IFAC
INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL

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Editor: Professor Ing. Dr. V. Broida
Honorary Editor of IFAC

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Note from the Editor

Seven and a half years ago, in May 1958, on page 1 of Bulletin No. 1, the Editor - at that time Second Vice-President of IFAC - addressed all National Member Organizations of IFAC in order to introduce the newborn Information Bulletin of our Federation and to ask them to kindly cooperate with him.

Since then, 22 issues of the Bulletin have been edited, published and distributed and the present, very short No. 22 is the last one in its present form.

Indeed, in the course of its meeting in August 1965 in Tokyo, the Executive Council of IFAC has decided not to continue the publication of the Bulletin in its present form but to replace it - starting from 1966 - by shorter press releases and news sheets to be published whenever necessary and, if possible, at more frequent intervals.

The Honorary Editor wishes to thank most sincerely all National Member Organizations of IFAC for their friendly and efficient cooperation and to express all the pleasure he has had personally in achieving this task of international exchange of information in the field of automatic control which is one of the major aims of IFAC. Furthermore he hopes that the cooperation will be continued for the new means of publication, the definite shape of which is still under consideration.

IFAC NEWS

Reports on past events

MEETING OF THE EXECUTIVE COUNCIL

The Executive Council of IFAC met in Tokyo, Japan, on 23rd, 24th and 27th August 1965 at the invitation of the Science Council of Japan and in conjunction with the IFAC Symposium on Systems Engineering for Control System Design, held in Tokyo on 25th to 28th August 1965 (see Bulletin No. 18/19, pp. 36 and 37, and Bulletin No. 20, pp. 8 to 11).

The following topics were discussed and the following decisions have been reached:

- About half a dozen symposia are at present planned for 1967 and 1968.
- The Chairmen and Vice-Chairmen of all IFAC Committees as well as the Honorary Editor and Honorary Secretary have been re-appointed.
- The preparation of the Third IFAC Congress in London (20th to 25th June 1966) has been reviewed in detail.

- A preliminary list of candidates for election at the General Assembly 1966 has been approved by the Executive Council and will be sent to all National Member Organizations before long.
- A decision on where the Fifth IFAC Congress should be held in 1972 was deferred until the next meeting of the Executive Council. (It is reminded that the Fourth IFAC Congress will be held in Warsaw, Poland, in 1969.)
- It was agreed that the next meeting of the Executive Council should be held in London in June 1966.
- Proposals for amendments to the Constitution and By-Laws, prepared by a special committee, were provisionally adopted for further consideration before the next General Assembly.

Throughout all these meetings of the Executive Council of IFAC a very generous and most pleasant hospitality was extended to all attendants by their Japanese hosts, headed by the Second Vice-President of IFAC, Professor K. Kaneshige, who was most actively assisted by the Honorary Secretary of the Japanese National Member Organization, Professor A. Nomoto.

MEETING OF THE IFAC EDUCATION COMMITTEE

As already announced in Bulletin No. 21 (page 16), a technical meeting of the IFAC Education Committee was held in Warsaw, Poland, on 9th and 10th September 1965. The meeting was presided over by Professor W. F i n d e i s e n (Poland), Chairman of the Education Committee, and it was attended by eight members from Austria, Canada, France, Germany, Greece, Japan and the United Kingdom, as well as by four observers from Poland.

The main items of the agenda were:

- National Reports on university level education
- Future trends in automatic control education
- Suggestions concerning courses on international basis (see Report by Dr. M. Cuénod and Dr. A.P. Sage published in this Bulletin under "Free Ideas, Opinions and Suggestions")
- Relations of IFAC with UNESCO
- Tutorial sessions and informal colloquia connected with the London Congress in 1966.

The discussion led to several statements and agreements. Some new activity on international courses and cooperation will be started, if approved by the Executive Council of IFAC. A Survey Report on University Level Education in Automatic Control will be prepared and presented at the London Congress.

