Newsletter of the IEEE Robotics & Automation Society

ROBOTICS AND AUTOMATION

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In This Issue

THE INSTITUTE OF ELECTRICAL
AND ELECTRONICS ENGINEERS, INC.
IEEE

Announcement & Call for Papers

The Journal of Microelectromechanical Systems

A Joint IEEE and ASME Publication Covering
Microstructures, Microactuators, Microsensors, and Microsystems

This new journal will provide a forum for the discussion of the science, engineering, design, and applications of microelectromechanical systems (MEMS) and devices. It will provide a common place where papers in related disciplines supporting MEMS can be published. The journal is sponsored by the IEEE Electron Devices Society, the IEEE Robotics and Automation Society, and the ASME Dynamic Systems and Control Division.

The topics of interest will include, but not be limited to: devices ranging in size from microns to millimeters, IC-compatible fabrication techniques, other fabrication techniques, measurement of micro phenomena, theoretical and computational results, modeling and control, new materials and designs, microactuators, microrobots, microbatteries, bearings, other components for microsystems, tribology, reliability, electrical and mechanical interfaces, microtelemanipulation, and standards appropriate to MEMS. Application examples and application-oriented devices in fluidics, optics, biomedical engineering, etc. are also of central interest.

The initial publication is the first quarter of 1992. Because only about 300 pages will be published during the first year, acceptance of papers will be quite competitive. Send five copies of paper submissions to: William Trimmer, J-MEMS, Department of Mechanical and Aerospace Engineering, D-215 Engineering Quadrangle, Princeton University, Princeton, NJ 08544-5263, USA. Papers should be between one and six journal pages in length. The paper review will be handled by one of the editors below:

President's Message

Tzyh-Jong Tarn
Washington University

I am delighted to have this opportunity to write to you in my new role as President of the IEEE Robotics and Automation Society. It is indeed a great honor to serve this young but dynamic Society which already has a distinguished track record and is supported by members worldwide.

Owing to the strong leadership and hard work of my predecessors and of so many dedicated volunteers, I am very pleased to be able to inform you that the state of our Society is excellent.

The IEEE Robotics and Automation Society is trying to be responsive to the needs of our members. In particular, we want to provide more services that are relevant to our industrial members, and we want to involve more of our nonacademic members and more of our members outside North America in Society activities.

Through a number of initiatives by my successive predecessors, our society already has a strong international membership which participates in publications and meetings. This year the society's annual conference, IEEE International Conference on Robotics and Automation, will be held in Nice, France and it has already been decided that the 1995 Conference will be held in Japan. I hope to see this activity continue to expand in the future.

An important role of the IEEE Robotics and Automation Society is to develop and to stimulate research directions in this rapidly changing field of science and technology. To accomplish this requires strong interaction between our industrial and academic members. I would like to encourage active industrial participation in the Administrative Committee of the Society, the Technical Activities Board and the Editorial Board of the Transactions. Please contact George Lee, who is the Vice President of Technical Activities, and Russell Taylor, who is the Editor of the Transactions, to explore these opportunities. I would like to hear from you. I would especially like to hear from you if you have some ideas on how we can better serve our members - both industrial and academic.

The IEEE: A Century of Service

The Robotics and Automation Society, which was established in 1989, is one of the youngest member societies of the Institute of Electrical and Electronics Engineers.

The IEEE had its beginnings more than 100 years ago, when a group of electrical inventors and entrepreneurs met in New York City to form the American Institute of Electrical Engineers (AIEE). As today, electrical engineers in 1884 were creating the most exciting and important new technologies of their times. Telegraph lines spread out in every direction, on the land and under the seas, to link people, communities and nations together. The telephone, less than a decade old, was already beginning to transform the patterns of communication within cities. Edison's electric light, invented only five years before, was being installed in factories, stores, schools and homes as the promoters of the new electric power system struggled to extend their work everywhere. And hard on the heels of the light were other uses for electric power, which promised to revolutionize almost every facet of life. The electrical engineers joined together in the AIEE to better understand and extend this new technology.

A generation later, another dramatically new technology emerged that was to have equally profound consequences for daily life--radio. So different was radio that its practitioners felt a need to form a separate society, the Institute of Radio Engineers (IRE). The IRE, founded in 1912, quickly became the focal point for the technology that evolved into electronics with applications in television, radar, control systems and computers.

By the end of World War II, electronics engineering rivaled the size and scope of the older fields of power and communications. Increasingly, electronics and electrical engineers found their common interests outweighed their differences. Against this background, in 1963 the AIEE and the IRE merged to form The Institute of Electrical and Electronics Engineers. Today, the IEEE is the world's largest engineering society with members, Sections and Student branches dotting the globe. Its activ ities extend far more widely than its forebears could have ever foreseen. However, it remains a premier spokesman for perhaps the most

Continued on page 9

From the Editor's Desk

Michael B. Leahy
Air Force Logistics Command
Robotics and Automation Center of Excellence (RACE)

Greetings from the American southwest, San Antonio, Texas to be precise. I still have unopened boxes all over my new cubicle. Office space is at a premium down here, but the weather is great. As I mentioned in the last issue I have been transferred from the Air Force Institute of Technology to the Air Force Logistics Command Robotics and Automation Center of Excellence (RACE). Please note the change of address on the masthead. Email is also being forwarded from my old AFIT address. RACE is in the embryonic stage, but we are chartered to become the focal point for robotics and automation activities within the command. Once things settle down a bit I will write an article about the RACE objectives.

After one month in Texas I was back in the midwest to attend the 1991 International Robots and Vision Automation Show and Conference in Detroit. The robotics industry has been in a period of consolidation and the old hands said this show was a fraction of its former self, but it was still a large demonstration of industrial products. This was my first visit to the semi-annual show and I strongly recommend the experience. I was able to get a clear snapshot of the industrial state of the art and talk directly to applications engineers from numerous companies.

Several roundtable sessions were held in conjunction with the show. One of particular interest was the session on the relationship between industry and university. This session was the counterpart to the panel discussion on the same topic held at our conference in Sacramento last spring. The Robotics Industries Association (RIA) is preparing a summary of the discussion that should be available for our next issue.

One of the basic issues was clearly a lack of communication between the two groups. Industry perceives that university level research is misdirected.

The research community answers by saying "you don't provide any guidance or funding."

While the newsletter can not solve the funding issue it can help bridge the communication gap.

The newsletter is committed to improving communication within the global robotics community. We have run, and will continue to do so, columns on the RIA and its function and we are trying to develop similar relationships with other trade organizations.

