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Editors

CAD/CAM Robotics and Factories of the Future '90

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Conference Objective

The last decade has seen the emergence of a unified approach for product design which attempts to combine traditionally distinct tasks like design, management, marketing, analysis, manufacture and materials. Often called "Concurrent Engineering" or "Simultaneous Engineering", this new philosophy aims at improving cost competitiveness by reducing waste of time, money, and other resources inherent in the iterative traditional methods. In view of the importance of this new philosophy, Concurrent Engineering is selected as the theme for this conference.

The main objective of the conference is to bring together researchers and practitioners from government, industries and academia interested in the multi-disciplinary and inter-organizational productivity aspects of advanced manufacturing systems utilizing CAD/CAM, CAE, CIM, Parametric Technology, AI, Robotics, AGV Technology, etc.

Conference Organization

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Letter from the President, ISPE

The International Society for Productivity Enhancement (ISPE) is entering its seventh year. The Conference you are attending is our fifth of the international series on CAD/CAM, Robotics and Factories of the Future (CARS & FOF). The fourth conference was held at the Indian Institute of Technology, New Delhi, India in 1989. During the past seven years, we have expanded our activities significantly. The membership interest and international participation are also growing. During the past year alone, the Society has made tremendous progress in the following major frontiers:

JOURNAL: The Society now has its own journal entitled The International *Journal of Systems Automation Research and Applications* (SARA), an international, multidisciplinary research and applications-oriented journal to promote a better understanding of systems considerations in interdisciplinary automation using computers. The Journal contains important reading for design, engineering, and manufacturing persons as well as those with interest in research and development and applications of productivity tools, concepts and strategies to multidisciplinary systems environments. The Journal will only publish original, quality papers. To receive more information about this Journal, write to: Editor-in-Chief, ISPE, SARA Journal Department, P.O. Box 731, Bloomfield Hills, Michigan 48303-0731.

PROCEEDINGS: Starting this year (with the Fifth Conference), the Society is now making the Conference Proceedings available at the Conference. Selected papers from this Proceedings will also be considered for publication in *SARA*.

CONFERENCES: ISPE's annual conferences are now book until 1994. The Sixth International Conference will take place at South Bank Polytechnic, London from August 19-21, 1991. The Seventh and Eight International Conferences will be held in Leningrad, USSR and France, respectively.

COOPERATIVE PROGRAMS: In 1989, ISPE started a new cooperative program called the Indo-U.S. Forum for Cooperative Research and Technology Transfer (IFCRTT) in cooperation with West Virginia University and the National Science Foundation (NSF). The first joint meeting of the IFCRTT was held from December 17-18, 1989, in New Delhi, India. The meeting attracted a large body of scholars from industry, universities, and research institutions from both the United States and India. Similar cooperative programs are being arranged in the U.K., U.S.S.R. and France.

As you can see, we have made great strides, but significant changes are taking place in the manufacturing sectors due to global competitiveness and economic factors. Productivity enhancement needs are even larger than before, and such needs require us to be more dynamic and resourceful. ISPE is looking for a few good people to take leadership positions in its organization and committees for sponsored events. If you would like to help us build our technical program or if you would like to work on ideas of your own, please write to us. There are openings in the following areas:

* *SARA* Journal - Readers' Committee
* Productivity Directors
* Workshop and Tutorial Organizers
* CARS & FOF Conferences: University, Industry, International Representatives, Session Organizers, and Technical and Program Chairpersons.

We are still a very young organization and your leadership can play a significant role. Please do not hesitate to write us with your ideas and opinions.

Biren Prasad, Ph.D.
ISPE, P.O. Box 731, Bloomfield Hills, MI 48303-0731, USA.

Acknowledgments

The Fifth International Conference on CAD/CAM, Robotics, and Factories of the Future (Cars & FOF '90) was hosted by the College of Engineering and Technology at Old Dominion University and was endorsed by more than ten societies, associations, and international organizations. The conference was held in Norfolk, Virginia at the Omni International Hotel from December 2-5, 1990. Over 200 presentations organized into 40 specialty sessions, three plenary sessions, and eight workshops were conducted during the four days. Authors, plenary session speakers, and participants from 17 different countries around the world converged in Norfolk for this Conference. In view of the ever-increasing importance for integrating different facets of manufacturing with design process, the organizing committee selected "Concurrent Engineering" as the theme of the Conference.

I wish to acknowledge, with many thanks, the contributions of all the authors who presented their work at the Conference and submitted the manuscripts for publication. It is also my pleasure to acknowledge the role of banquet, luncheon, and plenary session speakers who shared their vision of the manufacturing industry and issues related to productivity. My sincere thanks to the session organizers, session chairs, and members of the Organizing Committee both at Old Dominion University and West Virginia University without whose cooperation this Conference would not be possible. Thanks are due to Ms. Georgette Ingram and other staff members in the MET Department for their patience and hard work. Financial support from the Center for Innovative Technology and industrial sponsors also made this Conference possible.

I acknowledge, with gratitude, the help and support received from Dr. James V. Kock, President, and Dr. Ernest J. Cross, Dean of the College of Engineering and Technology at Old Dominion University. From West Virginia University, I thank Dr. Donald W. Lyons, Chairman, MAE Department, for his support; Drs. Ralph Wood and John Spears for their help in reviewing conference papers and for allowing us to use the facilities of the Concurrent Engineering Research Center; and Ms. Sati Maharaj for her assistance in coordinating the conference. In addition, I extend my deepest gratitude to Dr. Suren N. Dwivedi for providing me with support and encouragement in organizing this conference. Furthermore, I express my sincere thanks to all my colleagues, friends, student volunteers, and family members who extended their help in organizing this conference.

I also acknowledge with great appreciation the excellent work done by Springer-Verlag in publishing both volumes of the proceedings.

Alok K. Verma
Conference General Chairperson

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Preface

According to the Concurrent Engineering Research Center (CERC) at West Virginia University, "the concurrent engineering (CE) is a rapid simultaneous approach where research and development, design, manufacturing and support are carried out in parallel". The mission of concurrent engineering is to reduce time to market, improve total quality and lower cost for products or systems developed and supported by large organizations. The purpose of the concurrent design methodology is to let the designer know the consequences of his design decisions in the manufacturing and assembly stages as well as in subsequent operations. Design for manufacture and assembly, design for reliability and testability, CAD/CAM/CAE, knowledge based systems, cost analysis and advanced material technology are the major constituents of concurrent engineering. The need for concurrent engineering can be justified from the fact that in every production cycle, the design phase approximately takes 5 to 10% of the total cycle, but overall it influences 80% of the production cycle.

This volume contains articles from a wide spectrum dealing with concepts of concurrent engineering. The importance of the knowledge-based systems in the CE environment is significant as they provide the common platform to achieve the same level of expertise to the designers and manufacturers throughout the organization for the specific task. Their role in "*do it right the first time*" is very important in providing aid to the designers and manufacturers to optimize the design and manufacturing setups for a cost-effectiveness and reduced production time. The application of neural networks in various manufacturing areas has been presented. The papers on the feature based design, process simulation, design automation and quality control are discussed. A special section has been devoted to printed circuit boards, recognizing their importance in a CAD/CAM environment from both design and manufacture standpoint. This volume also presents articles describing the payoffs of concurrent engineering in advance materials development. The final section discusses the implementation of CE technology.

Suren N. Dwivedi

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