IFAC International Federation of Automatic Control

Newsletter

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Seasons Greetings

Contents:

Applications Committee (APCOM)

The Applications Committee is concerned with and involved in applications of automatic control to materials and energy processing in industry, research and testing. Computers, analogue, digital or hybrid, are likely to be involved in such applications. The Committee is not concerned though with space, society, management or biological applications of control.

The committee's broad scope of activities is detailed in the following, the most of it being organized in Working Groups (WGs), responsible for given subject areas, such as

— Chemical Process Control
— Electric Generating Plants
— Electric Power Systems
— Mining, Mineral and Metal Processing.

The Committee also deals with areas which have not been WG-classified. The role and responsibilities of the existing WGs were increased and the possibilities of new WGs (e.g. marine control, control of vehicles and engines, etc.) are continuously investigated.

The aims of the working groups are:

— to foster the international exchange of information and experience on applications of control engineering, systems science, and computer science to the design, operation, and automation of major plants and systems;

— to promote sponsorship or cosponsorship by the Applications Committee of regional and international workshops, conferences and symposia dealing with system-oriented problems of major plants and systems;

— to participate through its membership in the technical review of papers submitted for presentation at workshops, conferences, symposia and the World Congress, which deal with subjects within the scopes of the WGs.

The main subjects for the working groups will be the following:

The introduction of new technologies and methods based on microcomputers is not straightforward in that security aspects and control reliability are very stringent for modern plants and systems, especially for large nuclear and fossil fired power stations. The application of new control concepts generally requires an extensive validation work to identify possible weak points, to gain confidence in their use and to make them acceptable to the operating personnel.

The above considerations widely justify the huge effort made by manufacturers, industry, and utilities to gradually move toward a fully automated operation of large plants and systems.

The most important subjects of research are therefore:

1. Development of accurate and usable modelling and simulation codes to predict the behaviour of major plants and systems in the most critical conditions and to test the control system behaviour in such circumstances;

2. Evaluation of actual improvements achievable by using new control technologies and concepts;

3. Analysis of advanced solutions in man-machine interfaces able to supply prompt and selected information to plant operators in most critical (incidental) contingencies;

4. Design of plant simulators to support engineering assessment and operators' training;

5. Application of an integrated design concept to process and automation designs, especially for new plants and systems.

The apparent interdisciplinary character of these research subjects can naturally be considered within the scope of IFAC where system approach, dynamic simulation and automatic control concepts are comprehensively developed and applied.

Therefore, the function of the WGs is to supply the opportunity to experts coming from different experiences and backgrounds, of discussing the most interesting innovations currently proposed and applied to modern power stations in a unifying system approach. Symposia and workshops specifically devoted to this subject seem to be necessary to deal with the current problems raised by real-size applications and to stimulate the participation of industrial research representatives. On the other hand, the rather cautious behaviour of industry, utilities and manufacturers when considering the application of new control technologies to such complex plants should be properly stimulated by the presentation and diffusion of really innovative applications, which require an adequate discussion of most practical aspects.

Apcom ctd.

Aims and scopes of APCOM-WGs are defined as follows:

Chemical Process Control
Convener: Prof. M. Kümmel (DK)

The WG organizes meetings on control and dynamics in the applications area of chemical, biochemical (fermentation, sewage treatment, . . .), oil and petroleum, polymer, pulp and paper plants.

Electric Generating Plants
Convener: Prof. C. Maffezzoni (I)

The WG organizes meetings on modelling, control and optimization of electric generating plants which are a class of very complex processes, where today the impact of automation is considered of increasing relevance for several reasons:

— as a basic means to enhance power stations and system security, to allow more flexible operation and repeatability of plant manoeuvres;
— as the natural way to substitute human work in routine operations, particularly to reduce the shift personnel during the night hours;
— to achieve a more precise control of process variables and, therefore, a better trade-off between efficiency and plant life;
— to cope with the new requirements to power plant operation raised by the shortage of modulating power in large power systems.

The relevance of the specific application field is clearly demonstrated by the large amount of capital investments involved in the automation of large power units, because of the strategic role of the economic exploitation of energy and the enormous return obtained from (even limited) improvements of energy conversion processes.

Due to the many peculiarities of the processes involved, control applications to electric generating plants require separate consideration and no significant practical improvement can be achieved without a suitable analysis of the process feature and of the actual plant constraints.