As the next step I am proposing using the newsletter as a forum for connecting people with problems to those with solutions. If there is sufficient interest a column could appear each issue for exchanging that type of information. I certainly don't have all the answers for the problems my organization is tasked to help solve.

At the moment we are looking at ways to paint and strip large cargo aircraft. Painting technology is mature so the trick is how to position the painting robots to cover the entire aircraft with real world constraints like ancient hangers and economics. We have a new facility for stripping but the technology is a problem. A lot of research has been done on stripping, but the existing systems all have significant drawbacks for large sized aircraft. If you have any innovative ideas for paint stripping please let me know.

The newsletter is looking to expand its content by publishing feature articles. Can you enlighten us with an article about topics like ***Robotics in Hazardous Occupations, Space Robotics and Telerobotics, or Undersea Robotics***?

As chairman of the TAB publication committee I am actively searching for authors and reviewers. Share your experiences with your colleagues.

We are coordinating with the RIA in search of authors who could provide tutorial type articles on current industrial processes and the unsolved problems associated with potential robotics and automation solutions. This is also part of our effort to increase cross fertilization between industry and the university. The more we know about each other's requirements the better we will be able to link our efforts

But before I quit I would like to thank all the people who have stopped me on my recent travels and provided feedback on the newsletter. Reader input is vital to the ability of Rosalyn and myself to provide you with a high quality informative product. Keep those comments flowing. Think of your feedback or articles as a belated holiday gift to the Society.

R&A Society Technical Activities Board

Under the leadership of **Professor George Lee** the Technical Activities Board (TAB) is taking a more active role within the society. A report on the most recent TAB meeting should be in our next issue. One of the major issues at that meeting was the organization and technical content of our annual conference. The TAB is interested in your opinion on that subject. Please take a moment to fill out the questionnaire in this issue and let us know your thoughts and ideas. This is your chance to help us help you.

Another current project of the TAB is the creation and reformulation of our society's Technical Committees (TC). The TCs give you a chance to interact with other researchers in your area of expertise. A complete list of the existing TCs and their chairs is included in this issue.

Active membership in a TC is an excellent way to contribute to the professional growth of yourself and the society. I encourage you to contact one the chairs and become involved. If you don't feel that your interests are adequately represented by one of the existing committees let a member of the TAB know. These committees are not carved in stone. The TAB is interested in providing TCs that span the complete interests of our membership.

The newsletter supports TC activities by providing space for articles and announcements. In future winter issues we hope to have a member of each TC contribute a short overview pf the major technical advances and issues that surfaced during the year and a short list of pertinent references. The collection of these articles would provide a state of the art overview of all the major technical areas of the society.

Following are reports from three of the TCs: the Computer Integrated Manufacturing (CIM), Assembly and Task Planning, and Standards

Computer Integrated Manufacturing

The **Computer Integrated Manufacturing (CIM) Technical Committee (TC)** is chaired by Walt Trybula. He is asking for any people who are interested in becoming involved to contact him. His mailing address is:

Ivy Systems Incorporated
PO Box 258
Ivy, Virginia 22945-0258 USA.
Phone (804) 295-1230
wjt5h@prime.acc.virginia.edu.

Please contact him if you are interested in working on the TC. The initial work will be to outline the goals and objectives of the TC. All ideas are welcome.

Assembly and Task Planning

A new **Technical Committee on Assembly and Task Planning** has recently been created and is to be chaired by Damian Lyons of Philips Laboratories. The scope of this technical committee includes assembly planning, task planning, action planning, reactive planning, etc. The objectives of the TC are to promote technical activities in these areas. One of the first steps to be taken is to set down the scope and objectives in more detail. People who are interested in becoming involved should contact Damian at

Dr. D.M. Lyons
Philips Laboratories
345 Scarborough Road
Briarcliff Manor NY 10510
phone: (914)945-6444
email: dml@philabs.philips.com

Standards Committee

The RIA is active in the creation of standards for the robotics industry.

Our society is represented on those standards committees by Dr Lenard Haynes. In the next issue of the Newsletter we will published a condensed overview of the status of those standards committee efforts which Lenny prepared. Take a few minutes to see how standards are shaping the commerical development of robotics and automation technology.

R&A Transactions Associate Editors

Among the associate editors recently appointed to the IEEE Transactions on Robotics and Automation are Jean-Claude Latombe and Chuck Thorpe.

Dr. Latombe is Associate Professor and Director of the Robotics Laboratory in the Department of Computer Science at Stanford University. Previously, from 1980 to 1984, he was a faculty member at the National Polytechnic Institute of Grenoble (France), and from 1984 to 1987, he was the executive chairman of ITMI, a company based in Meylan (France) that he cofounded in 1982.

Dr. Thorpe is currently a Senior Research Scientist at the Robotics Institute of CMU. He works with the Navlab project on perception, planning, and architectures for outdoor mobile robots. He received his Ph.D. in Computer Science from Carnegie Mellon University and his BA from North Park College in Chicago.

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RI/SME Elects Officers

Five new members have been elected to the Advisory Board of Robotics International of the Society of Manufacturing Engineers (RI/SME). The members, who will serve two year terms are: Philip A. Barone, International Technology Associates, Santa Clara, California; Kevin M. Croft of EG & G, ; David L. Hoska, D & D Engineering;; Thomas J. Meravi, Northern Michigan University; and Dr. Bartholomew O. Nnaji of the University of Massachusetts..

The Association's 1992 Chairman is Ray S. Hinson, Automation Consultants/ Engineers. Dr. Hadi A. Akeel, GMFarmc Robotics Corporation, will serve as Chairman-elect.

RI/SME, which has approximately 7600 members worldwide, is an association for the exchange of robotics information in the manufacturing community.

IEEE Robotics and Automation Society
Membership Survey on Future Conference Direction

My research/job activities consist of: (please indicate percentage)

___% in Robotics ___ % in Automation

___% in other non R&A activities (e.g., controls in non-robotics area)

1. Are you happy with the technical contents of the past annual Robotics and Automation Conferences? (please check one)

[ ] YES; [ ] NO.

If your answer is NO, how would you like it to be changed?

2. Our past annual conferences usually had 600-700 submitted papers, and the paper acceptance rate is about 40-45%. Do you feel this is an acceptable rate? If not, other possible acceptance rates are: (please check one.)

