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Before and After IFAC '87

Preparing this Newsletter there are just a few weeks left until the 10th IFAC World Congress in Munich. The whole IFAC Community is busy preparing for what will be a further highlight in the history of our Federation. The technical program promises rich and useful days in Munich, and our hosts are going to make our stay pleasant, offering a wide range of technical visits and social events.

As you are reading this Newsletter the Congress is already over and I am sure that you will return from Munich fully satisfied with the technical presentations and social events.

Because of the time schedule and deadlines in the preparation of the Newsletter, the full review of the Congress, the General Assembly and the Council and Related Meetings will be published in the October issue of the Newsletter. I hope to meet many of the Newsletter readers personally at the Munich Congress.

The Editor

Large Scale Systems
Theory and Application
4th IFAC/IFORS Symposium
Zürich, Switzerland, August 26—29, 1986

In view of the technological development in the last decade, the increasing complexity of technical systems and the natural complexity of environmental and socioeconomic systems, the development of a theory to cope with this complexity was felt to be necessary in order to analyse and design controls for such systems.

This symposium was the fourth in a series which began 1976 in Udine (Italy). The second was held in Toulouse (France) in 1980 and the third one in Warsaw (Poland) in 1983. The aim of the symposium was to present the state of the art of the theory of Large Scale Systems, to give an overview and examples of applications in different technical and non-technical disciplines, and to bring together scientists and engineers from different countries to discuss the development in this area. On the theory side papers were presented in the areas of Modelling and Model Reduction, Decomposition, Stability, Decentralized Control and Estimation, Hierarchical Control and Decision and Multicriteria. The areas of CAD, Expert Systems and Distributed Computing, Local Area Networks related to Large Scale Systems were also dealt with to some extent.

Papers on application in Management, Socioeconomics, Energy, Transportation, Communication and Information Systems, Production Systems, Water Systems and several other complex systems were presented at the symposium.

Seven interesting plenary papers by well known experts were presented, namely by: V. Streijc on Mathematical Modelling, E. J. Davison on Control and Stabilization, Y. Y. Haimes on Hierarchical-Multiobjective Analysis, L. Pun on Production Planning, H. Glavitsch on Electric Power Systems, M. G. Singh on Management Systems and Th. M. Liebling on Combimaterial Optimization Problems. Large interest was aroused by the two round table sessions organized by K. J. Åström on "Applications of Artificial Intelligence to Large Scale Systems" and by S. Engell on "Future of Control Theory for Complex Systems".

About 250 abstracts were submitted to and reviewed by the members of the IPC. The authors of the accepted abstracts were invited to submit the full papers which were reviewed again by the IPC. The finally accepted 165 papers were arranged in 28 technical sessions. 163 participants from 22 countries attended the symposium.

Technical visits to different institutes of the ETH were organized during one afternoon.

We feel that this conference has contributed to the theory and application of the control of complex systems and we look forward to the next symposium on the subject in the German Democratic Republic in 1989.

M. Mansour
Chairman

LAST CALL

Issues 1 and 2 of the Newsletter this year conducted a survey for the continuation of subscription. Although the deadline of June 10, 1987 is past, those who have not replied will be kept on the Newsletter mailing list **if they confirm their subscription by return mail.**

For those who wish to discontinue their subscription, this August issue is the last one to be received.

Automation and Data Processing in Aquaculture

IFAC Symposium

Trondheim, Norway, August 18—21, 1986

This Symposium was organized by the Norwegian Society of Automatic Control (NFA), sponsored by the IFAC Technical Committee on Applications and co-sponsored by the European Aquaculture Society (EAS). The Symposium was held at the Royal Garden Hotel, Trondheim, Norway.

Aquaculture is a rapidly growing industry on a worldwide basis. It deals with the culturing of plants and animals in aquatic environment and is regarded as one of the most important future contributions to a continuous high-quality food supply in many parts of the world. Modern techniques of instrumentation, automation and data processing are now being adopted at an increasing rate in the aquaculture industry in order to improve quality and productivity.

