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Newsletter

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Coordinating Committee on Systems and Signals

CC Chair Han-Fu CHEN



Among nine Coordinating Committees (CC) of IFAC, the CC on Systems and Signals together with the CC on Design Methods is rather theoretically and methodologically oriented. The technical areas concerned in the CC on Systems and Signals normally introduce randomness, uncertainty or systems that cannot be described by the conventional difference or differential equations.

1. Technical Committees and Scopes of TCs

The CC on Systems and Signals includes five Technical Committees (TCs):

TC on Modeling, Identification, and Signal Processing (SSM), chaired by B. Wahlberg:



TC-SSM concerns all aspects of modeling and identification for various systems including deterministic and stochastic, finite-dimensional and infinite-dimensional, linear and nonlinear. Both the theoretical and methodological developments and practical applications are within the

scope. TC-SSM also promotes the interaction between signal processing and control.

TC on Adaptive Control and Tuning (SSA), chaired by R. Ortega:

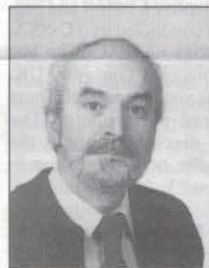


TC-SSA concerns the analysis, synthesis and design of general adaptive systems including techniques such as autotuning. The features of interest include stability, convergence, robustness and performance of the adaptive systems. TC-SSA also considers the full range of industrial, aerospace,

and marine applications and contemplates the

development of new identification technique for robust control.

TC on Stochastic Systems (SSS), chaired by G. Picci:



TC-SSS promotes the probabilistic and statistical methods in modeling, identification, estimation and control of uncertain systems. Besides the classical areas of stochastic control and dynamic estimation theory, TC-SSS also considers modeling, realization, and the structural properties of stochastic systems and statistical methods in the analysis and simulation of complex dynamic systems.

TC on Fuzzy and Neural Systems (SSF), chaired by K. J. Hunt.

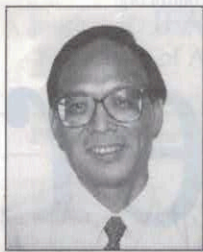


TC-SSF considers all aspects of fuzzy and neural systems that are relevant to control-related theory and applications such as modeling, identification, control design, adaptation, stability analysis etc. TC-SSF aims at creating a dialogue which allows the articulation of the industrial state-of-the-art in applications of fuzzy neural systems and at developing a sound theoretical foundation for the subject.

Merry Christmas and a Happy New Year

TC on Discrete Event Dynamic Systems (SSD), chaired by X. R. Cao

TC-SSD focuses on the analysis and control of discrete event dynamic systems that are characterized by (countable) finite state spaces and the evolution is characterized by jumps. From an applications point of view, SSD are almost man-made systems, which consist of finite number of resources shared by several users. Synchronization, concurrency and conflicts characterize the interaction. Both timed and untimed SSD models are considered. TC-SSD also covers the new area of hybrid systems.



2. Main Events

The IFAC Symposium on System Identification (SYSID) is conducted by TC-SSM. This is a triennial IFAC series and the last one, SYSID'97, was the 11th Symposium.

SYSID'97 was successfully held in Kokura Japan, July 8-11, 1997. The total number of participants of SYSID'97 was 468 persons from 32 countries. Among 378 submitted papers there were 295 accepted papers distributed over 19 invited sessions, 28 contributed sessions, 3 software demonstration sessions, 4 plenary sessions and 4 tutorial sessions.

TC-SSM has initiated work for the next SYSID, which will be held at the University of California, Santa Barbara, USA in 2000.

The IFAC Workshop on Adaptive Control and Signal Processing (ACASP) is conducted by TC-SSA. This is also a triennial series of IFAC. The last event, ACASP'98, took place in Glasgow, UK, August 26-28, 1998 and was very successful. There were about 100 registered participants. The Committee has initiated discussion about the possibility of organizing the next Workshop in Como, Italy, from June 21 - 23, 2001.

3. Contribution to the IFAC World Congress

As also for the 13th IFAC World Congress, among the nine IFAC CCs, the CC on Systems and Signals has received the second largest amount of papers submitted to the 14th IFAC World Congress (IFAC'99). Among 2139 papers in total, 439 papers were submitted to the CC on Systems and Signals, which amounts to 20.53% of the total submission. The statistics mean that the topics of the above mentioned five TCs have attracted great interest among a large number of control scientists and engineers. On the other hand, this also implies a very heavy burden for the TC Chairs who are responsible for arranging paper review. Using this opportunity I would like to thank all TC Chairs (not only in the CC on Systems and Signals), all TC Members and all reviewers for their important contribution to the success of the forthcoming IFAC'99.