[ ] 20% [ ] 20-30% [ ] 30-40%

[ ] 40-50% [ ] 50-60% [ ] 60-70%

[ ] others, please specify
Comments:

3. Our past annual conferences usually had 6-9 parallel sessions. Do you feel this is an acceptable number of parallel sessions? If not, other possible numbers of parallel sessions are: (please check one.)

[ ] 2-3 parallel sessions
[ ] 4-5 parallel sessions
[ ] 6-7 parallel sessions
[ ] 8-9 parallel sessions
[ ] 10-11 parallel sessions
[ ] 12-13 parallel sessions
[ ] others, please specify

4. Do you feel that we should split our annual R&A conference into two separate annual conferences, one in robotics and the other in automation?
[ ] YES; [ ] NO.

If your answer is YES, please answer the following questions:
(a) In what months should the conferences be held?
[ ] one in January/February and the other in June/July.

[ ] One in March/April and the other in August/ September.

[ ] One in April/May and the other in September/ October.

[ ] One in May/June and the other in October/November.

[ ] Others, please specify
Reason(s) for splitting the conference:

5. If you feel that we should not split our annual conference into two separate conferences, are you happy with how our past annual Robotics and Automation Conferences were run? (please check one)
[ ] YES; [ ] NO.

If your answer is NO, how would you like it to be changed?

6. Do you feel that our past annual conferences had too many "robotics" papers and too few "automation" papers?
[ ] YES; [ ] NO.

If your answer is YES, what are your suggestions to improve this imbalance?

7. Is it a good idea to require that all authors to submit their conference papers with a camera-ready original copy and five copies for review? If the paper is accepted, then the camera-ready copy will be used for proceedings publication. This also requires that authors with

overlength papers (over 6 mat pages) to include a check to pay for the page charges. If the paper is not accepted, then the check will be returned. (Please circle one.)

Terrible Idea[1] [2) [3] [4] [5]

[6] [7] [8] [9] [10]
Great idea

Comments:

8. Are you happy with how the Tutorial sessions have been run in our annual conference?

[ ] YES; [ ] NO.
Comments:

9. Are you happy with how the Workshop sessions have been run in our annual conference?

[ ] YES; [ ] NO.
Comments:

Your Name: _

Signature: _

Please return the survey on or before March 15 to:

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ADDITIONAL COMMENTS:

IEEE Information Index

When a colleague asks you what you can get from the IEEE, the first thing that comes to mind may be our Conferences or Technical Literature. Or you may think of Standards development. Or resources for improving Section/Chapter meetings. All of this, and more, is available from the various IEEE entities.

The following is a list of major IEEE catalogs and programs, as well as the staff contact for each.

The mailing address for most IEEE Departments and offices is: 445 Hoes Lane , Piscataway NJ 08855-1331 USA.

- **IEEE Technical Activities Guide** (TAG) features a five- year advance schedule of over 150 annual conferences that are sponsored by IEEE Societies, Councils, or geographic regions. TAG is published quarterly. Contact: IEEE Conference Services; phone (908) 562-3871.
- **IEEE Publications Catalog** is an annual listing and/or description of all materials published by the IEEE. Contact: IEEE Customer Service; phone (908) 981-1393.
- **IEEE Standards Catalog and Standards Update** are biannual publications of the IEEE Standards office which list all standards information. Contact: IEEE Standards; phone (908) 562-3824.
- **IEEE Video Programs & Self Study Courses** is the catalog of IEEE Educational Activities. This free catalog lists available video tutorials, video conferences and self-study courses. Contact: IEEE Educational **Activities:** phone (908) 562-5495.
- **A Guide to Program Resources** lists audiovisual materials and contacts for speakers and distinguished lecturers available for Section, Chapter and Branch meetings. Contact: IEEE Field Services; phone (908) 562-5512.

Guide to Staff Services describes Technical Activities staff contacts for a variety of volunteer support functions. Contact: Technical Activities; phone (908) 562-3908.

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COSMIC Update: The catalog of programs available from COSMIC, NASA's Computer Software and Information Center is now available on Internet: service@cossack.cosmic.uga.edu

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Applying Learning Algorithms to Force Control

Kennon Guglielmo and Nader Sadegh *

As the discipline of automation and controls advances, it seems that the human example becomes more and more the model for our physical and mathematical reasoning.

Research at Georgia Tech is helping develop this concept by formulating low level control algorithms based on the manner in which a human deals with a problem. For example, consider the case of an assembly line worker new to his job. At first, his performance both in terms of accuracy and speed is poor, but after several hours or days of performing the same task repetitively, he can be expected to learn from his mistakes and inefficient techniques. Thus, by observing his own error, he can improve his performance.

This "learning" process has been implemented in terms of a mathematical model for real-time robot and machine tool control. Much interest has recently been focused on neural networks and their application to control systems. However, the pure application of a neural network to real-time mechanical control is not currently feasible with today's computing power. Therefore, an efficient learning algorithm was derived from the basic concept of a general neural net. Again, the neural network concept is an attempt to model the human learning process.

Previous work has resulted in many publications presenting the excellent performance obtained for the application of this algorithm to position control of an IBM 7545 robot using a 386/387 based PC. The robot's original control system was completely removed with the exception of the PI velocity servo power amplifiers for the DC motors. These power amplifiers were converted to current (torque) servos for easy implementation many of the popular adaptive control laws. These adaptive controllers along with simple PID schemes have been used for comparison to the learning algorithm. The learning (or "repetitive") controller is capable of driving the position tracking error of the robot more than an order of magnitude below that of the other control schemes, and even down to the resolution of the optical encoders throughout the desired trajectory.

Given the excellent performance of the repetitive algorithm as applied to position control, the extension of the scheme to force control was very promising. First, the IBM 7515 was fitted with a wrist force/torque sensor from Assurance Technologies, Inc., and high speed parallel feedback to the PC was implemented using an optional parallel interface. The 500Hz force feedback rate eliminated many of the problems encountered with force control while trying to establish contact with a stiff surface. Also, a reasonable numerical time derivative of the force signal could be formed for introducing artificial damping.

The learning algorithm has demonstrated excellent performance both in terms of maintaining a specified normal contact force while moving tangentially to a surface and improving the speed with which the robot may approach the surface. This type of control would be applicable to a grinding or surface finishing operation. Also, the learning scheme has been integrated into the rotation transformation system to maintain tangential motion along an unknown surface. Other applications of repetitive force control could include insertion tasks, part mating, gluing, and surface mount part connection.