IFAC/IFIP SYMPOSIUM ON MICROMINIATURIZATION IN AUTOMATIC CONTROL EQUIPMENT AND IN DIGITAL COMPUTERS AND MEETING OF THE IFAC COMPONENTS COMMITTEE

In Bulletin No. 21 (pp. 11 to 16) we have given the full programme of this Symposium, held since then in Munich, Germany, from 21st to 23rd October 1965 and personally attended by the Editor.

This programme has been achieved with the exception of the following three papers which we had announced but which were not actually presented:

1.9. H.L. F o x , Sperry Utah Company, Salt Lake City, Utah, USA: Application of the Fox-Thorne Effect to Fluid Amplifiers.

2.4. J. K i l b y , Texas Instruments, USA: The Use of Optical Diodes in Integrated Circuits.

7.1. I.V. P r a n g u i s h v i l i , Institute of Automation and Telemechanics, Moscow, USSR: Microelectronics gives Birth to New Construction Techniques for Instruments and Devices.

On the other hand, the following paper, not listed in our preliminary announcement, was actually presented at the Symposium:

3.7. H. S c h w a r z e r , Telefunken, Konstanz, Germany: Comparison of Magnetic Matrix Storage Systems.

The Panel Session of 22nd October, presided over by Dr. J. B e r g h a m m e r (Germany) with the participation of Dr. E.M. D a v i s (USA), Dr. G. K o h n (Switzerland), Mr. A. R a d e m a k e r s (Netherlands) and Mr. C.P. S a n d b a n k (United Kingdom) and devoted to general problems of microminiaturization proved to be most interesting. It grouped various views on the future of these techniques, ranging from the very enthusiastic and clear display by Dr. K o h n of the theoretical limits of microminiaturization to the somewhat sceptical but more realistic remarks by Mr. S a n d b a n k. A very objective and clear synthesis of these contradictory positions by the panel chairman closed a more than two hours' discussion which constantly kept alive all attendants, despite an evening session after a very long day of work with reports and discussions of some 25 papers.

The Symposium itself proved to be a very large success, with nearly 500 attendants and the impossibility for the organizers to admit any more people even before it started. The material organization was exceedingly well with an unusual quality of simultaneous translation from German into English and vice versa, one of the best the Editor has ever heard, despite the high technical level of the topics involved. Kind hospitality was displayed to the attendants by their German hosts.

On the occasion of the Symposium, the IFAC Technical Committee on Components held its meeting on 20th October 1965 under the chairmanship of Professor B.S. S o t s k o v (USSR). The meeting was mainly devoted to the preparation of the Third IFAC Congress in London, June 1966.

IFAC (TEDDINGTON) SYMPOSIUM ON THE THEORY OF SELF-ADAPTIVE CONTROL SYSTEMS

The Symposium was held at the National Physical Laboratory, Teddington, England, from 14th to 17th September, 1965. Some 150 invited delegates from more than ten countries attended the meeting.

About thirty papers were presented which were grouped as follows:

- Controllers using Stochastic Decision Processes
- Adaptive Control in Biological Systems
- System Identification
- Adaptive Controllers using Deterministic Models
- Control using Perturbation Techniques

The full list of papers has been given in Bulletin No. 21 on pages 9 to 11. R. K u l i k o w s k i did not present his paper on "Adaptive Optimalization of Multi-Level Control Systems". In its place a paper by M.V. M e e r o v on "Synthesis Techniques for Structures Equivalent to Self-Adjusting Systems in Plants with Variable Parameters" was read. The paper by S.P. B i n g u l a c "On the Compensation of small Parameter Variations" was also not presented.

The papers and proceedings are to be published by the Instrument Society of America (ISA) early in 1966.

NEWS FROM NATIONAL MEMBERS

Israel

The Israel Committee for Automation has made efforts to enlarge its basis and to include representatives of the Technion and the Electronic Industries, as a result of which Professor B e n - U r i and Dr. S i v a n on the part of the Technion, and Mr. U. G a l i l , Managing Director of Elron, Electronic Industries, have joined the Committee.

USA

The American Automatic Control Council has elected the following set of officers for the following biennium:

President — Dr. Theodore J. W i l l i a m s
Control and Information Systems Laboratory
Purdue University, Lafayette, Indiana

Vice-President — Dr. O. Hugo S c h u c k
Director of Research, Military Products Group
Minneapolis-Honeywell Regulator Co.
Minneapolis 9, Minn.

