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Robotics and Autonomous Systems 13 (1994) 151–152

Robotics and Autonomous Systems

Editorial

Discrete event systems in robotics and automation

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Welcome to the Special Issue of the Journal of *Robotics and Autonomous Systems* on 'Discrete Event Systems in Robotics and Automation'.

The underlying mathematical representation of complex computer-controlled robotics and automation systems is still insufficient to create a set of models which accurately captures the dynamics of such systems over the entire range of system operation. We remain in a situation where we must tradeoff the accuracy of our models with the manageability of the models. Closed-form solutions of mathematical models are almost exclusively limited to linear system models. Computer simulation of nonlinear and discrete-event models provide a means for off-line design of control systems. Guarantees of system performance are limited to those regions where the robustness conditions apply. These conditions may not apply during startup and shutdown or during periods of anomalous operation.

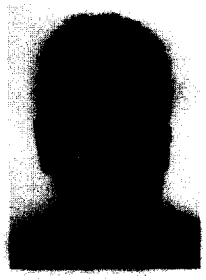
Recently, attempts have been made to model low- and high-level system changes in automated and semi-automatic systems as discrete event dynamic systems (DEDS). Several attempts to improve the modeling capabilities are focused on mapping the continuous world into a discrete one. However, repeated results are available which indicate that large interactive systems evolve into states where minor events can lead to a catastrophe. Discrete event systems (DES) have been used in the robotics, manufacturing and automation domains to model system state changes within a process. Timed, untimed, and stochastic petri nets and state automata, in addition to markovian, and perturbation models have been used extensively to model and control automated manufacturing systems. DEDS controllers have also been used to guide the behaviour of robots based on sensory feedback.

The focus of this issue is to present some problems related to robotics and automation for which discrete event systems play a significant role in the solution. We hope you will enjoy the papers in this issue.

Tarek M. Sobh received the B.Sc. in Engineering degree with honors in Computer Science and Automatic Control from the Faculty of Engineering, Alexandria University, Egypt in 1988, and M.S. and Ph. D. degrees in Computer and Information Science from the School of Engineering, University of Pennsylvania in 1989 and 1991, respectively. He is currently a Research Assistant Professor of Computer Science at the Department of Computer Science, University of Utah, and the Co-Chairman of the Discrete Event Dynamic Systems (DEDS) Technical Committee of the IEEE Robotics and Automation Society. Dr. Sobh was a research Fellow at the General Robotics and Active Sensory Perception (GRASP) Laboratory of the University of Pennsylvania during 1989–1991. His background is in the fields of computer science and engineering, control theory, robotics, computer vision and signal processing. His current research interests include reverse engineering and industrial inspection, CAD/CAM and active perception under uncertainty, robots and electromechanical systems prototyping, and automation for genetics applications. He has published over 50 journal and conference papers, book chapters, and technical reports

SSDI 0921-8890(94)00009-Q

in those areas. Professor Sobh is also interested in developing theoretical and experimental tools to aid performing adaptive goal-directed robotic sensing for modeling, observing and controlling interactive agents in unstructured environments. Dr. Sobh is a Licensed Professional Electrical Engineer in the State of Utah, a member of ACM, IEEE, Tau Beta Pi, Sigma Xi, and Phi Beta Delta honor societies.



Kimon P. Valavanis was born in Athens, Greece, in 1957. He received the Diploma in Electrical Engineering, Division of Electronic Engineering from the National Technical University of Athens (NTUA), Athens, Greece, in June, 1981, and he completed the Professional Engineer (PE) exams in February, 1982. Dr. Valavanis received the M. Sc. and Ph. D. degrees from Rensselaer Polytechnic Institute (RPI) in Electrical Engineering and Computer and Systems Engineering in 1984 and 1986, respectively. He is a member of the Technical Chamber of Greece (TEE). From 1982 to 1985 he was a Research Associate in the Robotics and Automation Laboratory at RPI. From 1986 to 1990 he held the Analog Devices Career Development Chair for Assistant Professors at the Department of Electrical and Computer Engineering, Northeastern University, where he was also Director of the Robotics Laboratory. Since January, 1991, he has been with The Center for Advanced Computer Studies, The University of Southwestern Louisiana (USL), where he is currently an Associate Professor of Computer Engineering and Associate Director for Research in Robotics and Automation at the USL Apparel-CIM Center. Dr. Valavanis' research interests are in the area of Robotics and Automation Systems, Intelligent Machines and Automated Manufacturing Systems. He has published over 100 book chapters, technical journal/transactions and conference papers. He is the co-author of the book (with G.N. Saridis) *Intelligent Robotic Systems: Theory, Design and Applications* (Kluwer Academic Publishers, 1992). He has organized and taught Tutorial Workshops at the IEEE CDC, ACC and IEEE International Conference on Robotics and Automation. He serves as the Robotics and Automation Society Discrete Event Dynamic Systems Technical Committee Co-Chair, he is an Associate Editor of the *IEEE Robotics and Automation Society Magazine*, and he is the Book Review Editor of the *Journal of Intelligent and Robotic Systems*. Dr. Valavanis was the Program Co-Chairman of the 4th IEEE International Symposium on Intelligent Controls, Vice-Program Chair of the 4th International Conference on Tools with Artificial Intelligence, Local Arrangements and Publications Chairman for the 1993 Computer Architectures for Machine Perception (CAMP '93) Conference, the General Chairman of the Second IEEE Mediterranean Symposium on New Directions in Control and Automation, and will be the Local Arrangements Chairman of the 34th IEEE CDC. Dr. Valavanis is a Senior member of IEEE, a member of Sigma Xi, member of the Academy of Sciences of New York, ISRA and RIA.