Special attention has to be paid to the interaction between electric generating plants and power system, by keeping in mind the actual requirements and constraints of the two sides in the real operation. This latter topic will be suitably dealt with in a collaboration between this Working Group and that on Power Systems.

Electric Power Systems
Convener: Prof. T. DyLiacco (USA)

This WG is concerned with:

— application of large-scale systems analysis, optimization, identification, estimation and control to power systems;
— design and implementation of real-time computer control hardware and software systems for power system operation, including man-machine interfaces and human factors design;
— theory and application of security control for normal, emergency, and restorative states of power system operation, considering system dynamics and stability;
— digital methods of system protection;
— hierarchical control system design and multilevel decomposition of monitoring and control functions;
— coordination of local control functions at substations and power plants with system control functions at the control center;
— training simulators for power system operators.

Mining, Mineral and Metal Processing
Convener: Prof. C. Stapleton (AUS)

This working group is concerned with the application of control and automation principles to all aspects of mining, mineral and metal processing, including extractive metallurgy. A major objective is to identify areas which may justify future symposia or workshops.

The Applications Committee introduced a policy which reduces the number of APCOM meetings and improves the program profile of the approved events. In the long range planning of the committee only meetings which are not too broad in scope will be sponsored. The pattern of support for a series will be continuously monitored: successful series will be continued, series with declining interest will be stopped and new subject areas will be introduced as required.

Some of the specific new areas which APCOM will introduce in the next period, are:

— Control of Biotechnological Processes
— Automation in Aquaculture
— Fault Detection and Reliability
— Digital Image Processing in Industry
— Automation in Woodworking Industry
— Control of Vehicles and Engines.

APCOM decided to be much more serious with the formal approval of the proposed meetings and will strictly follow the IFAC regulations in the future.

Chairman: Prof. L. Keviczky (H)
Vice-Chairmen: Prof. T. DyLiacco (USA)
Prof. M. Kümmel (DK)
Prof. V. Lototsky (SU)
Prof. C. Maffezzoni (I)
Prof. C. Stapleton (AUS).

Education Committee
(EDCOM)

Chairman: Prof. W. Schaufelberger, CH

Scopes

The Education Committee is concerned with the study and dissemination of information about the planning and practice of automatic control education. It stimulates studies and activities in the fields of prevailing educational problems. The subject matter, educational techniques, laboratory equipment, text books and organizational forms including informal educational processes, are monitored and reported on at various IFAC symposia, workshops and congresses.

Areas of major concern are:

— Automatic Control Education at University Level: curricula / textbooks / control laboratories / group and project oriented courses / computer aided instruction and design / exchange of computer programs / industry-university relations;
— Continuing Education;
— Medium and Lower Level Education;
— Automatic Control Education in Developing Countries.

Pending problems in control education are, e.g., the following:

— the balance between theoretical and practical education,

— the introduction of computer aided control system design into the curriculum on a wide scale,
— the preparation and use of laboratory scale experiments,
— the introduction of new material into control courses (sequencing control, man-machine interaction, artificial intelligence techniques, etc.),
— the coordination with mathematics, systems, computer science, robotics, etc.

EDCOM provides a possibility to discuss these problems on an international scale.

Working Groups
Continuing Education (WG 7.1)
Chairman: Prof. P. M. Larsen

Interchange of information on Continuing Education Programs in the IFAC countries.

Listings of existing Continuing Education Courses will be prepared and published in Automatica and local periodicals twice a year.

In case well-defined needs for particular courses are recognized, an attempt will be made for organizing such courses under IFAC auspices and for publication of textbooks under the one publisher scheme.

Educational Programs on Robotics (WG 7.2)
Chairman: Dr. P. Kopacek

Preparation of a survey report on educational programs in Robotics and Manufacturing Systems on university level, i.e., programs, courses, laboratories and research centers which will enable students to specialize in design and application of modern robotics. The survey should be organized according to geographical areas.

In addition to the two Working Groups the "IFAC Educational Subcommittee on Co-operation between Northwestern European Universities" has been installed.

Plans for future activities

Apart from the normal activities of organizing meetings and sponsoring and co-sponsoring symposia and workshops, the following activities are under way:

1. An IFAC/IMEKO Symposium "Trends in Control and Measurement Education" will be organized in the UK in 1988.
2. A Workshop on Education in Control is also planned for 1988 in the GDR.
3. Discussions have started to organize an educational event in the USA in the near future.