Professor Gerald W e i s s will continue to serve as Secretary-Treasurer.

Reports on past events

India

The Steering Committee of the Indian Society for Automation and Information Sciences (ISAIS) met on 25th August 1965 under the chairmanship of Professor J.N. B h a r at the Institute of Radio Physics & Electronics. Following decisions were taken:

1. Formation of Special Interest Groups.
   It was decided that at present ISAIS can have the following three Special Interest Groups, and small committees were formed with powers to co-opt to start organizing activities in the respective spheres.

   (i) "Group on Theory and Applications of Control Systems". Prof. T. P r a s a d, Mr. U.S. G a n g u l y, Prof. A.K. C h o w d h u r y, Dr. D.D. M a j u m d a r.

   (ii) "Group on Numerical Analysis and Computer Programming". Dr. M. K e n n e d y, Prof. S.K. M i t r a, Prof. P.K. B o s e, Prof. P.K. G h o s h, Dr. A. G h o s h.

   (iii) "Group on Computer Technology". Dr. D.D. M a j u m d a r, Mr. B. N a g, Dr. M.S. B a s u, Mr. P.K. Sinha R o y .

The Convenor - Secretary of ISAIS will convene the first meeting of the persons interested in the respective fields, in which the office bearers for the groups will be selected.

2. After a prolonged discussion it was decided that the Centre of Advanced Study (CAS) in Radio Physics & Electronics and ISAIS will jointly sponsor a symposium on the basis of papers submitted on "Theory and Applications of Automatic Control", sometime in the middle of February 1966. In order to carry out the necessary organisational work a preparatory committee has been constituted with Prof. J.N. Bhar, Prof. T. Prasad, Dr. A.M. Daw, Prof. A.K. Chowdhury, Dr. M.S. Basu, Dr. M. Krishnamurthy and Dr. D.D. Majumdar.

   The papers are expected to deal with:

   (i) COMPONENTS: Digital Components; Analog Components; New Solid-State Components and their use as control devices; Fluid Amplifiers, Space vehicle actuators etc.

   (ii) APPLICATIONS: Process Dynamics; Analog, Digital, Hybrid, on- or off-line; Optimizing and/or Adaptive Control Applications etc.

   (iii) THEORY: Discrete Systems; Stochastic Systems; Optimal Systems; Learning Systems; Reliability, performance criteria and evaluation. (Theory papers are expected to bridge the gap between theory and practice).

   (iv) SOCIO-ECONOMIC ASPECTS AND MANAGEMENT: The Economic and Social Effect of introducing Computers and Automatic Control Equipment in India.

All intending participants are requested to contact at their earliest possible convenience with Prof. J.N. Bhar, Director, Centre of Advanced Studies in Radio Physics & Electronics, 92, U.C. Road, Calcutta 9.

Further details of the programme will be communicated afterwards. It is needless to mention that the success of such a symposium depends on the whole-hearted co-operation of the Individuals, Institutions and Industries.

USA

THE 20th ANNUAL ISA CONFERENCE

The 20th Annual Conference of the Instrument Society of America was held in Los Angeles on 4th to 7th October 1965. Amongst the very large number of contributions the following 46 papers seem to be of particular interest to Automatic Control specialists:

SESSION 3.1 AEROSPACE APPLICATIONS OF AUTOMATIC CONTROL I

- "Aerospace Applications of Discontinuous Control Systems" by Dr. M.J. Abzug, Douglas Aircraft Company, Inc.
- "Some Aspects of Adaptive and Self-Organizing Flight Control Systems" by Dr. E.B. Stear, University of California, Los Angeles, and Cpt. R.R. Rankine, U.S. Air Force.

SESSION 3.2 AEROSPACE APPLICATIONS OF AUTOMATIC CONTROL II

- "Control Systems Applications of Linear Estimation Theory" by Dr. J.L. LeMay, Aerospace Corporation.
- "Digital Computers in Aerospace Guidance and Control Systems" by B.S. Horton, Lear Siegler.

