8. Robotics in Dynamical Environments  
Organizers: **D. Koditschek**, Yale University and **M. Ralbert**, MIT
9. Robots in Unstructured Environments  
Organizer: **M. Jamshidi**, University of New Mexico
10. Traded and Shared Control between Autonomous and Teleoperated Systems  
Organizer: **S. Hayati**, JPL

## Registration Form

ROBOTICS  
AND AUTOMATION

May 14-19, 1989  
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Scottsdale, Arizona

May 14-19, 1989

The Registry Resort  
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Please complete and return this form (with your check made payable to "Robotics and Automation") to:

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After 4/10/89  
(301) 434-1990

Telephone Contact:  
Harry Hayman  
(407) 483-3037

Please Circle applicable fees for those sessions you desire to attend. Then add together to determine total fee which should be included with your registration.

For registration after May 1, 1989 add \$25 late fee.

☐ Payment Enclosed

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☐ Please send me a full advance program

Please register me as follows (Circle appropriate fee):

	Member fee	Non-member fee	Student fee
Conference	\$185	\$230	\$100
Tutorial 1A (full day)	\$200	\$250	\$200
Workshop 1B (half day)	\$ 75	\$100	\$ 75
Tutorial 1C (half day)	\$100	\$125	\$100
Tutorial 2A (half day)	\$100	\$125	\$100
Tutorial 2B (half day)	\$100	\$125	\$100
Workshop 2C (half day)	\$ 75	\$100	\$ 75
Workshop 3A (full day)	\$100	\$125	\$100
Workshop 3B (full day)	\$100	\$125	\$100
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The tutorials and workshop includes coffee breaks and notes.

Conference registrations includes the proceedings, coffee breaks, and social functions.

Student registration for the conference only (does not include social functions, but includes coffee breaks and proceedings). To qualify for student rate, students must be IEEE Members and must not be employed full time. Students will be required to show their IEEE membership card when picking up their registration.

Request for refunds (less \$15 handling fee) must be received in writing prior to May 8, 1989.

Late registration will be accepted beginning Saturday May 13, 1989 at the Registry Resort at 4:00 P.M.

ROBOTICS  
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Departure Time \_\_\_\_\_

A block of rooms for this conference is reserved until April 15, 1989. Reservations received after this date will be confirmed on a space-available basis.

Note: Each attendee is responsible for a deposit equal to the first night's charge for each accommodation and is due with each reservation request on or before the cut-off date of April 15, 1989, and becomes non-refundable

if the guest does not arrive or cancels less than seventy-two (72) hours prior to arrival.

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IEEE Robotics & Automation Society

# ROBOTICS AND AUTOMATION



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