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Acknowledgement to IFAC would be appreciated.

Artificial Intelligence in Real-Time Control (AIRTC)

7th IFAC Symposium
Grand Canyon, Arizona, USA
October 5 - 8, 1998

The atmosphere of the Symposium was excellent. The attendants were leading researchers, from several diverse information processing and control communities, together with some of their students. Industry was represented at a very high level; and in addition to some individual presentations, there was a special session organized by Dr. Jay Bayne, Vice President of Johnson Controls, Inc. Dr. Steve Kahne's address at the start of the Symposium also helped to provide perspective and enthusiasm for the occasion.

There was sufficient commonality in viewpoints, task objectives, and approaches to make the occasion useful and a pleasure to attend, despite considerable difficulties because of the many different technical 'languages' used by researchers from different communities.

It would seem that intelligent real-time control is very much in need and feasible to a growing extent. This line of symposia or workshops can contribute towards the realization of that objective.

The quality of the papers presented at the symposium was generally above average and represented an expanding scope of research of topics.

Adequacy of the papers to the symposium scope

The 49 papers covered the following topics:

- 10 papers - modeling of nonlinear problems - using supervisory and/or unsupervisory learning methods,
- 14 papers - linearization of nonlinear problems - using fuzzy / rough sets to address control solutions
- 8 papers - evolutionary methods to address modeling, optimization and control of real-time systems,
- 10 papers - hybrid methods of partitioning or discretizing continuous spatio-temporal problems,
- 6 papers - dimension reduction and pattern recognition methods for object and/or condition detection,
- 1 paper - timing and time reasoning in real-time systems.

Industrial/academic balance of the symposium

Of the 49 regular/short presentations (which excludes tutorials):

- 8 presentations were from industry,
- 5 presentations were from research institutes,
- 36 presentations were from academia.

In addition to tutorials, future symposia should emphasize increasing industry participation via a 'government-industry' panel, wherein a paper presentation is required of each panelist before they are asked to argue the most pressing social and/or industrial control problems we currently face in the world today.

Outstanding ideas presented:

Evolutionary / Reinforcement Learning - a growing community of researchers is advocating the use of evolutionary methods to address problems where size and complexity and/or economic scale discourage more conventional analytic approaches to modeling. One such evolutionary method, referred to as 'reinforcement learning', involves learning a model by interaction in lieu of approximation. The objective of reinforcement learning is to acquire a model of a plant without requiring an analytic model of the plant. The discussion surrounding reinforcement learning centered around the issue of learning vs refining a control model.

Enterprise (Distributed) Control - the scope of control problems is increasing with the advent of the internet and the growing number of multi-national corporations and companies with multi-site locations requiring 'client-server-type' distributed control. Enterprise control will require research in more sophisticated dimension reduction, pattern-recognition and process discovery methods for optimization and/or redistribution of control involving a hierarchy with increasingly fast and varying response time requirements across globally disbursed sensor-actuator loops.

Visualization and Imaging - another community of researchers is exploring the human visual system with the hope to discover improved methods of dimension reduction and pattern recognition. Such areas of research are particularly important to future multivariate 'real-time' control applications with varying spatial and/or temporal conditions wherein point measurement of process parameters will be combined to capture 2-D and/or 3-D depictions for more 'accurate' and 'transparent' human-machine interfaces. In the long run, such visualizations may engender more collaborative human-machine process discovery and evolving/adaptive real-time control.

Technical trends (emergent and declining subfields).

- Adaptive PID is **emerging** in applications of industry - driven by global competitiveness and economic trends in reducing energy consumption and environmental pollution.
- Neural networks (supervisory and unsupervisory) are **reemerging** in areas of research in conjunction with other methods:
 - 1) Supervised learning is being complemented with discrete methods to overcome the 'transparency' issue,
 - 2) unsupervised methods are being combined with more conventional pattern recognition methods in the context of hyperspectral visualization and imaging problems, and
 - 3) unsupervised and supervised methods are being combined to address scalability problems.
- Evolutionary / Reinforcement Methods - appear to be **emerging** in the area of model development - refining, as opposed to replacing, an empirically learned plant model.
- Hybrid (continuous-discrete) Modeling - is **emerging**, possibly in conjunction with evolutionary methods, to address more complex control problems and also to enable more model adaptivity, particularly in the context of long term aging and/or environmental conditions.