The application of advanced control algorithms to manufacturing equipment to increase speed and accuracy is a cost effective way to improve production. Integrated position and force control extend the effectiveness and applicability of flexible automation. Research at Georgia Tech is continuing in this and other areas to push the leading edge of manufacturing technology even further.

For a more detailed description of the learning algorithm, see the following references or any one of a number of other publications by the authors in recent conference proceedings of ASME and IEEE.

1.
2. Guglielmo, K. and N. Sadegh, "Theory and Implementation of a Repetitive Robot Controller with Cartesian Trajectory Description," Submitted for publication to the ASME Journal of Dynamic Systems Measurement and Control, 1990.
3. Sadegh, N. and K. Guglielmo, "A New Learning Controller for Mechanical Manipulators," International Journal of Robotics Research, 1989.

A technical paper on the success of the learning scheme applied to force control is being submitted to the USA-Japan Symposium on Flexible Automation.30332

*Department of Mechanical Engineering, Georgia Institute of Technology, Atlanta, GA 30332

IEEE International Conferences on Robotics and Automation:1993-1995

- 1993 Atlanta May 2-8. Wayne Book, Georgia Institute of Technology, Chairman, Johnson Luh, Clemson University, Program Chair.
- 1994 San Diego. May 8-13.William Gruver, University of Kentucky, General Chair, Program Chair. Harry Stephano, Rensselaer Polytechnic Institute.
- 1995, Japan May 21-26, Ngoya General Chair.Toshio Fukuda, Ngoya Univ.

NSF Travel Grant Applications

Our Society will hold the 1992 International Conference on Robotics and Automation, May 10-15, 1992, in Nice, France. As you probably know, it is the first time that we will have our major conference outside the U.S.A.

A proposal for a block travel grant has been submitted to the National Science Foundation to help defray travel costs of U.S. participants to the conference. Pending on the approval of the grant, we solicit requests for travel support from the authors and contributors to the conference. Only citizens or permanent U.S. residents are eligible for travel funds.

The conference participants who would like to be considered for travel support should, before February 21, 1992, submit their applications to

Professor A.J. Koivo
School of Electrical Engineering
Purdue University
1285 Electrical Engineering Bld.
West Lafayette, IN 47907-1285
Tel: (317) 494-3436

Each applicant should provide a one-page request containing reasons for requiring support and specifying

(i) technical area of interest;
(ii) impact of the conference participation on his/her professional development;
(iii) description of the nature of the involvement in the conference;
(iv) opportunities for planned visits, talks, and interactions during the travelling and/or beyond the conference;
(v) the amount of support required to be able to attend and participate in the 1992 ICRA
(vi) the list of additional funding that he/she may have available for travelling; and specifically
(vii) the available NSF funded travel money in the current year (1992).

The proposed selection committee consists of Professors G.A. Bekey, A.J. Koivo, and A.C. Sanderson. In the selection process, the committee will exclude participants from government agencies, those receiving other government support for travelling abroad, or industrial representatives, and those who will receive other NSF travel support during the year 1992. Participants with NSF research support are encouraged to request special permission to use their current travel funds for the international travel.

IEEE "Engineers for Education"

IEEE members are being sought to participate in "Engineers for Education," the largest private sector voluntary effort in support of education in the United States today.

Organized by the National Coalition of Engineering Societies for Precollege Mathematics and Science Education, a group of 45 scientific and technical societies including IEEE, the program was launched early this year to attract 100,000 volunteer engineers to assist in improving math and science education in classrooms nationwide.

Some 1,000 volunteers have been enlisted in the last six months.

IEEE members who are interested in participating in the program can obtain registration materials by calling the coalition at (800) 489-0348. The kit provides details about typical outreach activities including ongoing efforts of the societies.

In addition to being the largest society participating in "Engineers for Education," the Institute has contributed almost $40,000 to the program through IEEE-USA and the IEEE Foundation.

WANTED: Reviewers and Authors for the IEEE Press

- Would you like to learn more about publishing in the IEEE Press?
- Would you like to review book proposals for the Robotics and Automation Society?
- Would you like to be an IEEE Press author?
- Would you like to have the inside track to being published?

If you have ideas for needed books or an innovative series that the Robotics and Automation Society should endorse, please let me know. To get into the network and understand the process, volunteer to join the list of reviewers for the Robotics and Automation Society.

I am putting together a database of reviewers for book proposals and manuscripts. Send your name together with the generic areas in which you are willing to provide critical reviews to:

Robert B. Kelley
Robotics and Automation Society
IEEE Press Liaison
Rensselaer Polytechnic Institute
8015 C.I.I.
Troy NY 12180-3590
Phone: 518/276-2653
FAX: 518/276-8715
Internet: kelley@ral.rpi.edu

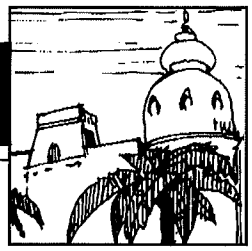
New Arrivals

Congratulations to **Alexander Zelinsky**, who received the Ph.D from the University of Wollongong, November 1991. *Thesis:* Environment Exploration and Path Planning Algorithms for Mobile Robot Navigation using Sonar, *Advisors:* Professor Chris Cook and Dr. Phillip McKerrow. Currently, lecturer in Computer Science at the University of Wollongong.

email: alex@cs.uow.edu.au

1992 IEEE INTERNATIONAL CONFERENCE ON

ROBOTICS AND AUTOMATION



N I C E

Acropolis Convention Center
Nice, France
May 10 - 15, 1992

Sponsored by the IEEE Robotics and Automation Society

General Chairperson:	**Giuseppe Menga**, Politecnico di Torino - Italy
General Vice-Chairpersons:	**Antti J. Koivo**, Purdue University **Arthur C. Sanderson**, Rensselaer Polytechnic Institute
Program Chairperson:	**Georges Giralt**, LAAS, Toulouse - France
Program Vice-Chairpersons:	**Hirochika Inoue**, Tokyo University - Japan **Stanley B. Gershwin**, M.I.T.
Treasurer:	**Richard Klafter,** Temple University
Local Arrangements:	**Pierre Bernhard**, INRIA, Valbonne - France

In cooperation with:

- Nice Chamber of Commerce and Industry - France
- Chamber of Commerce of Torino - Italy
- Commission of the European Communities DG XIII - Telecommunications, Information Industries and Innovation - ESPRIT

With financial contributions from:

- Prima Industrie S.p.A. - Torino - Italy
- D.E.A., Digital Electronic Automation - Moncalieri - Italy
- ABB Robotics - Västeras - Sweden
- Siemens - Münich - Germany

. beautiful "Cote d'Azur" will host the 1992 IEEE International Conference on Robotics and Automation, to be held in Europe for the first time. Presented in an international co-operative environment, the theme of the conference will be "Advances in Information Technology for Robotics and Automation" and it will aim to be a door opening on the new frontier of Machine and System Intelligence, from machine and shop-floor automation to the Integrated Factory, from sensors and mechanical devices to the high level functionalities of third generation robots.