The Symposium was organized in twelve technical sessions covering broadly the fields of modelling, identification and simulation; instrumentation; automatic control; data processing. Five international experts in aquaculture were invited to present survey papers describing status and perspectives in the different sectors in the course of the plenary sessions. Two panel sessions covered the aspects of educational needs in aquaculture automation and reliable measuring systems in aquaculture.

The 39 papers accepted for this symposium were of high quality and attracted a large audience. The contributors came from 11 different countries thus stressing even more the international character of the subject.

The number of participants was roughly 100, a bit less than originally expected but giving ample opportunity for very active discussions.

Technical excursions were organized during the Symposium, to educational research institutions in Trondheim dealing with aquaculture. After the Symposium the opportunity was offered to choose between two full day excursions to aquaculture facilities on the coast near Trondheim.

36 of the accepted papers together with the five plenary papers will be published by Pergamon in its IFAC Proceedings series.

In the course of the Symposium strong interest was expressed in continuing discussion on this topic by organizing a further Symposium on the same topic in 1989.

Jens G. Balchen
IPC Chairman

Mass Spectrometry in Biotechnological Process Analysis and Control

IFAC Workshop

Graz, Austria, October 23—24, 1986

The IFAC Workshop "Mass Spectrometry in Biotechnological Process Analysis and Control", organized by the Institute for Environmental Research, Graz, Austria attracted 63 people from European countries and from the USA. It was aimed at bringing together developers of methods for on-line mass spectrometry (MS), interested industrial appliers, and manufacturers of equipment. The present state of developments, the need of industrial appliers, the trends in equipment manufacturing and the requirements of necessary software were summarized.

The greatest limitation for biotechnological process analysis and control is the lack of reliable on-line sensors. MS is a universal detector for any chemical species. Problems mainly stem from the fact that only about 15—20% of all known chemical compounds are volatile and that only these can easily be introduced into the high vacuum of the MS.

Available on-line MS systems allow analysis of gas partial pressures for a series of bioreactors by multiplexing between different gas streams. Membrane sensors to measure dissolved gases and volatiles are now also offered by some companies.

MS gas analysis combined with elemental balancing methods has been applied to analysis and control of production of baker's yeast and penicillin. MS also was used to analyse gas and liquid phase mixing behaviour in a tower loop bioreactor. Another application was the analysis of eight gases in a bioconversion process. Pyrolysis coupled to MS offers great opportunities to analyse complex biological samples including non-volatile polymer materials.

In the discussions it was generally agreed that MS application in fermentation except for gas analysis still is a rather exotic technique, but MS experts pointed out that development of adequate interfacing between bioprocess and MS would allow a much more extensive application of MS for process analysis and control.

Proceedings will be published by Plenum, London and are intended to appear in spring 1987.

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Instrumentation and Automation in the Paper, Rubber, Plastics, and Polymerization Industries

6th International IFAC/IFIP/IMEKO Symposium

Akron, Ohio, USA, October 27—29, 1986

The Symposium was sponsored by the Applications Committee and co-sponsored by the Systems Engineering and Components Committees. One hundred people attended the symposium, participants equally divided between those from 14 countries outside the USA and those from the USA.

The Symposium was hosted by the Industrial Control and Instrumentation Group at the University of Akron with the primary support of Bailey Controls Co.

The delegates were welcomed by Professor A. Kaya (Organizer and Chairman) during the Opening Session, and the representatives of supporting organizations. Professor A. Van Cauwenberghe spoke on behalf of Prof. M. Thoma for IFAC. IMEKO President G. Toumanoff emphasized the importance of measurements and the relation to the goals of the PRP Symposium. Mr. W. E. Miller (Vice President of IFAC) welcomed the audience on behalf of the American Automatic Control Council (NMO). Finally, Prof. T. J. Williams, IPC Chairman, presented the highlights of the Symposium Program.

The conference keynote speaker was D. Cannon, President, Bailey Controls Co., USA. He emphasized the rapid changes of microprocessor technology and their effects on the control systems, manufacturing procedures, and business ventures.