Others

Relative to the issue of applying a suitable method to a respective control problem, the following is an attempt at distilling varied discussions:

- FUZZY LOGIC / FUZZY SETS - SCALABILITY is being addressed by clustering of the output or 'product space' and causal partitioning of respective inputs-outputs.
- NEURAL NETWORKS vs FUZZY LOGIC / FUZZY SETS

Tradeoffs: while NNs have better numerical accuracy, Fuzzy representations have better transparency.

Missing Tradeoff: Little or no performance comparisons have been done to address either or both (NNs or Fuzzy) in the context of noisy data.

Control Engineering Practice Volume 6 Number 7, July 1998

Contents:

Introduction to Quantitative Feedback Theory for Lateral Robust Flight Control Systems Design (S.-F. Wu, M.J. Grimble and S.G. Breslin)
Electrical Assistance for S.I. Engine Idle-speed Control (P. Bidan, L.K. Kouadio, M. Valentin and G. Montseny)

A Loop Transfer Recovery Approach to the Control of an Electro-hydraulic Actuator (R.N. Banavar and V. Aggarwal)
Optimization of the Control Parameters of a Pneumatic Servo Cylinder Drive Using Genetic Algorithms (Y.-S. Jeon, C.-O. Lee and Y.-S. Hong)
Knowledge-based Multivariable PID Control (W.K. Ho, T.H. Lee and E.B. Tay)

Preface to the Special Section of Custom Processors (D.I. Jones)

Targeted Processor Architectures for High-performance Controller Implementation (S. Jones, R. Goodall and M. Gooch)

The Applications of Reconfigurable Logic to Controller Design (M. Wegrzyn, M.A. Adamski and J.L. Monteiro)
Hardware Implementation of Real-time Petri-net-based Controllers (N. Chang, W.H. Kwon and J. Park)

A Realizable Architecture for Genetic Algorithm Parallelism (K.S. Tang, K.F. Man, Y.C. Ho and S. Kwong)

IFAC Meeting Papers – Keyword Listing

Fault Detection, Supervision and Safety for Technical Processes
Kingston Upon Hull, UK, August 1997
Advances in Control Education
Istanbul, Turkey, July 1997

Index of IFAC Meeting Papers
Conference Calendar

Control Engineering Practice Volume 6 Number 8, Aug. 1998

Contents:

Real-time Localization of a Low-cost Mobile Robot with Poor Ultrasonic Data (P. Hoppenot and E. Colle)

Sub-optimal Collision-free Motion Planning of a Two-robot System Using Free Arc (S.W. Lee, B.H. Lee and K.D. Lee)

Computing Bounds on Greenhouse Energy Requirements Using Bounded Error Approach (D. Maksarov and Z.S. Chalabi)

Real-time Midcourse Guidance with Intercept Point Prediction (E.-J. Song and M.-J. Tahk)

Derivation of Signatures for Faults in Gas Turbine Compressor Blading (N. Aretakis, K. Mathioudakis and V. Dedoussis)

Supervised Optimal On-line Compensation for Harmonic Pollution in Electrical Networks (P. Beguery, S. Gentil and F. Bonnard)

Using the Net Transformation Method to Program Programmable Logic Controllers (T. Mielczynski, Z. Samsonowicz and R. Wiclawek)

Preface to the Special Section on Automation in the Steel Industry (E. Rose)

An Application of Min-max Generalized Predictive Control to Sintering Processes (Y.-H. Kim and W.H. Kwon)

Application of Neural Network to the Supervisory Control of a Reheating Furnace in the Steel Industry (Y.I. Kim, K.C. Moon, B.S. Kang, C. Han and K.S. Chang)

Control of the Silicon Ratio in Ferrosilicon Production (H.T. Ingason and G.R. Jonsson)

Interaction Measure of Tension-thickness Control in Tandem Cold Rolling (K. Asano and M. Morari)
Optimal Control System for Hot Strip Finishing Mill (M. Okada, K. Murayama, A. Urano, Y. Iwasaki, A. Kawano and H. Shlomi)
Submerged-arc Ferrosilicon Furnace Simulator: Validation for Different Furnaces and Operating Ranges (A.S. Hauksdottir, A. Gestsson and A. Vesteinsson)

IFAC Meeting Papers – Keyword Listing

Automated Systems Based on Human Skill
Kranjska Gora, Slovenia, September 1997

Index of IFAC Meeting Papers
Conference Calendar

Automatic Control in Aerospace 14th IFAC Symposium

Seoul, Korea, 24 – 28 August, 1998

The 14th IFAC Symposium on Automatic Control in Aerospace was held from 24 to 28 August, 1998 at the Hoam Faculty House, Seoul National University, Seoul, Korea. This symposium was sponsored by the IFAC TC on Aerospace, and co-sponsored by both the Automatic Control Research Center at Seoul National University and the Korea Aerospace Research Institute, Korea.