Special topics include but are not limited to the following:

- Modelling, performance evaluation and simulation of discrete-event dynamic systems.
- Scheduling and control of manufacturing systems.
- Information technology for CIM: software environments for design and prototyping, distributed computer architectures, local area networks.
- Concurrent design of products and automated manufacturing.
- Micro electro-mechanical devices and systems.
- Temporal and logical reasoning systems.
- High level man/machine interfaces.
- Robot sensing : vision, touch, range, force; sensor integration.
- Multisensory perception and environment modelling.
- Design and advanced control software for robotic mechanisms.
- Task level planning, programming, reasoning and reactivity, skills acquisition, learning.
- Autonomous manipulation and mobility: geometric reasoning, navigation, motion generation, sensor-based execution, control.
- Multiple robot coordination and group robotics.
- Applications of automation and robotics in industry, construction, medicine, agriculture, etc.
- Teleoperation, telerobotics and autonomous robots for unstructured environments: underwater, space, hostile environments, etc.

A strong industrial participation through exhibits and presentation of projects is expected. Submissions of non-commercial papers describing applications of interest are encouraged from representatives of industry. A video proceedings presenting research results and applications will be prepared.

Workshops and Tutorials

•Workshop S1 (Sunday, May 10, 1992 - 9:00 AM to 5:00 PM: Assembly Planning: Theory and Implementation

The objective of this Workshop is to provide an informal forum for researchers in industries, universities and government labs to get together to discuss recent progress and future research directions in assembly planning.

Topics of interest include: assembly modeling, assembly plan representation, evaluation of assembly plans, algorithmic and knowledge-based approaches to assembly planning, and implementation issues.

Each of the speakers will deliver a 25-minutes presentation, and the attendees will participate in an hour long discussion at the end of the presentations.

The outcome of the Workshop hopefully will be a concerted research effort among the researchers to advance the science and engineering in assembly planning.

Organizers: C.S. George Lee, Purdue University
Sukhan Lee, University of Southern California
A.C. Sanderson, Rensselaer Polytechnic Institute

Speakers:

C.S. George Lee, Purdue University
Jean-Michel Henrioud, Alain Bourjault, Laboratoire d'Informatique de Besancon
Thomas L. De Fazio, Daniel E. Whitney, Charles Stark Draper Laboratory
A.C. Sanderson, Homem de Mello, Rensselaer Polytechnic Institute Sukhan Lee, Jet Propulsion Laboratory and University of Southern California

May 10-15, 1992
**Acropolis Convention Center\ **
Nice, France

Please complete and return this form (with your check made payable to "Robotics and Automation") to:
Robotics and Automation
Harry Hayman
P.O. Box 3216
Silver Spring, MD 20918 USA
Telephone contact: Phone/Fax
Before April 1: (407)483-3037
After April 1:(301) 236-5621
**(checks must be in U.S. dollars drawn on a U.S. Bank) **

Name.....

Company.....

Address. _____

_____

City/State/Zip/Country

_____

_____

Tel. No. _____
(Where you can be reached during the day)

IEEE Membership Number

_____

Please register me as follows (Circle appropriate fee).

	Member	Non-Member	Student
Conference	$ 225	$ 275	$ 100
Conference (plus Video)	$ 280	$ 330	$ 155
Workshop S1 (full day)	$ 125	$ 150	$ 125
Workshop S2 (full day)	$ 125	$ 150	$ 125
Tutorial M1 (half day)	$ 100	$ 125	$ 100
Tutorial M2 (half day)	$ 100	$ 125	$ 100
Tutorial M3 (full day)	$ 125	$ 150	$ 125
Tutorial M4 (full day)	$ 125	$ 150	$ 125
Tutorial M5 (half day)	$ 100	$ 125	$ 100
Tutorial M6 (half day)	$ 100	$ 125	$ 100
Workshop F1 (half day)	$ 100	$ 125	$100
Workshop F2 (half day)	$ 100	$ 125	$ 100
Workshop F3 (full day)	$ 125	$ 150	$ 125
Workshop F4 (half day)	$ 100	$ 125	$ 100
TOTAL	$ ~~~	$ ~~~	$ ~~~

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 April 20, add $50 late fee ($20 for Students). Payment may made by Check in U.S. Dollars on U.S. Bank, VISA or Master Card Only

Payment enclosed $ ..... **Credit Card No.** ..... **Exp. date**.....

Signature .....

The tutorials and workshops include coffee breaks and notes. Conference registration 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 Registration fees may be refunded in full if a written request is received before April 15. A 50% penalty charge will be levied to those who request a refund after that date and before April 30. After April 30 there WILL BE NO REFUNDS). Late registration will be accepted beginning Sunday May 10, 1992 at the Acropolis Convention Center. Note: The conference plus video includes a copy of the video presentations which will be presented at the conference in a video theatre.

Alessandro De Luca, University of Rome
Howard Moraff, National Science Foundation
Tzyh-Jong Tarn, Washington University in St. Louis

EXHIBITS

A limited number of exhibit booths will be available at the Acropolis Convention Center. For further information regarding exhibiting at the conference contact:
Amedeo Carcassi
Di.Effe Srl
Tel: +39/2/48009430
Fax: +39/2/4980138

The Conference has arranged for North American attendees to make additonal AIRLINE and HOTEL reservations at a substantial savings through:
Cerel's Travel Center
19 Main Street
Natick, MA 01760
Tel: 508-653-2400, 800-231-2264
Fax: : 508-653-5158

HOTEL REGISTRATION FORM

Please fill and return before March 31, 1992 to:

NICE CONVENTION BUREAU
B.P. 85
06302 NICE - FRANCE
Tel (33) 93 92 80 81 Fax (33) 93 92 80 85
Telex 461 861 F

Name _____ *Company* _____

Address _____

City _____ *Zip Code* _____ *Country* .....