Two simultaneous sessions were conducted in Pulp & Paper and Rubber & Polymers. The sessions covered the techniques and applications in depth while plenary talks put a light into and set the pace for both sessions to follow.

The main theme was the improved productivity and product quality, which was reflected in papers in terms of: better sensors and new sensing techniques; advanced control and optimization methods; applications including dedicated controls as well as plant-wide optimization and scheduling.

Forty papers were presented in ten technical sessions. The topics in modelling and control of different processes pointed to the critical issues. Round Table discussions summarized what was accomplished and what are future needs. Microprocessors have played a dominant role to meet the challenges for the practitioners to implement the control techniques.

There were four plenary sessions on applications of adaptive and predictive control in the pulp and paper industry; adaptive control concepts for plastic processing units; measurement and modelling problems in plastics processing of non-sheet processes; and a survey of user needs and expected development in sensors for manufacturing sheet products.

A. Kaya

Automatic Measurement and Control in the Woodworking Industry

IFAC Symposium

Bratislava, CSSR, November 17—21, 1986

This symposium was the first attempt under IFAC sponsorship to establish a forum for the exchange of ideas and experiences among the professionals in the field. The core work at the symposium was to formulate and try to solve the specific automation problems in the woodworking industry. These problems result from the properties of wood and the process control relating to wood products manufacturing.

L. Keviczky, chairman of the IFAC Applications Committee addressed the Symposium participants in the opening ceremony on behalf of the President of IFAC, Prof. Manfred Thoma.

Most of the papers at this symposium dealt with the following aspects: Analysis and perspectives of technology and automation in the woodworking industry; automatic control of continuous and discrete processes; sensors, measuring and data processing, optimization of peeled logs centering and use of computers in wood research. In the centre of interest was the design and application of various vision systems to be used e.g. for automatic detection of wood defects. 45 papers were selected for publication in the Proceedings of Pergamon Press, the editors being Branislav Hruz and Milan Cicel.

The host organization of the Symposium was the State Forest Products Research Institute in Bratislava, Czechoslovakia. There were 125 participants from 12 countries.

A round table discussion under the chairmanship of Prof. Dr. R. Fischer from the Technical University of Dresden, GDR, dealt with the topic "Measuring and Control in Woodworking and Furniture Production — What is to be Done?".

A small exhibition was organized as an accompanying program of the symposium. The organizers felt that the symposium was well received and hope that some time in the years 1989—1991 a similar symposium continuing the initiated tradition will again be organized. Our beloved forests deserve that!

Branislav Hruz
IPC Chairman
Symposium Proceedings Editor

Milan Cicel
Symposium Proceedings Editor

Theory of Robots

IFAC/IFIP/IMACS Symposium

Vienna, Austria, December 3–5, 1986

The aim of the symposium was to present a review of the state of the art in the field of robots mainly from a theoretical point of view. Special aspects were kinematics and kinetics, models for the dynamic behavior and control algorithms mainly in connection with robots of the future (elastic structures, redundant degrees of freedom...). In addition to these main topics assembly problems, sensors, path planning, simulation and education were discussed as well.

The Symposium was organized by the Austrian NMO of IFAC, the "Austrian Center for Productivity and Efficiency (ÖPWZ)". The NOC was chaired by I. Troch and the IPC by P. Kopacek.

For this event 133 abstracts were reviewed by the IPC members. As a result of this procedure 90 authors were invited to submit a full paper for presentation. These papers were arranged in 16 Technical Sessions. In addition 4 Survey Papers and 3 Panel Discussions completed the scientific program.

In the survey papers given by Bejczy and Tarn (USA), Vidyasagar (CDN), Hanafusa (J) and Desoyer, Kopacek, Lugner and Troch (A) the state of the art on some research streams of robotics was reviewed. The panel discussions dealt with "CAD Methods in Robotics" (Siegler), "Theory and Applications of Advanced Robots" (Aida) and "Education in Robotics" (Kopacek). 50 Technical Papers were presented and discussed.

The authors of these papers came from 21 countries in four continents. The 118 participants (15 from Austria) came from all over the world.