Fifty-nine contributed papers from 17 countries were presented in 19 sessions including 4 parallel sessions, representing up-to-date technical accomplishments in the field of guidance and control of aerospace systems. Also, six plenary speakers were invited from the USA, Germany, Japan, and Korea to present a variety of works on automatic control in aerospace. The following list of topics is of relevance to the symposium

- Current Status of National Aerospace Programs
- High Precision Pointing Control Systems
- Missile Autopilot
- Space Robotics and Manipulators
- Missile Guidance, Navigation and Control
- Fault Tolerant Control Systems
- Satellite Attitude and Orbital Control Systems
- Control Theory
- Integrated/Multidisciplinary Flight Control
- Spacecraft Attitude Control
- Satellite Navigation System GPS/GLONASS Applications
- Flexible Structure Control
- Engineering Technology in On-Board Processing
- Guidance, Navigation, Tracking Theory and Analysis
- Mission Control Launch Vehicle

The titles of the presented plenary sessions are as follows:

Prof. Jason L. Speyer, Univ. of California at Los Angeles, USA: Control of Dynamic Systems in Spatial Networks: Applications, Results, and Challenges

Dr. Eveline Gottzein, Daimler-Benz Aerospace, Germany: Challenges in Control and Autonomy of Future Communication Satellites

Prof. Shunji Manabe, Tokai University, Japan: Coefficient Diagram Method

Prof. Kimio Kanai, National Defense Academy, Japan: Active Control Technology and Restructurable Flight Controller Design

Dr. Han Hwangbo, Korea Telecom, Korea: Attitude Control Operations for KOREASAT Satellites

Dr. Hidehiko Mon, Sumitomo Heavy Industries Ltd., Japan: Control of Launch Vehicles as Flexible Bodies.

General sessions were successful and 32 papers were selected to be suggested for publication in the IFAC journals; Automatica, Control Engineering Practice and the IFAC Affiliated Journal on Space Technology.

Jang Gyu Lee, IPC Chairman

Space Robotics – SPRO'98

IFAC Workshop

Montreal/St. Hubert, Quebec, Canada

19 – 22 October, 1998

The Workshop took place from October 19 to 22, 1998 in St-Hubert, 30 km South of Montreal. The Conference was accompanied by the exhibition of space-related hardware and software developers. The IFAC SPRO'98 was organized under the auspices of the IFAC Aerospace Technical Committee and Robotics Technical Committee as well as IFAC-Canada. This conference would not have been possible without the generous support of the Canadian Space Agency (CSA). The CSA made available its conference center and related facilities to the SPRO'98. During the conference, participants had free access to telephone, fax and e-mail facilities. This conference also benefitted from the generous support of the Spar Aerospace, Ltd., of Toronto, Ontario.

This conference was originally planned as a workshop, but in view of broad range of interests and number of papers submitted, it grew in size to the equivalent of a symposium rather than a workshop. The number of registered participants was approx. 100. There were also several student-participants. The participants came from Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Poland, the United Kingdom and the USA. The number of papers originally submitted was higher than expected and the workshop had to be planned for three days with a single stream of sessions. No parallel sessions were allowed. Finally, 30 papers were selected and accepted by the International Organizing Committee. Papers were presented in 8 sessions in three days. Each paper was allowed 30 minutes plus 10 minutes for discussion. Also, there were three keynote speeches presented by invited speakers and three "round-table" discussions.

On day 1, eight papers were presented in two sessions. Session 1 was related to Dextrous Robots and Session 2 – Mobile Robots (Part 1 and 2, in total 5 papers). That morning, the sessions were preceded by the welcome notes by Mr. Claude Brunet, Chair of the National Organizing Committee and Professor Jerzy Sasiadek, Chair of the International Program/Organizing Committee. The welcome notes were followed by a short introduction done by Dr. V. Jha, Director General of the Canadian Space Agency. The two keynote presentations followed the welcome and opening notes. First keynote speaker was Dr. Alain Poirier from CSA. The topic of his speech was "The Mobile Servicing System- the Canadian Contribution to the International Space Station". The second keynote speaker was Dr. Peter Putz from the European Space Agency (ESA), ESTEC. The topic was "Space Robotics Activities at ESA".