SESSION 3.3 PROCESS MODELS AND PLANT SIMULATIONS I

- "A Review of Process Simulation Techniques" by Dr. K.W. Goff, Leeds & Northrup Company.
- "Dynamic Model of an Electric Utility Boiler System" by Dr. F.T. Thompson, Westinghouse Electric Corporation.
- "A Simulation Study of Automatic Turbine Startup" by J.R. Greenwood, III and N.D. Payne, The Foxboro Company.
- "An On-Line Mathematical Model of a Fine Paper Machine" by Dr. J.D. Schoeffler and P.R. Sullivan, IBM Corporation.

SESSION 3.4 PROCESS MODELS AND PLANT SIMULATIONS II

- "Analog and Mathematical Models for Distributed Parameter Systems" by P.H. Gaither and Dr. M.J. McCann, Case Institute of Technology.
- "Development of a Model for a KAMYR Digester" by D.S.Hoag and J.M. Nelson, Honeywell Inc.
- "Process Models for a Cyclic Catalytic Gas Reformer" by Dr. R.L. Zahradnik and Dr. D.H. Archer, Westinghouse Electric Corporation, and Dr. R.R. Rothfus, Carnegie Institute of Technology.
- "Pressure Control in Low Pressure Gas Transmission" by Dr. J.O. Hougen, Monsanto Company.

SESSION 6.1 USE OF LOGIC TECHNIQUES IN PROCESS INSTRUMENTATION

- "Sequence Control in a Refinery" by T.H. Sonnichsen, Esso Research and Engineering Company.
- "Switching Logic for Electrical Interlocks in the Chemical Industry" by W.A. Finneran, Monsanto Company.

SESSION 13.4 FINAL CONTROL ELEMENTS I

- "Development of Transmissions and Torque-Limiting Clutches for Extreme Environment Actuators" by W.R. Kee, The Bendix Corporation.
- "Hydraulic Control Rod Actuators for the KIWI-TNT Nuclear Reactor" by R.A. Frame and C.P. Milich, Los Alamos Scientific Laboratory.
- "Hot Hydrogen Gas Control Valving - NERVA Project" by L.C. Musselman, Velan Engineering Companies.
- "Development of Servomotors for Extreme Environment Actuators" by J.R. Kremidas, The Bendix Corporation.

SESSION 13.5 FINAL CONTROL ELEMENTS II

- "The Effect of Dynamic Compressible Fluid Properties on Control Valve Operation" by P.V. P i p e r, Electronic Associates, Ind.
- "A Study of a Fluid State Actuation System for Extreme Temperature and Radiation Environment" by M.H. C a r d o n and L.R. E r w i n, The Bendix Corporation.
- "The Application of Spring and Diaphragm Actuators" by E.D. H o d g s o n Jr., Leslie Company.
- "Solving Control Valve Erosion Problems" by J.L. H e t e r, Kaiser Engineers, and N.J. H a t t e r, N.J. Hatter & Co.Inc.

SESSION 22.1 PIPE LINE INSTRUMENTATION

- "Automation of the Alberta-California Natural Gas Pipeline" by J.M. K u n z, Pacific Gas Transmission Company.
- "Recent Control and Measurement Installations of PG & E Gas Department" by W.F. B e r r e y e s a, Pacific Gas and Electric Company.
- "Automation Potential for Gas Operations" by J.F. T u r b e v i l l e, Southern California Gas Company.

SESSION 30.1 DIRECT DIGITAL CONTROL I

- "Direct Digital Control with Self-Adjustment for Processes with Variable Dead Time and/or Multiple Delays" by R.M. B a k k e, IBM Corporation.
- "Completely Adaptive Control of Processing Plants" by K.B. G r a y, Hughes Research Laboratories.
- "DDC Experience in a Chemical Process" by J.W. B e r n a r d, The Foxboro Company, and J.W. W u j k o w s k i, The Dow Chemical Company.
- "Analysis of Sampling Rates and Control Settings for Direct Digital Control" by C.C. H a r t w i g s e n, K. M o r t i m e r, D.E. R u o p p, and Dr. L.M. Z o s s, Valparaiso University.
- "Some Considerations in Digital Process Control Applications" by R.T. C u r r a n, Great Southern Land and Paper Company.

