

**SCIENTIFIC EVENTS**  
**IEEE International Conference on Control  
Applications**  
**IEEE International Symposium on Intelligent  
Control**  
**IEEE International Symposium on  
Computer-Aided Control System Design**

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**Theodor -Dan Popescu** was born at Rosiori de Vede, Romania, in 1949. He received his MSc. degree and his Eng. Sc. D (Ph.D) degree, both in Automatic Control, from the Polytechnical Institute of Bucharest in 1972 and 1983 respectively. Since 1972 he has been with Computer Process Control Laboratory at the Research Institute for Informatics in Bucharest, where he is a senior research worker. Since 1975 he has been a lecturer at the Department of Automatic Control and Computers, "Politehnica" University of Bucharest. His main research interests are in the fields of system identification, adaptive control, time series analysis and digital signal processing. He has published technical papers on these topics and co-authored the books titled: "Modelling and Forecasting of Time Series", Academic Publishing House, Bucharest (1985, in Romanian), "Computer-Aided Identification of Systems", Technical Publishing House, Bucharest (1987, in Romanian), "Practice of Time Series Modelling and Forecasting. Box-Jenkins Approach", Technical Publishing House, Bucharest (1991, in Romanian).

Convening for the first time three notorious meetings, the IEEE Control Systems Society succeeded in organizing a truly unique event. The luxurious Ritz-Carlton, Dearborn, was the venue of the Conference. Co-ordination of the three Organizing Committees, three Programme Committees, and unique issues for the technical program and joint conference proceedings, made this event be a big challenge to organizers. General Chair was Professor Stephen Yurkovich, Department of Electrical Engineering, the Ohio State University, who, getting the assistance of a performant team, made an excellent job. I am confident that all the participants enjoyed a comfortable social environment, as well as a stimulating technical programme.

From the viewpoint of the **Conference on Control Applications (CCA)**, the 1996 Conference brought forth another strong program in the traditional line of the CCA. The first CCA, held in Dayton in 1992, was on Aerospace Control. The second one, held in Vancouver, featured the pulp and paper industry. The third, held in Glasgow, focussed on industrial process control, while the fourth, held in Albany, featured power systems. The 1996 Conference, although on automotive systems, featured a wide spectrum of control applications, having full sessions devoted to each of the above subjects of the previous CCAs. Its special note was given by several ASME-organized sessions, meant for broadening the interaction with colleagues covering the engineering disciplines in a co-operative state of mind. The main topics discussed at CCA included: application of adaptive control, robust control, sensor-based control, nonlinear control, sliding mode control, system identification, fuzzy or neural control, expert systems, distributed systems, physiological systems, fault tolerant systems, man/machine interface, target tracking, data fusion, and power electronics.

The **International Symposium on Intelligent Control (ISIC)** distinguished by an exceptional technical programme. Intelligent control, a discipline which develops control algorithms by emulating certain characteristics of intelligent biological systems, is pushed ahead by the advances in computing technology, and is signal as a technology that may open highways to significant technological progress. The intelligent control topics are gradually evolving towards merging with those of conventional con-

trol. For instance, recent work has focussed on comparative cost-benefit analyses of conventional and intelligent control techniques through simulations and implementations. In addition, there has been recent activity focussed on modelling and nonlinear analysis of intelligent control systems, particularly on stability analysis. The development of intelligent and conventional control systems that can be highly autonomous in operation is pursued. Such autonomous intelligent controllers aim at integrating conventional and intelligent control approaches, at attaining levels of performance, reliability, and autonomous operation, which previously only systems operated by humans could present. ISIC was dedicated to all these subjects.

**This International Symposium on Computer-Aided Control System Design (CACSD)** was the ninth specific IEEE meeting since the first one held at Troy, NY, in 1981. Computing technology has enormously progressed for the last twenty years. Such a development together with the advances in the control system design methodologies have driven the field to higher and higher levels. Computing power, as it is today available to engineers, leads to very powerful software tools for CACSD. The Symposium discussed some of the latest developments and results in the field. The papers were concerned with all the important areas of application: knowledge-based CACSD, numerical algorithms, hybrid systems, design via linear matrix inequalities, optimization-based CACSD and nonlinear systems. Application-oriented sessions included CACSD for fault detection, automotive control and manufacturing systems.

Each conference has organized an excellent plenary presentation. On the first of the three days of the conference, the invited papers for the plenary sessions were:

- **CACSD : Control of Automotive Systems**, Mr Dennis Bogden, GM Powertrain Group.
- **CCA : What Does the Customer Really Want ?**, Dr. William F. Powers, Ford Research Laboratory.
- **ISIC : Intelligent Autonomous Control: From Theory to Applications**, Dr. Panos J. Antsaklis, University of Notre Dame.

During the conference, **two CCA tutorials** and **one ISIAC tutorial** were organized:

- **CCA Tutorial : Fault Detection and Diagnosis with Automotive Applications**, G. Rizzoni, The Ohio State University.