Close cooperation with DECOM is sought, and the proposal of TB Vice-chairman L. F. Pau for the "support of control engineering education in developing countries" is backed.

The World Congresses of IFAC are of vital importance in the special situation of EDCOM as described above.

2nd IFAC/IFORS/IEA Conference
Analysis, Design and Evaluation of Man-Machine Systems

Varese, Italy, September 10—12, 1985

The 2nd man-machine conference held in Varese, Italy, in September this year was just as successful as the first one held in Baden-Baden in 1982. 170 people enjoyed Italian hospitality in the old and beautiful Villa Ponti for three days.

In the opening session the participants were welcomed by Mr. Baruffi, responsible for training and education activities in Lombardy, by Prof. Bishop, General Director of the Ispra Joint Research Centre of the Commission of European Communities and by Mr. Ferraioli, General Director of Agusta, a leading aeronautical industry of Italy.

The scientific programme contained 63 submitted papers, 6 invited survey papers and 3 Round Table discussions.

A key-note paper with the title "45 Years of Man-Machine-System. Review and Projection" was given by Professor Thomas Sheridan, USA. According to Sheridan the following trends will have profound implications in the future: (1) The removal of the human element up ("super") and away ("tele") from direct and local physical interaction with the process or product; (2) analytical engagement with systems having multiple decision-makers with partially overlapping data bases and multi-incompatible objectives; (3) a new acceptance of reported mental events (as contrasted to physically observable behaviour) and fuzzy relations (as contrasted to exclusive-set probabilistic events) and (4) an emerging equivalence and transformability relation between computer-based decision aids and normative models of human performance.

Prof. Fred Margulies, Austria, and Dr. Peter Brödner, F.R.G., in their survey papers, dealt with flexible automation and its possibilities for very qualified tasks for the operators. Margulies means that the future workshop will have a team of highly qualified versatile "craftsmen", who are trained to a broader level of skill in the direction of professional engineers using latest technology.

For the first time in IFAC's history a woman gave a plenary paper! Professor Veronique de Keyser, Belgium, and Professor Maurice de Montmollin, France, presented a most interesting paper "Expert Logic vs Operator Logic". They opposed the complexity of the operator's task to the relative simplicity of the expert's task and the expert's science was opposed to the operator's experience.

Gunnar Johannsen, F.R.G., John Rijnsdorp, the Netherlands, and Hiroshi Tamura, Japan, presented a survey paper with the title "Matching User Needs and Technologies of Displays and Graphics". The paper dealt with the fundamental changes of user-system interactions caused by new displays and graphics technologies. With examples from the process industry it was said that the serial nature of information presentation is not so easily understood as the parallel form of conventional displays. Further, many commercial systems which function properly in a one-person one-display situation show serious shortcomings in a multi-person multi-display situation. Unfortunately, the latter is the case when interface design is put to the test, i.e. during large-process upsets.

Finally, James Alty, United Kingdom, and Giovanni Guida, Italy, gave an excellent paper with the title "The Use of Rule-Based System Technology for the Design of Man-Machine Systems". Rule-based system technology, which has emerged from artificial intelligence research, has made it possible to tackle problem solving tasks at a higher level of abstraction and in a flexible, effective and natural way.

With the wisdom given in these papers as a background we then tried in a Round Table discussion to evaluate the importance of "humanization of technology (the social effects) vs human engineering (man-machine research)". The discussion was chaired by Tom Sheridan, who had carried out a Delphi study among "social effects-experts" and "man-machine-experts". The result of the Delphi study and of the round table discussion is that, in order to create a high quality work place in a high technology surrounding, there is a need for both types of research.

The Conference was closed by concluding remarks of Giuseppe Mancini, Italy, which touched upon the role and the challenges of decisional aids in the information structures of man-machine systems.

Lena Mårtensson

PROFESSOR Y. SAWARAGI

IFAC Advisor, presented the lecture "Interactive Modelling for Large Scale System" at IIASA, Laxenburg (Austria) on November 4, 1985.

3rd IFAC/IFIP Symposium
Computer Aided Design in Control and Engineering Systems
Copenhagen, Denmark, July 31—August 2, 1985

264 experts from 33 countries attended the symposium where a total of 90 papers were presented, which were divided up into 4 plenary sessions, 3 special technical sessions, 15 technical sessions and a panel discussion concerning standardization of software for CACSD.