Telephone. _____ . *Fax* _____ *Telex* _____

I wish to make a reservation in a hotel of category (please, tick accordingly)
4 ( ) 3* ( ) 2* ( )*
RATES:

HOTELS	PRICE Single	Double	Breakfast
Category 4*			
ELYSEE PALACE	640	640	80 FF/pers
PLAZA (1)	850	850	80 FF/pers
SOFITEL CENTRE	780	780	70 FF/pers
Category 3*			
ACROPOLIS	665	680	35 FF/pers
APOGIA	420	470	49 FF/pers
GOLD	400	450	35 FF/pers
MERCURE BAIE (2)	415	500	50 FF/pers
NOVOTEL CENTRE	510	560	48 FF/pers
PULLMAN	530	630	30 FF/pers
VENDOME	510	590	40 FF/pers

HOTELS	Single	Double	Breakfast
Category 2*			
ARCADE	370	400	45 FF/pers
HARVEY	270	330	20 FF/pers
IMPERIAL	265	350	20 FF/pers
MADRID	310	320	20 FF/pers
NATIONAL	310	320	20 FF/pers
RELAIS BLEUS	230	270	30 FF/pers
SPORTMEN	365	380	30 FF/pers
SIBILL'S	298	326	25 FF/pers

(1) Supplement sea view : 100 FF
Supplement club floor : 200 FF

(2) Supplement sea/garden view 120 FF

Rates in French Francs, per room, per day, inclusive of tax and service, but not inclusive of local tax. Local tax: 4 = 5FF; 3* = 4FF; 2* = 3FF Your reservations:*

Rooms Type	Number	Hotel	Dates Arrival	Departure
Single				
Double				

No accomodation will be guaranteed after March 31, 1992 but requests will be met according to availability. Upon receipt of this form, NICE CONGRES will send you a note with the name and address of the hotel where a room will have been booked on your behalf. Then, for firm confirmation of your reservation, kindly send NICE CONGRES a check, made out to the name of your hotel for the amount indicated on the confirmation form or please advise your Credit Card number and type. This sum corresponds to a deposit and will be deducted from your final bill. Of course, you will be responsible for paying the balance of your bill directly to your hotel. Any change regarding your stay must be notified to NICE CONGRES at least two weeks before arrival, failing which you will lose your night deposit. NICE CONGRES cannot be responsible for the availability of accomodation if arrival is in advance of the notified date.

DATE ..... *SIGNATURE* .....

Calendar

•**February 4-7 MEMS'91: 5th Annual Workshop on Micro Electro Mechanical Systems.** Travemunde, Germany. *Sponsor:* IEEE Electron Devices Society. Contact: MEMS'92 Secretariat. Susanne Jakob. Fraunhofer-Institut fur Mikrostrukturtechnik, Dillenburger Str. 53, D-1000 Berlin 33, Germany.

• **February 18-21 International Conference on Intelligent Control & Instrumentation (SICICI '92)** Singapore *(See Call for Papers)*

•**March 8-12. IEEE International Conference on Fuzzy Systems. San Diego.** *Sponsors*: the IEEE Neural Networks Council CA. Sponsors: Contact: Nomi Feldman, Conference Coordinator, FUZZ-IEEE SYSTEMS CONFERENCE, 5665 Oberlin Drive, Suite 110 San Diego, CA 92121 USA (619) 453-6222 FAX (619) 535-3880

•**March 16-18 2nd International Workshop on Advanced Motion Control.** Nagoya Japan. *Sponsor*: IEEE/IES. *Contact:* Prof. Shigeru Okuma, Nagoya Univ. Japan, Tel: 81 52 781 5111, ext. 6753; FAX 81 52 781 9263

•**May 10-15 IEEE International Conference on Robotics and Automation.** Nice, France. *Contact:* R&A Conference,(US) Harry Hayman, PO Box 3216, Silver Spring MD 20918. Phone/FAX: 407 483 3037. (Other) Monique Simonetti or Catherine Juncker, Bureau de Relations Exterieures, Unit de Recherche, Sophia- Antipolis 2004, Route des Lucioles, B.P. 109-06561, Valbonne, Cedex France. FAX 33-93-65-77-65.

•**May 18-22 ECCV2 European Conference on Computer Vision.** Santa Margherita Ligure Italy. Contact: Prof. Giulio Sandini, DIST Univ. of Genova, via Opera Pia 11 A, 16145 Genova, FAX 39 10 603 801, e-mail eecv92@dist.unige.it.

•**May 20-22 3rd Int. Conf. on Computer Integrated Manufacturing.** Troy, New York. Sponsors: Rensselaer Polytechnic Institute and New York Center for Advanced Technology in Automation and Robotics. Contact: Alan Desrochers, RPI, CII 8015, Electrical, Computer and Systems Engineering, Troy NY 12180-3590.

•**May 20-22 IFAC Symposium on Intelligent Components and Instruments for Control Applications.** Malaga, Spain. *Contact:* SICICA '92, Facultad de Informatica, Plaza El Ejido s/n, 29013 Malaga SPAIN. (Tel:) (34)52-131412; FAX: (34)52-264270. E-mail: sicica@octima.uma.es.

•**June 7-10. IJCNN: International Joint Conference on Neural Networks.** Baltimore. Contact: Ms. Nomi Feldman, IJCNN '92 5665 Oberlin Drive, Suite #110 San Diego, CA 92121 Telephone (619) 453-6222 FAX (619) 535-3880

• **June 14-17 The Fifth IEEE Symposium on Computer-Based Medical Systems:** Durham, North Carolina. Pete Santago, Department of Radiology, Bowman Gray School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157-1022 (telephone 919-748-4260; FAX 919-748- 2870; e-mail cbrns@mrips.bgsm.wfu.edu))

•**June30-July2 FAIM 92: Joint International Conference on Flexible Automation and Information Management.** Limerick, Ireland.

•**July 7-10 IEEE International Conference on Intelligent Robots and Systems IROS '92.** Raleigh NC.

• **July 13-15 Japan-USA Symposium on Flexible Automation.** San Francisco ASME and Institute of Systems, Control and Information Engineers of Japan. Contact: Professor Ming C. Leu, Dept. of Mechanical and Industrial Engineering, Rm. 311, MEC, New Jersey Institute of Technology, University Heights, Newark NJ 07152.