SESSION 30.2 DIRECT DIGITAL CONTROL II

- "A Program for Evaluating Three-Mode Algorithms" by J. G. P o u n d s, Honeywell, Inc.
- "Programming Aspects of Direct Digital Control" by George W o o d l e y, The Foxboro Company.
- "The DDC Control Center - Buffer Zone between Man and Machine" by R.F. L a i r d, Jr., E.I. du Pont de Nemours & Company, Inc.
- "Computer Control Programs: Status and Trends" by Dr. I. L e f k o w i t z and Dr. M.J. M c C a n n, Case Institute of Technology.

SESSION 31.1 INTEGRATED PLANT CONTROL - THE NEXT BIG STEP IN AUTOMATION (Panel)

- "Effective Management of Technical Data" by M.L. B o s w e l l, Dr. D.A. H a u s r a t h, and D.L. K n o w l t o n, Autonetics.
- "Multilevel Control of Coupled Systems" by Dr. L. L a s d o n, Case Institute of Technology.
- "An Automotive Assembly Consolidated Control System" by John M c B r i d e, Scientific Data Systems.
- "A View of Refinery Computer Control" by R.P. C l i n e, Bunker-Ramo Corporation.
- "Information and Control Systems for Petroleum Refineries" by J.F. M o o r e, Bonner & Moore Associates, Inc.

SESSION 32.1 PROCESS SIMULATION PROGRESS IN THE STEEL INDUSTRY

- "An Analysis and Simulation of a Hot Strip Rolling Mill" by R.G. R o c k w e l l, P.S. W a n, and Dr. W.S. W u, IBM Corporation.
- "Steel Process Simulation with a Hybrid Computer" by E.L. K e e n e r, U.S. Steel Corporation.
- "A Mathematical Model of Soaking Pits" by Dr. E.Y. K u n g, J.R. D a h m, and G.B. D e L a n c e y, Jones & Laughlin Steel Corporation.
- "Modeling and Control of a Multi-Stand Hot Rolling Process" by Dr. S.S. H a r b a u g h, Allegheny Ludlum Steel Corporation, and Dr. A. L a v i, Carnegie Institute of Technology.

SESSION 34.1 NUCLEAR POWER

- "Data Logging and Computing Equipment for the Enrico Fermi Nuclear Power Plant" by J.G. S e l m e c z y, Westinghouse Electric Corporation, and A. C a m p l a n i, Selni Enrico Fermi Plant, Italy.
- "Operation of the On-Line Computer at the Garigliano Nuclear Power Station" by L.K. H o l l a n d, T. S o r l i e, and S.L. G u m m e r s a l l, General Electric Company.
- "Application of On-Line Computer System - Big Rock Nuclear Plant" by J.G. L e w i s, Consumers Power Company.

Announcements of future events

Finland

The Finnish Society of Automatic Control has decided to arrange a meeting and an exhibition called

AUTOMATION DAYS 66

in Helsinki from 21st to 24th March, 1966. This four-days' meeting consists of a three-days' exhibition, in which almost all the instrument manufacturers that have an agent in Finland will participate, and a two-days' meeting, the leading theme of which will be the APPLICATION OF MODERN AUTOMATION TO INDUSTRIAL PROCESSES AND THE ASSOCIATED SYSTEM TECHNIQUES.

Foreign experts possibly interested in submitting a paper are kindly asked to indicate the subject to the Secretary of the Meeting,

Mr. R. T u u l i,
Suomen Kaapelitehdas,
Tallberginkatu 1,
Helsinki, Finland.

Italy

XIIIth INTERNATIONAL SCIENTIFIC CONGRESS ON ELECTRONICS

The Congress will be held in Rome from 15th to 20th June 1966 with the general theme "SOLID STATE ELECTRONIC DEVICES AND SYSTEMS" which is divided into three groups, one of which is of particular interest to automatic control people, namely

APPLICATIONS IN AUTOMATIC CONTROLS AND IN COMPUTERS

- Circuits and apparatus with controlled rectifiers and derived devices, both monc and bidirectional; state switches and level power switching devices in general, inverters, feeders, and amplifiers.
- Integrated linear circuits, with particular reference to d.c. amplification compared with traditional methods.
- Semiconductor devices in the problem of analog-digital and digital-analog conversion.
- Integrated circuits variously employed for the realization of digital circuits calculation.
- Advanced techniques for the realization of memories, with particular reference to thin film and cryogenic techniques.

