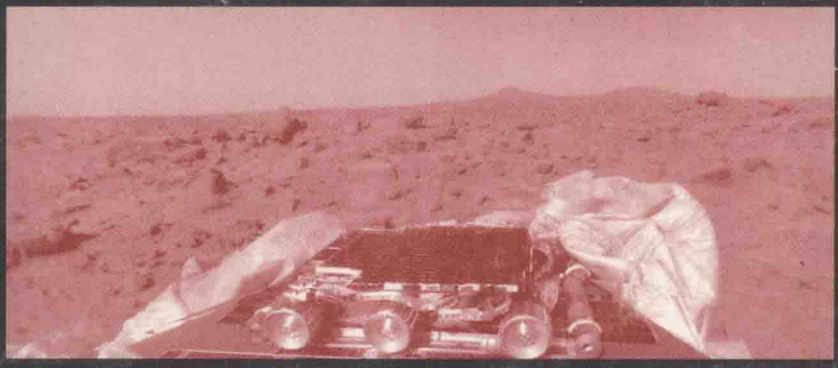
ROBOTIC AND MANUFACTURING SYSTEMS

Recent Results in Research, Development and Applications

Volume 10



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Cover Design: The cover of this Volume shows the NASA JPL's Mars Pathfinder as it landed on the red Planet on July 4, 1997. Photo is courtesy of NASA.

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Proceedings of the Fourth Biannual World Automation Congress (WAC 2000), ISORA 2000 and ISOMA 2000, Maui, Hawaii, USA

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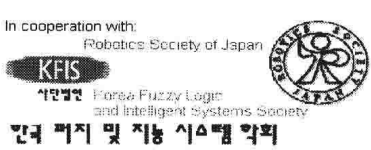

ALBUQUERQUE **TSI PRESS** **2000**

THIS VOLUME IS DEDICATED TO:

Dr. Joseph F. Engelberger

For his pioneering, outstanding and dedicated life-time work in establishing the Robotic Industry. For his outstanding and truly pioneering contributions to science and technology of robotics and its industrial usage worldwide.

Please see the reverse side

Joseph F. Engelberger is the founder and was the first president of Unimation, Inc. His background includes B.S. and M.S. degrees from Columbia University, and has authored numerous articles in the instrumentation field and in the field of robotics. His 1980 book entitled Robotics in Practice has been translated into six languages. In 1989, his latest book, Robotics in Service, was published simultaneously in the United Kingdom and the United States. Honors include the Progress Award of the Society of Manufacturing Engineers, the Leonardo da Vinci Award of the American Society of Mechanical Engineers, and the 1982 American Machinist Award. The University of Liverpool bestowed the first McKechnie Award on him in 1983. In 1984, he was elected to the National Academy of Engineering; he was the recipient of the Egleston Medal for distinguished engineering achievement from Columbia University. Honorary doctorates have come from the University of Bridgeport, Spring Garden College, Briarwood College, Trinity College and from Carnegie-Mellon University. In 1992, he was profiled in the London Sunday Times series on The 1000 Makers of the 20th Century. In January 1997, he received the Beckman Award for pioneering and original research in the general field of automation. He is the 1997 recipient of the highest Japanese technology honor, the Japan Prize, for the establishment of the robot industry.

Dr. Engelberger, often called the Father of Robotics, is generally considered to have been the driving influence in the creation of the industrial robot industry. The Robotic Industries Association annually presents the Joseph F. Engelberger Awards to "persons who have contributed outstandingly to the furtherance of the science and practice of robotics." Dr. Joe Engelberger was the chairman of HelpMate Robotics Inc. (formerly known as Transitions Research Corporation). The mission of HRI is to give robots a spectrum of sensory perception so that mobile, sensate robots can work shoulder to shoulder with human mentors in service activities. The company's flagship product is HelpMate, a robotic hospital courier, installed in over 80 US hospitals as well as in Europe and Japan. Engelberger's new cause celebre' is a two armed, mobile, sensate and articulate robot that could be a servant-companion for elderly cognitive but mobility impaired individuals.

PREFACE

Robotics and Manufacturing continue to make big impacts on the daily lives of the all nations. These effects are more pronounced among more developed nations where robots are being put to use in various applications : From traditional applications like spray painting and spot welding to space autonomy and on to health care robots for the service industry. In the USA, for example, autonomous robots are being developed for space-based applications as well as semi-autonomous vehicles for earth-bound use like nuclear waste monitoring and handling and detonation of bombs, etc. One area of robotics which has received great deal of attention in recent years has been cooperative robotics with applications in space, military, etc.

Manufacturing, at the same time, constitute a major home for both robotics and soft computing techniques. The former mix would result in automated and flexible manufacturing, while the latter would provide what is being called "intelligent manufacturing".

It is anticipated that robotics and manufacturing will continue t play major roles in the 21st Century. As price of labor force goes up and the danger of hazardous materials handling and exposure to human become even more concern, robots and robotic systems continue to dominate both the industrialized world and the developing world.

This volume constitutes a report on the research papers presented at the Eighth International Symposium on Robotics and Applications (ISORA 2000) and Seventh International Symposium on Manufacturing and Applications (ISOMA 2000) held within the World Automation Congress (WAC 2000) in Maui, Hawaii from June 11-15, 2000. These symposia brought together scientists and technologists from many countries around the world. Government, industry and academia were represented well.

The editors would like to take this opportunity to thank all the authors for their contributions to this volume and the Symposium. We would like to thank Dr. Joseph F. Engelberger, Professor George Bekey, Dr. Charles Wesibin, Dr. David Sassoon and Dr. F. Cancilliere for their keynote speeches and contributions to the technical program of these Symposia. The two robotic mini-symposia were also an important element of the ISORA 2000 program. We like to thank Professors J. Yu and S. Choi of the University of Hawaii for superb and diligent organization of SURP 2000 - Symposium on Undersea Robotic Technology and Dr. Edward Tunstel and Dr. Steve Chien of NASA Jet Propulsion Laboratory for their superb organization of the other mini-symposium, SSA 2000 on Space Autonomy. The mini-symposia, which have been offered at WAC 2000 for the first time, have been complete success due to the fine works of the above individuals.

We wish to thank and acknowledge the contributions of many other individuals, including Professors C. C. Nguyen, R. Roberts, A. Agah, Nina Vojdani and H. Abachi as well as Drs. G. Oriolo, J. Kia, J. Michaloski, F. Proctor, among many others who have made ISORA and ISOMA 2000 very successful tracks for WAC 2000. The diligent efforts of Ms. Jila S. Jamshidi of TSI Enterprises, Inc. and many others prior and during the World Congress are truly appreciated.

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July 29, 2000

WAC 2000

WAC 2000
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ISORA 2000

ISOMA 2000

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