

## *Editorial for Special Issue*

The Advanced Summer Institute, ASI'96 was held in Toulouse, France, June 2<sup>th</sup>-6<sup>th</sup>, 1996. It was the third such event that was organized under the auspices of the ESPRIT Network of Excellence (NOE) in Intelligent Control and Computer Integrated Manufacturing Systems.

**The main theme of ASI'96 was "Life Cycle Approaches to Production Systems: Management, Control, Supervision".** The objective of ASI'96 was to bring together as many experts as possible from academia and industry to present their views on the present state of the art in the technical areas involved. An effort has been made to have presentations covering the principal aspects of the main theme of ASI'96 as widely as possible.

A series of invited lectures, technical presentations, round table discussions and demonstrations/exhibitions was planned during the four-day conference with the aim to raise the awareness of the scientific and industrial community in Europe regarding the potential impact of emerging solution for worldclass manufacturing in the future.

The paper **"A Hierarchical Structure for Control Of Discrete Events Systems and Monitoring Of Process Failure"** by E. Zamai et al, deals with a hierarchical and modular structure for real-time control and monitoring of Discrete Events systems like Flexible Manufacturing Systems (FMS). The developed approach is structured around three aspects: the complexity of the physical process to be controlled, the complexity of the controller and monitor, and so, the complexity of the communication between the physical process and the control and monitoring system.

The paper **"Performance Improvement Of A Mobile Robot Navigation System Through Ultrasonic Sensor Agents"** by E. Oliveira Freire et al, deals with the construction of a behavior-based control system for a mobile robot and the agent-based ultrasonic sensing system which was developed. For this agent-based system, the structure and the hardware implementation are examined. This sensing system is able to provide information on the type of detected obstacle as well as on the distance from it to the robot.

The article **"Solving FMS Scheduling Problems Using Hybrid Flowshop Scheduling Methods"** by J.-C. Billaut et al, considers a particular class of FMS, where the flexibility of the system is given by the material handling system which interconnects different machines in the system, and an Automated Guided Vehicle system (AGVs) ensures the links between the machines among the FMS. It emphasizes the relations that exist between FMS and the Hybrid flowshop scheduling problems, and shows how some of the FMS problems can be solved by this method.

The paper **"An Asymptotical Modification Of Two- Riccati Approach in Robust Stability Synthesis"** by A. Pervozvansky and L. Chechurin, discusses on how such a modification can make standard programs available and recent results in the asymptotical behavior of  $H_\infty$  and  $H_2$  norms. The paper answers how the optimal robustness problem is related to transfer function uncertainty which can be reduced to the synthesis on  $H_\infty$  criterion.

In the paper **"Identification Of Manufacturing Cell Dynamics Using Recurrent Neural Networks"** by G. Rovithakis et al, a neural network approach to the factory dynamics modeling problem is proposed. A recurrent high-order neural network structure is employed for identifying the manufacturing cell dynamics, and the capabilities of the proposed architecture are demonstrated. The plant is assumed to be an unknown dynamic system which varies in time and the objective is to approximate the unknown nonlinear dynamic system by neural networks.

The paper **"Decentralized Production-Synchronization Based On A Multi-Agent-Model"** by T. Kuhlmann et al, describes a development system for the production-coordination in the shipbuilding industry to support the decentralization of production planning. This application supports the long-and middle-term production-planning of complex one-of-a-kind products. Considering the involved software-systems concurrent manufacturing demands, a movement is applied from centralized towards decentralized models of control and action for such systems.

The paper **"Decoupling Functionality To Facilitate Controlled Growth"** by R.J van den Berg and A.J.R. Zwegers, describes the results of the action research project «Gordian» which studied some measures to be taken in order to facilitate controlled growth of a software product. It discusses three aspects of enhancing controlled growth of information systems and adequate technical decoupling streamlines the integration between systems components, whereas conceptual decoupling can be used to secure integrity of the system.

In the paper **"Evolutionary Computation Techniques for Traffic Supervision Based On A Model Of Telephone Networks Built From Qualitative Knowledge"** by I. Servet et al, three evolutionary

computation techniques for the optimization of complex functions are considered: multiple restart hill-climbing, population-based incremental learning and genetic algorithms. Their binary version and a real-coded variant of each of these techniques are experimented on a real problem: traffic supervision in telephone networks; they are compared and their results are discussed.

The paper "AED Theory and Hierarchical Knowledge Networks" by S. Novikava et al, describes the AED theory and its requirements when it is used for design & control process either as a single unit or as an AED network. The AED theory gives a new world outlook. It was applied to design&control of concrete physical, chemical and technical units. The hierarchical knowledge network is the result of initial processor multiplying by connecting single units, directed on design& control&learning of known levels. The highest unit in AED network creates new knowledge and multiplies it in lower levels constructions by learning strategy.

In the paper "Graph Modeling Approach. Application To A Distillation Column" by V. Hovelaque et al, a directed graphical modelling approach is examined for a linear disturbed system. The graph approach is based on the state space model of linear system and the digraph reflects the structure of the system. An illustrative application of graph modelling approach to solve the disturbance decoupling problem on a distillation column model is presented.

The paper "Knowledge Representation With Object-Oriented Modeling. Application To the Development Of Manufacturing Systems" by R. Chalmeta et al, shows a new way to develop a model for a Manufacturing Systems, using an Object-Oriented Methodology for complex systems. This methodology is applied to the development of a Reference Model of a Manufacturing system, that can be used to simulate different alternatives of a particular Manufacturing System by a computer.

This special issue of the Journal presents outstanding papers of ASI'96 in the diverse areas of Production Systems, Intelligent Control, Flexible Manufacturing Systems (FMS), Neural Networks, Multi-agent models, Hierarchical and Decentralized Systems, Knowledge Base Systems and Object-Oriented Modeling. The Proceedings of ASI'96 has more than 50 papers that were presented at the conference.

With this collection of papers I have intended to give a flavour of the exciting things that took place during ASI'96 and at the same time to provide a glimpse at what is currently happening in the lively field of computer integrated manufacturing and automation of flexible manufacturing systems. I take the opportunity to thank the Editor Florin-Gheorghe Filip for providing "Studies in Informatics and Control" as a forum, the editorial staff of the journal for all their efforts and of course the people who made ASI'96 possible.

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Professor Groumpos is the Greek NMO representative to IFAC and he is vice president of the Technical Committee "Large Scale Systems". He is an associate Editor for the international journals Computers and Electrical Engineering and Studies in Informatics and Control. Professor Groumpos is a member of the Honorary Societies Eta Kappa Nu and Tau Beta Pi. He is the Co-ordinator of the ESPRIT Network of Excellence in Intelligent Controls and Integrated Manufacturing Systems (ICIMS-NOE). He has published over 70 journals and conference papers, book chapters and technical reports. He has been the principal investigator on many R&D projects both in the USA and in Greece. His main research interests are intelligent manufacturing systems and CIM, process control, hierarchical large-scale systems control and adaptive control.