The main topics of the Symposium were identical with the main directions in robotics research. The robots of the future will be more "intelligent" and therefore equipped with sensors. They will be able to carry out more intelligent tasks like assembly, etc.

This symposium represents a significant progress. It also points to the great need for further work. Therefore, the International Program Committee, in its meeting during the symposium decided unanimously that the organization of a second symposium for 1989 should be proposed.

P. Kopacek

From left to right:
H. Troger, Dean of the Faculty of Mechanical Engineering at the Technical University of Vienna; H. Bodenseher, representative of the Federal Ministry for Science and Research; I. Troch, NOC Chairperson; W. Brantner, Director of the Austrian NMO; P. Kopacek, IPC Chairman.

Working Group: "Guidelines for CACSD-Software"

Scope and Goals

The goal of the working group established at the IFAC Council and Related Meetings 1986 is to formulate several levels of **guidelines/standards** for different aspects of Computer-Aided Control System Design (CACSD) software. The scope of the working group should be limited to aspects within the direct influence of the working group (and thereby avoid topics outside the control field proper, such as operating systems and general graphical standards). It was decided to form three subgroups working on the following topics:

- A first subgroup is to deal with the **User Interface** of CACSD packages. This includes, but does not limit itself to, standards on the syntax and semantics of command languages, naming-conventions for certain basic algorithms and guidelines on the use of graphical tools for communicating with a package (e.g. to enter or modify models).
- A second subgroup is to deal with **Data Structures.** Their guideline suggestions are to cover the internal structures needed of a CACSD-tool as well as formats to be used for external data exchange between different packages.
- A third subgroup is to deal with **Algorithms.** In particular, this subgroup is to study the necessary numerical algorithms for a CACSD-tool and to define interfaces to aid the exchange of algorithms between different packages.

The working group has decided that the time is not yet ripe to form a subgroup working on **Expert Systems** for control or detailed specifications for **Graphical Interfaces,** but the group will keep these areas in mind for later.

News from NMOs – Singapore

The Council of the Instrumentation and Control Society (ICS), i.e. the IFAC National Member Organization of Singapore, consists of nine elected members which include the President, Vice-President, Honorary Secretary, Honorary Assistant Secretary, Honorary Treasurer, Honorary Assistant Treasurer and two elected Council members. In addition, the Council co-opts interested members to join the Council to promote its activities.

ICS 1986/1987 Council and Committee Members

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Dr. C. C. Lim

Vice President:
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Honorary Assistant Secretary:
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Mr. Charles Cheong*
Mr. Koo Wun Kuon*
Mr. Yong Yoon Cho*

* Co-opted Council Members

The following committees organize the various activities of the Society:

Education
Technical
Past President
Conference and Exhibition
Membership
Special Interest Group
Publication
Social and Inter-Society Liaison.

The education committee only recently has organized various courses on continuing education, among others on "Process Analyzers and Factory Automation" and an "Advanced Control Course". The technical committee arranges monthly technical talks and technical visits. The Past President Committee plans the future direction the society should take. The Conference and Exhibition Committee is at present sponsoring the joint ChemAsia 87/InstrumentAsia 87/AnalabAsia 87 exhibition and related conference to take place this year. The membership committee promotes membership and looks after members' interests. Among the special interest groups the relevant committee has sparked this year there is one called Computer Control Group. A further such group on Analyzers is planned later this year. The social committee is, among others, responsible for the organization of the annual general meeting. The newly formed inter-society liaison committee hopes to establish close ties and foster exchange with related societies around the world.