The 4 invited papers were:

1. "Impact of CAD in Modern Industry" by B. I. Franksen (DK).

2. "Recent Development and Future Trends in Computer Aided Control System Design" by C. Herget (USA), described the possibilities and advantages of using symbolic languages as an overhead to the basic numeric packages.

3. "Expert Systems Techniques in a Computer Based Control Systems Analysis and Design Environment" by J. D. Birdwell (USA), gave an introduction to the use of expert system techniques in a CAD environment and its special advantages and problems.

4. "Decision Aids for the Management of Large Non-Job Shop Type Manufacturing Systems" by M. Sing (UK), described a complete software package able to optimize the coordination between manufacturer and distributor channels.

14 invited papers were presented at the 3 special technical sessions.

The 15 technical sessions covered the hole span from finished and used CAD packages in industrial companies and universities to the introduction of the newest trends and ideas which will be implemented in the future design and engineering packages. Some of the papers gave an introduction to how advanced graphical workstations have extended the research direction toward more efficient man-machine interface and to a certain degree expert system techniques to guide the user towards more qualified decisions through the design procedure.

Because of the large amount of man-power needed for the design of a complete advanced package for computer aided engineering of control systems it becomes more and more necessary to introduce some level of standardization especially concerning the software. Among the areas where a certain level of standardization can be useful are operating systems, programming languages, user interfaces, data- and database structures, graphical interfaces and interfaces to algorithms & packages. Although it was recognized that some degree of standards for these topics would save a lot of research and development time it was also clear that it would be difficult to introduce anything else but an open standardization.

The symposium was closed by giving over the CADCE flag to Zhen-Yu-Chen who will take part in the planning of the 4th symposium in Beijing 1988.

F. Thiim

5th IFAC Workshop

Control Applications of Nonlinear Programming and Optimization

(Capri, Italy, June 11—14, 1985)

The purpose of the Workshop was to exchange ideas and information on the applications of optimization and nonlinear programming techniques to real life control problems, to investigate new ideas arising from this exchange and to seek progress in nonlinear programming and optimization theory which is useful in solving modern control problems.

It was the 5th Workshop on this subject and it benefited from the sponsorship of the IFAC Committees on Theory and on Mathematics of Control. 55 people from 16 countries attended this meeting.

The scientific program of the workshop extended over four days, with four invited papers and 26 contributed papers presented. Invited speakers were Professor A. E. Bryson (USA), R. Bulirsch (FRG), H. J. Kelley (USA) and J. L. Lions (France).

A number of papers treated various aspects of the numerical solution of optimal control problems. Specific applications included the optimization of fuel consumption in cars, of mineral and metallurgical processes, of aircraft trajectories, of chemical plants and of wind tunnels. Computer aided design of control systems was also considered in some papers.

New Publications:

Safety of Computer Control System 1985

Proceedings of the 4th IFAC Workshop, Como, Italy, 1—3 Oct. 1985

Editor: W. J. Quirk, Atomic Energy Research Establishment, Harwell, UK.

This publication contains 28 papers of interest to computer scientists, control and electrical engineers and systems scientists. It discusses the most recent developments relating to the safe operation of computer systems, covering both the software and hardware aspects, and the theoretical and practical considerations of safe computer operation. Major areas covered include distributed systems, man-machine interface, verification and validation, reliability and safety assessment, hardware, fault tolerance and diversity. The systems of interest range from direct process control through robotics to operator assistance, with safety aspects being central in each case.

pp. 181   US $ 38.00

PLEASE NOTE:

The new brochure "IFAC Constitution and By-Laws" is now available at the Secretariat.

CHANGE OF VENUE

The 5th IFAC/IFIP/IMACS/IFORS Symposium on Information Control Problems in Manufacturing Technology, Robotics and Flexible Manufacturing Systems, April 22—25, 1986, originally scheduled for Yerevan, has been shifted to Suzdal near Moscow.

The scientific program was arranged by an International Program Committee chaired by Angelo Miele (USA).

Pergamon Press is planning to publish the Workshop Proceedings.

