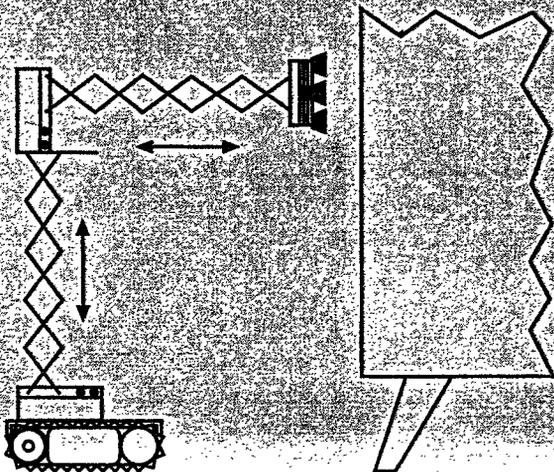


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Alicia Casals and
Anibal T. de Almeida (Eds)

Experimental Robotics V

The Fifth International Symposium,
Barcelona, Catalonia, June 15–18, 1997



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Editors

Professor Alicia Casals
Universitat Politècnica de Catalunya, Pau Gargallo n.5, 08028 Barcelona, Spain

Professor Anibal T. de Almeida
ISR, Dep. Eng. Electronica, University of Coimbra, POLO II, 3030 Coimbra, Portugal

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PREFACE

Experimental Robotics V - The Fifth International Symposium on Experimental Robotics (ISER) was held at the Universitat Politècnica de Catalunya (UPC), Barcelona, from June 15 to 18, 1997. This meeting was the latest in a series of symposia designed to bring together researchers from institutions around the world that are at the forefront of experimental robotics research. The main objective of these symposia is to pool experience in the various fields of robotics, concentrating not only on theoretical and technological questions, but also on their experimental validation.

The experimental robotics symposia are held every two years rotating through North America, Europe and Asia. The first Symposium of the series was organized by V. Hayward and O. Khatib, in Montreal, Canada in June 1989. The second one, organized by R. Chatila and G. Hirzinger was held in Toulouse, France, in June 1991. The third, organized by T. Yoshikawa and F. Miyazaki, was held in Kyoto, Japan, in 1993, and the 1995 meeting was organized by O. Kathib and K. Salisbury, and held in Stanford, USA.

The International Program Committee for the 1997 meeting comprised:

Anibal T.de Almeida	University of Coimbra, Portugal
Alicia Casals	Universitat Politècnica de Catalunya, Spain
Raja Chatila	LAAS/CNRS France
John Craig	Adept Technology, Inc., U.S.A
Paolo Dario	Schuola Superiore Sta. Anna, Italy
Joris De Schutter	Katholieke Universiteit Leuven, Belgium
Vincent Hayward	McGill University, Canada
Gerhard Hirzinger	DLR, Germany
Oussama Kathib	Stanford University, U.S.A
Jean-Pierre Merlet	INRIA, France
Fumio Miyazaki	Osaka University, Japan
Yoshihiko Nakamura	Tokyo University, Japan
Kenneth Salisbury	MIT, USA
James Trevelyan	University of Western Australia
Tsuneo Yoshikawa	Kyoto University, Japan

As occurred with the previous ISER meetings, the publication of the symposium preprints has been followed by publication in this Lecture-Notes Series of the revised papers and general conclusions of the sessions. This time, the compilation of the experimental results in the video proceedings will provide a further source of information about the advances in experimental robotics.

The symposium was attended by participants from thirteen countries who introduced the studies selected by the International Program Committee (IPC). These experimental studies covered the design, perception, control, planning and robotic

applications in areas such as mobile robots, space, underwater, medicine and civil engineering. The standard presentations in one-theme sessions were enriched by four keynote speeches, one of which opened the proceedings each day. The first one, by Pradeep Koshla, was entitled: Emerging Paradigms and Technologies in Robotics; the second, given by Gerd Hirzinger was: On the way towards a new Robot Generation; the third, presented by Hirochika Inoue, was entitled: Evolution of Experimental Robotics; and the last one, by Georges Giralt, was entitled: Novel Perspectives and Challenges for Robotics in Europe. The quality of these presentations stimulated numerous questions and comments from the participants. The small number of participants and the quality of the experimental research presented enabled the goal of the symposium to be attained: that is, to present the most advanced research works in experimental robotics, in an atmosphere that was conducive to discussion and the exchange of ideas.

Despite a certain feeling among the general public that robotics is antisocial, the fields of application of this technological research and development area show that robots can contribute greatly to a better quality of life. The new techniques emerging in the surgical field make minimally invasive surgery possible in some delicate interventions improving both surgical procedures and results. The advances in rehabilitation robotics open up possibilities for the greater independence of disabled people. Very risky tasks, or tasks which humans can not perform, can be solved by robots or by robots cooperating with humans. Successes in space, underwater, construction, medicine, hazardous manufacturing tasks, the nuclear industry and mining applications show the realities which already exist. The success of this event and the interest it aroused confirmed the appropriateness of its continuing in the future. Therefore, the IPC decided to entrust the sixth edition of ISER to Peter Coorke and Ray Jarvis, who will organize it for 1999 in Cairns, Australia.

On behalf of the International Program Committee we would like to thank the UPC, for hosting the symposium and especially its Rector Jaume Pagès for his kind welcoming address. We would also like to thank Antoni Giró, President of the Catalan Research Agency for his warm reception in the wonderful setting of the Palau de la Generalitat. We also wish to thank the CICYT (Spanish Research Agency), CIRIT (Catalan Research Agency), SCT-IEC (Catalan Society of Technology filial of the Institute for Catalan Studies) and the ETSECCP (School of Civil Engineering of Barcelona) for their contributions to the Symposium.

Our special and warm thanks to the group of people of the Department of Automatic Control and Computer Engineering of UPC who did a tremendous job of organization and support before and during the symposium. Professor Josep Amat provided many good ideas and experiences. Josep Fernandez, Jesús Galceran, Antoni Grau, Pere Marès, and Rita Planas gave their best in support of the Symposium. The administrative support of Rosa Sánchez was paramount to the smooth running of the conference.

Alicia Casals and Anibal T. de Almeida
Barcelona, Catalonia (Spain), September 1997

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Keynotes

The evolution, trends and perspectives of experimental robotics are the main issues of the keynotes. This analysis addresses topics such as real world understanding, human robot cooperation, advanced teleoperation, haptic devices, biologically inspired systems, intelligent systems with tight coupling between perception and action, advanced sensors, sensor data fusion and registration, dexterity, and micro-robotics among others. New concepts and paradigms lead to advanced methodologies and procedures to develop more powerful and intelligent robotic systems.

Hirzinger describes through the DLR's experiences in space robotics, some relevant aspects of the current state of the art of: advanced sensor technologies, mechatronics devices, advanced teleoperation control, interfaces with bilateral control, 3D imaging and virtual environment. Associated with these technologies and methodologies other aspects such as world modeling, skill transfer and learning and neural networks are considered, in relation to the applications developed at DLR.

Inoue analyses experimental robotics evolution through the Japanese research program on intelligent robotics. Biological inspired systems and humanoid robots shows real new trends in robotics research comprising the above mentioned technologies. The program focuses the research towards emerging paradigms of machine intelligence through real world interaction, world and behavior understanding and human-robot interaction and cooperation among other related issues.