On day 2, the keynote speaker was Mr. Wolfgang Wimmer from the European Space Agency, ESOC. The topic was "Robotics and On-Board Autonomy: For What and How Far Can We Go?" This presentation was followed by Session 3: Robot Controllers (5 papers), and Session 4: Vision Systems and Control (5 papers). In the late afternoon, there were two "round-table" discussions on Flexible Robots chaired by Professor Adam Morecki from Poland and Vision Systems chaired by Professor Denis Poussart from Canada.

That evening, an official banquet was held in the Marriott Chateau Champlain in Montreal. The invited speaker for the banquet was Dr. Antal Becjcy from the NASA Jet Propulsion Laboratory in Pasadena, California. The topic of the speech was "Mars and Beyond". A short discussion followed the very interesting presentation.

On day 3, there were 5 sessions followed by a "round-table" discussion. Session 5: Manipulation Control, Session 6: Kinematics, Session 7: Nonholonomic Systems, Session 8: Space Opera-

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Survey Paper

From Youla-Kucera to Identification, Adaptive and Nonlinear Control
(B.D.O. Anderson)

Papers

On Consistency of Subspace Methods for System Identification
(M. Jansson, B. Wahlberg)

Brief Papers

Simultaneous Constrained Model Predictive Control and Identification of Darx Processes
(M. Shouche, H. Genceli, P. Vuthandam, M. Nikolaou)

Singular H_∞ Suboptimal Control for a Class of Nonlinear Cascade Systems
(M. Dalsmo, W.C.A. Maas)

Disturbance Attenuation and Trajectory Tracking via a Reduced-order Output Feedback Controller for Robot Manipulators
(M. Zasadzinski, E. Richard, M.F. Khelfi, M. Darouach)

Simultaneous External and Internal Stabilization for Continuous and Discrete-time Critically Unstable Systems with Saturating Actuators
(P. Hou, A. Saberi, Z. Lin, P. Sannuti)

Anti-windup Designs for Multivariable Controllers
(Y. Peng, D. Vrancic, R. Hanus, S.R. Weller)

Feedback Control of Limit Cycle Amplitudes from a Frequency Domain Approach
(D.W. Berns, J.L. Moiola, G. Chen)

Design Automatic Voltage Regulator by Modified Discrete Integral Variable Structure Model Following Control
(T-L. Chern, G-K. Chang)

Linear Quadratic Feasible Predictive Control
(B. Kouvaritakis, J.A. Rossiter, M. Cannon)

Robust Stabilization of Nonlinear Systems via Normalized Coprime Factor Representations
(B.D.O. Anderson, M.R. James, D.J.N. Limebeer)

A Multivariable Two-degree-of-freedom Control Methodology
(E. Prempain, B. Bergeon)

On Stability of Constrained Receding Horizon Control with Finite Terminal Weighting Matrix
(J-W. Lee, W.H. Kwon, J. Choi)

An Application of Independent, Increasing, Free-choice Petri Nets to the Synthesis of Policies that Enforce Liveness in Arbitrary Petri Nets
(R.S. Sreenivas)

An Analytical Study on Structure, Stability and Design of General Nonlinear Takagi-Sugeno Fuzzy Control Systems
(H. Ying)

Technical Communiques

Multimodel Robust Control by Fast Output Sampling – an LMI Approach
(H. Werner)

Discrete Adaptive Sliding Mode Control of a State-space System with Bounded Disturbance
(C.Y. Chen)

Wavelet-based Identification of Linear Discrete-time Systems: Robustness Issue
(M. Doroslovacki, H. Fan, L. Yao)

Static Output Feedback Stabilization: An ILMI Approach
(Y.-Y. Cao, J. Lam, Y.-X. Sun)

Frequency Domain Analysis of Oscillatory Modes in Decentralized Control Systems
(J.C. De Castro)

Zeros of Continuous-time Linear Periodic Systems
(G. de Nicolao, G.F. Trecate, S. Pinzoni)

A Sliding Mode Controller with Improved Adaptation Laws for the Upper Bounds on the Norm of Uncertainties
(G. Wheeler, C.-Y. Su, Y. Stepanenko)