Gianni Di Pillo
Member of the IPC, Workshop organizer

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The Journal of **IFAC** the International Federation of Automatic Control

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Papers from the Next Issue – Jan. 1986

Microcomputer Control of High Dynamic Performance Ac-drives
(W. Leonhard)
Microprocessor-based Control of Industrial Sewing Machines
(B. Hertzanu, D. Tabak)
Use of Optimal Control Theory for Computing Optimal Injection Policies for Enhanced Oil Recovery
(Z. Fathi, W. Ramirez)
A Parallel Architecture for Kalman Filter Measurement Update and Parameter Estimation
(J. Jover, T. Kailath)
The Modified Gain Extended Kalman Filter and Parameter Identification in Linear Systems
(T. Song, J. Speyer)
Robust Stabilization of Distributed Systems
(P. Khargonekar, K. Poolla)
Robust Controllers for Uncertain Linear Multivariable Systems
(M. Vidyasagar, H. Kimura)
Fenchel Duality and Smoothness of Solution of the Optimal Routing Problem
(G. Stassinopoulos)
Model Reference Adaptive Control System of a Catalytic Fluidized Bed Reactor
(M. Koutchoukali, C. Laguerie, K. Najim)
A Distribution-free Criterion for Robust Identification. With Applications in System Modelling and Image Processing
(A. Venot, L. Pronzato, E. Walter, J. Lebruchec)
Application of Decomposition/Coordination Methods to Parameter Identification Problems in Interconnected Distributed Parameter Systems
(A. Munack, M. Thoma)
Performance of Kalman Filter with Missing Measurements
(H. Faridant)
Multimodel Strategies under Random Disturbances and Imperfect Partial Observations
(Z. Gajic, H. Khalil)
On the Order of Stable Compensators
(M. Smith, K. Sondergeld)
Infinite Gain Margin Problem in Multivariable Feedback Systems
(H. Maeda, M. Vidyasagar)
State-space and Frequency-domain Methods in the Control of Distributed Parameter Systems
(J. Babary)

WHO IS WHO IN IFAC
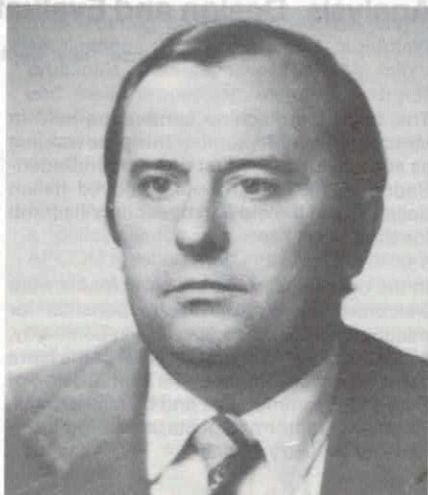
Prof. Dr. Lazar P. Lazarov
IFAC Council Member

Prof. Lazar P. Lazarov was born on May 13, 1939, in Rousse, Bulgaria. He is a graduate from a Technical High School in his native town. In the period of 1957 — 1962 he was a student of Electrical Engineering at the Higher Institute of Mechanical and Electrical Engineering in Moscow, USSR, where he received a BSc. in Automation of Production. In 1971 in Moscow, he took his Doctor of Technical Sciences Degree, defending a paper on the problems of automatic control.

Prof. Lazarov worked in the Academy of Agricultural Sciences and the Ministry of Agriculture where he was Head of Department of Production Automation. In 1972 he became a lecturing Professor at the Institute of Social Management and since 1981 he has held the Chair of Organization and Automation of Management.

As a scientist, Prof. Lazarov works on the problems of automation of production and management. He has published more than 40 papers in this field.

In the period of 1963 — 1971 he was a member of a Study Group of the United Nations Economic Commission for Europe, and, as such, participated in the study and the summarizing of the experience of a number of countries on the problems of electrification and automation of agriculture. He is the author of a series of papers in United Nations publications.

In recent years his scientific interest has been directed to the development and implementation of hierarchical management systems.

In 1978 Prof. Lazarov was appointed Vice-Chairman of the State Committee for Science and Technical Progress of the People's Republic of Bulgaria and Chairman of the National Council of Automation. He is in charge of the National Programme for Automation of Production and Management, member of a number of scientific councils and deputy editor-in-chief of the Automatics, Computers, and Automated Systems Magazine.

As chairman of the Bulgarian National Council of Automation which officially represents the People's Republic of Bulgaria, Prof. Lazarov has participated actively in IFAC activities for many years. Prof. Lazarov was elected an IFAC Council Member at the IFAC Congress in Budapest in 1984.