•**August 4-7 International Conference on Control and Robotics.**

ETFA'92 Call for Papers

IEEE International Workshop on
Emerging Technologies and Factory Automation
-Technology for the Intelligent Factory-
August 11-14, 1992, Melbourne, Australia

IEEE

Sponsors:
IEEE Industrial Electronics Society
Swinburne Institute of Technology, Australia

In cooperation with:
Applied Computing Research Institute, La Trobe University, Australia
Australian Computer Society
Institution of Engineers, Australia

With financial contributions from:
Holden's Engine Company, Australia
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Organizing Committee:

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Swinburne Inst. of Tech. , Australia

Workshop Vice Chairman
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Program Committee Chairman
T S Dillon
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Program Committee
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R Swiniarski, San Diego State Univ. USA
R Taber, University of Alabama, USA
A C Weaver, Universit of Virginia, USA

Local Organization
R Dawe, Swinburne Inst. of Tech.
M Gillin, Swinburne Inst. of Tech.
M Palaniswami, University of Melbourne
R Zmood, Royal Melbourne Inst. of Tech.

A qualitative change is taking place in the area of factory automation with the advent of the "intelligent factory". This is characterized by the addition of intelligent components to the factory environment. This will provide greater flexibility and productivity with reduced capital outlays in the 21st century. These emerging technologies and their applications to the factory environment are the topics of this workshop.

Papers are invited on the following methodologies and applications:

-Neural networks: architectures , learning algorithms, applications
-Fuzzy control, learning control, diagnosis
-Temporal and logical reasoning systems
-Genetic algorithms and their applications
-AI techniques/expert systems for intelligent robotic and industrial systems
-Petri nets and other techniques for modelling and performance evaluation of discrete-event dynamic systems
-Concurrent engineering
-Scheduling and control of manufacturing systems
-Information technology for CIM: software environments, computer architectures
-Factory computer communications: protocol performance and efficiency, LANs, architectures, new protocols
-Intelligent automation/process automation
-Intelligent robotic systems: task and motion planing, distributed multiple robotic systems, cellular robotics, robot sensing, sensor integration and fusion
-Vision and inspection systems
-Application of parallel or distributed computing to manufacturing and robotic systems
-Software development and tools for manufacturing related systems

Tutorial Sessions:
Tutorial sessions will be offered in parallel on Tuesday, August 11, 1992. These tutorials, which will be presented by industry and academic leaders, will offer participants both an overview and a deeper look into some of the emerging technologies and their applications to factory environment.Tutorials will cover the following topics: expert systems, neural networks, fuzzy control, systematic approach to development of manufacturing systems, intelligent robotics, sensor integration and fusion.

Submission of Papers and Author's Schedule:
Submit an abstract and summary, formatted as follows. First page: title, authors, mailing address of each author, telephone and fax numbers, Email address. Second page: title, authors, 100 word abstract. Third and succeeding pages: title, 1500-2000 word summary. Submit four copies of each, in English, to the Technical Program Committee Chairman.

Prof. Tharam S. Dillon
Dept. of Computer Science
La Trobe University
Melbourne, 3083
Australia

Paper summary submission due:	Jan. 31, 1992
Acceptance notification	April 1, 1992
Final camera ready paper due	June 1, 1992

For further information contact Dr Richard Zurawski, Laboratory for Concurrent Computing Systems, Swinburne Institute of Technology, PO Box 218, Melbourne 3122, Australia. Ph. +61 3 819 8036, Fax +61 3 819 6443, Email address rzz@stan.xx.swin.oz.au

An associated symposium, consisting of invited papers and panel discussions, is planned for North Queensland for the days following the main Workshop.

CALL FOR PAPERS

1992 IEEE International Symposium on

INTELLIGENT CONTROL

August 11-13, 1992
The Albany Hotel
Bothwell Street
Glasgow, Scotland.
U.K.

Sponsored by the IEEE Control Systems Society

General Chairman:	Edward Grant, University of Strathclyde/Turing Institute
Program Chairman:	Thomas C. Henderson, University of Utah
Local Arrangements:	Kenneth Hunt, University of Glasgow
Publications Chairman:	Barry A. Shepherd, Turing Institute
Finance Chairman:	William Leithead, University of Strathclyde

Having evolved in the USA the 7th IEEE International Symposium on Intelligent Control (ISIC-92) will be held for the first time in the UK.

The theme for ISIC-92 will be **"Learning in Control"**. Artificial intelligence techniques have begun to enter control engineering. The requirement for an accurate mathematical model of the process to be controlled and the inability to set meaningful goals for the adaptive mechanism are the two major difficulties in designing an adaptive controller using conventional control theory. The expert controller equipped with the control engineers' knowledge and skills overcomes these two major difficulties. Expert controllers with an automatic learning capability must be built, controllers that learn through transferring the skill of the expert by a tutorial process. That is the machine must be able to build up its skill in the domain automatically in the form of appropriate control actions triggered by the sensed state variables. This skill transfer phase can be through elicited rules, passive learning or machine learning. Although machine learning has been applied widely in the control of complex dynamic systems, learning from Computer Aided Design (CAD) and interactive graphic representations and models is still in its infancy. In ISIC-92 we hope to attract discussion on this form of learning when applied in the automated manufacturing workcell, teleoperation domains, and at the architecture specification level.

Papers are being solicited for presentation at the Symposium and publication in the Symposium Proceedings. Topics of interest include but are not limited to:

- Intelligent Control for Process Systems
- Machine Learned Control
- Perception for Task Control
- Autonomous and Teleoperated Robotics
- Qualitative Modelling
- Adaptive and Self-Organising Systems
- Intelligent Manufacturing Systems
- Fuzzy Control
- Autonomous Control Systems
- CAD and Interactive Graphics
- Space, Underwater, and Teleoperated Robots
- Hierarchical Controllers
- Bio-engineering
- Reasoning Under Uncertainty
- Neural Network Controllers
- Multisensor fusion
- Active Sensing and Perception
- Fault Diagnosis and Monitoring
- Discrete Event Systems
- Knowledge-Based Automation
- Linguistic Control
- Mechatronic System Control
- Relational Databases for Control
- Hypermedia Design Tools
- Other Related and Novel Topics

PTO

ICARCV '92
SECOND INTERNATIONAL CONFERENCE ON AUTOMATION, ROBOTICS AND COMPUTER VISION

15 - 18 September 1992
Hyatt Regency, Singapore

Organisers

- School of Electrical and Electronic Engg. Nanyang Technological University
- Institution of Engineers, Singapore (IES)