- **CCA Tutorial : Design of Robust Adaptive Systems**, P. Ioannou, Y. Zhang, University of Southern Carolina, J. Sun, Ford Motor Company.
- **ISIC Tutorial : Neural Networks for Intelligent Control**, K.S. Narendra, Yale University, Center for Systems Science & Neuroengineering and Neuroscience Center, S.T. Venkataraman, Yale University.

The first CCA tutorial reviewed fault detection and diagnosis via state space methods, input-output models, parameter estimation, and signal processing. Case studies in power train sensor and actuators, engine torque estimation and misfire detection, and vehicle steering were presented.

The second CCA tutorial discussed the ideas and principles underlying the design, simulation and implementation of robust adaptive systems for identification and control. At the beginning, the design of robust adaptive schemes for plants with constant and time varying parameters was considered. Then applications of adaptive systems (including electronic braking, adaptive automotive cruise control, etc.) and tools for design and implementation (including a recently developed Adaptive Control Toolbox) were referred.

The ISIC tutorial showed how concepts and methods developed in system theory and artificial neural networks could match the intelligent control of dynamical systems under uncertainty. From basic introductory material, gradually developed methods for identification and control of nonlinear systems, disturbance rejection, and multivariable control to intelligent control, all was there. Applications in industrial environment were mentioned.

ISIC dedicated a post-conference workshop to **Architectures or Mathematics: What Determines the Design of Intelligent Systems ?**. Organizers were Dr. Jim Albus, NIST and Professor Alex Meystel, NIST and Drexel University. At present there are known several approaches to the design of intelligent systems including the use of mathematics and architectures. The relationship between these approaches is not clear enough. Having effective mathematical algorithms without an architecture to integrate them into an intelligent system will be of no purpose. On the other hand, having a system architecture without components based on solid mathematical principles is of no use. The question asked at this workshop was: "Is it possible to derive one from another, or are there fundamental scientific principles involved in both?"



The three Conferences Technical Sessions run as:

- CACSD Knowledge Based CACSD, Numerical Algorithms & Software for CACSD, Hybrid Systems and Supervisory Control, CACSD for Fault Detection - Applications, CACSD Synthesis and Analysis, Automotive and Vehicle Control, Rapid Automotive Control Prototyping and Testing, Algorithms & Software Tools for LMI Problems in Control, Optimization Based CACSD, VHDL-A: A Candidate for Uniform Modeling, Integrated CASE/CACSD for Real-Time Systems, CACSD for Nonlinear Systems, Hybrid Systems Modeling and Simulation, Matlab Toolkits, Scilab:A Freeware Alternative for CACSD, Symbolic Algorithms for CACSD, Data Model & Process Management, CACSD Integration Support, Mechatronics CACSD.
- CCA Aircraft Control, Automotive Chassis Control, Optimal Control, Intelligent Control for Industrial Applications - A Celebration of Diversity, Robotic Control, Aircraft Dynamics, Control and Simulation.(organized by ASME), Paper Machine Control, Fuzzy/Neural Networks, Applications of Sliding Mode Control (organized by ASME), Manufacturing Systems and Machine Tool Control, Nonlinear Systems, Vibration Control via Command Shaping (organized by ASME), Flexible Structures, Laboratory Experiments in Control Applications (organized by ASME), Robust Control, Identification, Control of Power Systems in a Deregulated Environment, Intelligent Controls, Automotive Powertrain Control, Motor Control, Analysis & Control of Systems with Nonlinear Friction (organized by ASME), Fault Detection, Diagnostics, Sliding Mode Control, Process Control, Adaptive Control, Linear Systems, Power Systems Control, Noise and Vibration Control, Applications.

- ISIC Navigation, Learning Control Systems, Neural Identification and Control, Applications of Fuzzy Control, Fuzzy Control, Estimation, Prediction and Detection, Intelligent Control Theory, Intelligent Control Applications, New Directions in Intelligent Control, Fuzzy Control Design and Analysis, Genetic Algorithms, Neural Control Techniques, Hybrid Systems, Neural Networks in Process Control, Stability of Intelligent Systems, Neuro Control of Automotive Systems, Neural Network Theory, Neural Networks for Control, Robotic Systems.

Panel discussions were as follows: **CACSD Tools and Methodologies - The User's View**, at CACSD Symposium, **Control System Needs of the Automotive Industry**, organized by ASME, and **Role of Control in Future Engineering**, organized by IEEE. Each event had its own Proceedings.

Book publishers and vendors of control software and hardware sponsored exhibitions. The conference banquet was held at the world famous Henry Ford Museum.

The three events highly attracted participation and made the paper presentations and the follow-up discussions be largely stimulating.

In many participants' opinion, the conference was a very successful event. The success of the 1996 CCA/ISIC/CACSD Conference could be accounted for by an interesting technical programme, the IEEE Control Systems Society support, and last but not least by the collaboration of many people and local institutions in its organisation.

**Theodor- Dan Popescu**