Correspondence

Comments on "Adaptive Fading Kalman Filter with an Application"
(L. Ozbak, F.A. Aliev)

Comments on "Robust Control for Parameter Uncertain Delay Systems in State and Control Input"
(Q.-L. Han, D. Mehdi)

Reply to "Comment on Robust Controller for Parameter Uncertain Delay Systems in State and Control Input"
(J.H. Kim, E.T. Jeung, H.B. Park)

Comments on "Nonlinear One-step-ahead Control Using Neural Networks: Control Strategy and Stability Design"
(J. Wang)

Reply to "Comments on Nonlinear One-step-ahead Control Using Neural Networks: Control Strategy and Stability Design"
(Y. Tan, A. van Cauwenbergh)

Large Scale Systems – LSS '98 IFAC/IFORS/IMACS/IFIP Symposium Patras, Greece, July 15 – 17, 1998

The International Conference IFAC LSS '98, "Large Scale Systems: Theory and Applications", was sponsored by the IFAC TC on Large Scale Systems, and co-sponsored by IFORS, IMACS, and IFIP. It was organized by the Laboratory of Automation and Robotics of the Electrical and Computer Engineering Department of the University of Patras, and the Technical Chamber of Greece, and was supported by local sponsors.

The technical program started with a plenary lecture given by Prof. S. Kahne, Past President of IFAC, Embry-Riddle Aeronautical University, Prescott, USA, who addressed the audience representing IFAC and conveyed the personal salutation of Dr. Yong-Zai Lu, President of IFAC. Prof. S. Kahne referred to the philosophy and the oncoming changes of the Air Traffic Control System, emphasizing the enormous importance of Automatic Control in the decrease of air traffic accidents.

Two more plenary lectures were given by IFAC Advisor Prof. T. Vamos, President of IFAC from 1981 - 1984, Computer and Automation Institute, Hungarian Academy of Sciences, Budapest, Hungary, and Prof. G. Stephanopoulos, A.D. Little Professor of Chemical Engineering, Massachusetts Institute of Technology, Cambridge, USA. During his speech, Prof. T. Vamos expanded on the views of the Ancient Greek philosophers on the philosophical aspects of Systems Science and their application to all scientific fields from medicine to the understanding of space. Prof. George Stephanopoulos, enlarged upon the application of automatic control systems in energy systems and in production systems in the chemical industry. He stressed the point that emphasis be given to the modeling and structural control of complex large scale systems.

During the round table discussion, that was organized during the second day of the conference, an EC representative, Dr. T. Skordas, presented the latest developments regarding the 5th Framework Program. During the discussion that followed his presentation, American, Japanese, and European

scientists presented their views on the subject of research funding in the areas pertaining to the scope of the Conference.

The technical program included 42 technical sessions held in parallel, and 3 plenary sessions. Of the 317 submitted papers 215 were accepted for presentation and 196 were finally presented. Due mainly to budget or visa reasons, 19 papers were not presented (mainly from Eastern Europe and China). The presentations covered the areas of Information and Telecommunication Systems, Production Scheduling and Planning, Robotic Systems, Fuzzy Logic and Expert Systems, etc. and many of them were related to applications in the areas of Transportation Systems, Air Traffic Control, Water, Gas, and Power Systems, etc. The conference was attended by about 240 scientists from 42 countries.

During the Conference, the IFAC TC on LSS chaired by Prof. P. Roberts held a meeting and decided to plan the next IFAC LSS Conference for Bucharest, Romania in 2001.

Peter P. Groumpos

SPRO - ctd. from page 3

tion (Part 1 and Part 2). Later that day, the "round-table" discussion on "Space Operation" was held. Professor Mark Balas from USA chaired this discussion.

The participants have visited the Canadian Space Agency facilities during the special tour. In particular, they visited some of the research laboratories involved in the space technologies program as well as the operation center of the CSA.

The conference was accompanied by an exhibition, with 13 exhibitors

As a Chair of the International Program Committee, and member of National Organizing Committee, I would like to underline the very efficient organization of this Workshop done by the National Organizing Committee chaired by Mr. Claude Brunet of the Canadian Space Agency. Moreover, the friendly atmosphere and hospitality created by the CSA made the presentations even more enjoyable.

In summary, this workshop supported by the IFAC Aerospace TC, IFAC Robotics TC as well as the IFAC-Canada was a very successful event.

Jerzy Z. Sasiadek,
Chairman of the International Organizing/
Program Committee

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