Co-sponsors

- The Institution of Electrical Engineers (IEE), UK
- Institute of Measurement & Control (InstMC), UK
- Economic Development Board (EDB)
- National Computer Board (NCB)
- GINTIC Institute of CIM, Singapore
- Instrumentation & Control Society of Singapore (ICS)
- Singapore Industrial Automation Association (SIAA)
- Singapore Computer Society (SCS)

In Co-operation with:

- The Institute of Electrical and Electronics Engineers (IEEE), Singapore Section
- IEEE Computer Society
- IEEE SMC Society

International Advisory Committee

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Loo Helene, SCS, Singapore
Loh Robert, Oakland U, USA
Luh Y, John, Clemson U, USA
McClamroch, N H, U of Michigan, USA
Nee Y C, Andrew, NUS, Singapore
Pugh, Alan, U of Hull, UK
Rodd, M G, U of Wales, UK
Snyder, Wesley E, Wake Forest U, USA
Sunahara Y, Okayama U, Japan
Trivedi M M, U of Tennessee, USA
Vidyasagar M, CAIR, India
Wang P, Northeastern U, USA

Organising Committee

General Chairman - Dinesh P Mital
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Secretary - P Saratchandran
Technical Programme - Soh Cheong Boon
Finance - Chin Teck Chai
Publications - R Devanathan
Publicity - Sng Yeow Hong
Local Arrangements - Sim Siong Leng
International Co-ordination - Toe Myint
Exhibition - Choo Fook Hoong

FINAL CALL FOR PAPERS

The Second International Conference on Automation, Robotics and Computer Vision will be held in Singapore on 15 - 18 September 1992. The conference is jointly organised by the School of Electrical and Electronic Engineering, Nanyang Technological University and the Institution of Engineers, Singapore. The theme of this conference will be *"A Glimpse of The 21st Century"* in the context of intelligent industrial automation. The conference will focus on both theory and applications. There will be plenary and tutorial sessions. An exhibition will also be held in conjunction with the conference.

Papers describing original work in, but not limited to, the following research areas are invited:

- Robotics
- Computer Vision
- Control Applications
- Real-Time Systems
- Pattern Recognition
- Sensors and Actuators
- Intelligent Automation
- Neural Networks
- AI & Expert Systems
- FMS Systems
- Process Automation
- CIM

Keynote Addresses by :

Professor Michael Brady, Professor Russell C Eberhart and Professor Lester Gerhardt

Tutorial Sessions :

A: State-of-the-Art in Computer Vision
By **Professor Michael Brady**

B : Technology and Integration in the 21st Century
By **Professor Lester Gerhardt**

C: Engineering a Solution with Neural Networks
By **Professor Russell C Eberhart**

D: Sensor-Based Intelligent Robots
By **Professor Mohan M Trivedi**

E : Real-Time Software Engineering for Industrial Applications
By **Professor Mike Rodd**

Authors are invited to submit four copies of an extended summary of 300-500 words to:

Assoc Prof D P Mital
ICARCV '92 Conference Secretariat
Associated Conventions & Exhibitions Pte Ltd
204 Bukit Timah Road, #04-00
Boon Liew Building, Singapore 0922
Tel : (65) 799 5470, 799 5399 Fax : (65) 791 2687
Telex : NTU RS 38851
E-mail: EMITAL@NTUVAX.BITNET

All materials must be written in English and papers should be submitted only if you intend to present the paper in Singapore. The extended summary should contain sufficient details including key concepts and novel features of the work. The summary should include authors' name, address for communication, contact telephone number, email address and broad classification under which paper can be best classified.

Author's Schedule :

30 April 1992	Extended Summary
31 May 1992	Notification of Acceptance
30 June 1992	Receipt of Final Manuscript

Proposals for special sessions are also welcome and should be submitted to the Conference Secretariat before 31 January 1992. The broad categories of areas to be covered are Robotics, Computer Vision, Intelligent Automation and Neural Networks.

An exhibition on the latest developments (hardware, software and literature) in the area of Intelligent Instrumentation and Automation will also be organised along with the conference. It will be held on 16 - 17 September 1992. For more details and reservation please contact the Conference Secretariat.

'92 Conference Update

The R&A '92 program committee was scheduled to meet in December to make the final selection of paper.. Program Chairman Georges Giralt reports that nearly half (49%) of the 941 papers submitted came from outside North America.. Submissions came from 36 countries around the world, with 14 countries submitting 10 or more papers each.

Submissions: February 14, 1992. Europe: G. Musgrave, Brunel University, Dept. Elect. Eng., Kingston Lane, Uxbridge, Middlesex UB8 3PH UK; North America: MP Associates, Inc., EuroDAK;92 Sec., 7490 Clubhouse Rd., Ste. '01, Boulder CO 80301; Asia: S. Goto, NEC Corporation, C&C Research Labs, 1-1 Miyazaki, 4-Chome, Miyamae-ku, Kawasaki Shi, Kanagawa 213 JAPAN

- **ISRAM'92: 4th International Symposium and Exhibition on Robotics and Manufacturing.** November 11-13 1992. Santa Fe New Mexico. *Submissions*: Send 3 copies of full-length regular papers or extended abstracts of short papers by October 1, 1991 *Contact*: Dr. Ron Lumia (Robotics), Intelligent Controls Group, Robot Systems Division, National Institute of Standards and Technology, Gaithersburg MD 20899 USA, Tel: 301-975-3452; FAX 301-990-9688, email: lumia@c-me.nist.gov or Prof. Joe H. Mullins (Manufacturing), Manufacturing Engineering Program, Farris Engineering Center, College of Engineering, University of New Mexico, Albuquerque, NM 87131 NM 87131 USA. Tel: 505-277-0558; FAX: 505-277-0813.
- **31st IEEE Conference on Decision and Control,** December 16-18, 1992, Westin LA Paloma Resort/ Hotel, Tucson, AZ. *Deadline:* March 1, 1992. *Contact:* Professor T. Basar, Coordinated Science Lab, Univ. of Illinois, 1101 West Springfield Ave., Urbana, IL 61801, (217) 333-3607, (217) 244-1764 (FAX) e-mail: tbasar@markov.csl.uiuc.edu.

A Century of Service (cont. from p. 3)

significant and exciting technological field of its time.

In the next issue of the Newsletter, with the assistance of the "Grand Old Men and Women of the Society" (most of whom will never see 40 again), we will present a brief history of the Robotics and Automation Society.

DEADLINE FOR SPRING ISSUE:

FEBRUARY 15, 1992!

IEEE Robotics & Automation Society

ROBOTICS AND AUTOMATION

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