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Papers from the Next Issue — Sept. 1987

Papers

Dynamic Path Planning for a Planar Articulated Robot Arm Moving Amidst Unknown Obstacles
(V. J. Lumelsky)

Experimental Evaluation of Flexible Structure Identification Using Lattice Filters
(N. Sundararajan)

Error Identification and Decomposition in Large State-Space Stochastic Rainfall-Runoff Models
(C. E. Puente, R. L. Bras)

Restricted Exponential Forgetting in Real-Time Identification
(R. Kulhavy)

Robust Pole Assignment
(Y. C. Soh, R. J. Evans, I. R. Petersen)

Dynamic Errors-in-Variables Systems with Three Variables
(B. D. O. Anderson, M. Deistler)

On the Robust Stabilizability of Uncertain Linear Time Invariant Plants Using Nonlinear Time-Varying Controllers
(T. T. Georgiou, A. M. Pascoal, P. P. Khargonekar)

Parametric Conditions for Stability of Reduced-Order Linear Time-Varying Control Systems
(C. C. H. Ma, M. Vidyasagar)

Brief Papers

Computation of Transfer Function Matrices of Linear Multivariable Systems
(P. Misra, R. V. Patel)

Robust Frequency Shaped L. Q. Control
(J. B. Moore, D. L. Mingori)

Matrix Factorization Method to Stabilize Multivariable Control Systems
(V. Feliu, A. J. Avello)

Simultaneous Stabilization with Almost Disturbance Decoupling-Uniform Rank Systems
(A. Saberi)

Stochastic Models for Uncertain Flexible Systems
(R. F. Curtain, P. Kotelenez)

Decision Support in Supervisory Control
(J. Rasmussen, L. P. Goodstein)

Technical Communiques

Book Reviews

Singular Perturbation Analysis by D. S. Naidu and A. K. Rao
(W. D. Collins)

Non-Adaptive and Adaptive Control of Manipulation Robots by M. Vukobratovic, D. Stokic and N. Kircanski
(L. P. Valavanis)

Commande Adaptive — aspects pratiques et théoriques by I. D. Landau and L. Dugard
(A. Benveniste)

Nonlinear Oscillations in Feedback Systems by V. Biro
(P. A. Cook)

WHO IS WHO IN IFAC

Prof. Lennart Ljung
Chairman of the IFAC Technical Board

Lennart Ljung was born in Malmö, Sweden, on September 13, 1946. He received the B.A. (Russian and Mathematics), M.Sc. (Engineering Physics) and Ph.D. (Automatic Control) degrees in 1967, 1970 and 1974, respectively, all from Lund University in Sweden. From 1970—1976 he held various teaching and research positions at the Department of Automatic Control, Lund Institute of Technology. In 1972 he spent six months with the laboratory for adaptive systems at the Institute of Control Problems (IPU) in Moscow, USSR. In 1974—1975 he was a research associate at the Information Systems Laboratory at Stanford University.

Since 1976 he has been Professor of Automatic Control at Linköping University, Sweden. Currently he is chairman of the Electrical Engineering Department there. The academic years 1980—1981 and 1985—1986 were spent at the Information Systems Laboratory at Stanford University, and at the Laboratory for Information and Decision Systems, MIT, respectively.

Professor Ljung is an associate editor of Stochastics, of Systems and Control Letters, of the IMA Journal of Mathematical Control and Information, and of Control — Theory and Advanced Technology. He was guest coeditor of Automatica's Special Issue on Adaptive Systems, September 1984 and the International Sub-IPC-Chairman of the Colloqium on Modelling and Identification at the IFAC World Congress in Budapest and is also very active in the preparations for the IFAC World Congress in Munich. He is also a subject editor for the Encyclopedia of Systems and Control (Pergamon Press).

He is the author of Reglerteori (in Swedish) and of System Identification: Theory for the User (Prentice Hall). He is the co-author of Reglerteknik (in Swedish) and of Theory and Practice of Recursive Identification (MIT Press). He is also the author of Mathwork's System Identification Tool Box, and of several research papers in the area of identification, estimation and adaptive control.

In 1979 Professor Ljung received the IEEE Control Systems Society's Outstanding Paper Award, and in 1981 with co-authors, Automatica's Prize Paper Award. He is a fellow of the IEEE, and a member of the Royal Swedish Academy of Engineering Sciences. For IFAC, he was a member of the Educational Committee between 1978 and 1984. He was a member of the Theory Committee from 1981 to 1984. He was the chairman of the Theory Committee between 1984 and 1987, and is now chairman of IFAC's Technical Board.