United Kingdom

POST-GRADUATE COURSE ON CONCEPTUAL AND MATHEMATICAL AIDS IN PROCESS CONTROL

The University of Aston in Birmingham (designate), at present the College of Advanced Technology, Birmingham, announce the holding, from October 1965, of a post-graduate course leading to the degree of Master of Science, on Conceptual and Mathematical Aids in Process Control.

Further particulars and requirements for enrolment are obtainable from the

Course Tutor,
Department of Mathematics,
College of Advanced Technology,
Gosta Green,
Birmingham 4.

THE SOCIETY OF INSTRUMENT TECHNOLOGY

In 1966 the Society of Instrument Technology will hold the following meetings at Manson House, 26 Portland Place, London W.1 and, unless otherwise stated, at 5.30 for 6 p.m.

12th January - Control Technology Section
- "Servomechanism Concepts Applied to a Production Control System" W.T. B a n e.

25th January - Systems Engineering Section
- "Automatic Traffic Control: Simulation, Concept and Practice" H.A. C o d d.

9th February - Measurement Technology Section
- "Recovery of Information from Noisy Measurement" D.A. B e l l.

9th March - Control Technology Section (in conjunction with the British Computer Society)
- "Computers and the Design of Control Systems". Three papers by L.J. P o s t l e, R.G. B l a k e, G.W.T. W h i t e.

13th April - Automation and Systems Engineering Sections
- Symposium: "Automation in Coal Mining" 3.30 p.m. Integrating Paper by A.E. B e n n e t. Five supporting papers.

26th April - Automation Section
- "Control in Automatic Vending Machines". Details to be promulgated later.

11th May - Systems Engineering Section
- "Redundancy in System Design for Marine Automation" D.S. T o w n e n d.

24th May - Annual General Meeting - 5 p.m.
Presidential Address - 6 p.m.

It is hoped to preprint the papers. These may be obtained from

The Secretary,
The Society of Instrument Technology,
20 Peel Street,
London, W. 8,

cash with order, on publication as follows:- Wednesday 9th March, 5s. total and Wednesday 13th April 12s. total otherwise 3s. per meeting or £1 16s. 0d. for the complete set of all papers published in the 1965-66 session.

SYMPOSIUM ON AUTOMATIC CONTROL IN ELECTRICITY SUPPLY

The Symposium is arranged under the aegis of the United Kingdom Automation Council and will be held at the Renold Building, The Manchester College of Science and Technology, Manchester, from 29th to 31st March, 1966.

AIM - To present and discuss the most recent experience in operation and practical-design aspects of automatic control in the supply of electric power, and to express views and expectations on possible future trends. It is intended to hold also an exhibition of suitable equipments and to arrange organized visits to power-station plant and to manufacturers' works.

SCOPE - (1) Automatic control in transmission and distribution supply networks (automatic switching and automatic loading). (2) Automatic control in generating stations (starting up and shutting down); control of running plant under steady-state and fault conditions; optimization of efficiency in the running of a power station. (3) Kindred problems and future trends.

SYMPOSIUM PUBLICATION - The Symposium Publication will contain the texts of all the contributions presented at the Symposium. It will be available in sufficient time for study before the Symposium and will be sent to all who register to attend.

ACCOMMODATION - Delegates can be accommodated in Halls of Residence of the University of Manchester. It will greatly assist in the planning if the probable use of such accommodation will be indicated.

FURTHER DETAILS AND REGISTRATION FORMS - Further details concerning the Symposium and Registration Forms will be available from

The Honorary Secretary,
Symposium Organizing Committee,
Dr. R. F e i n b e r g,
Transformer Division,
Ferranti Limited,
Hollinwood Avenue,
Chadderton, Lancs.

SYMPOSIUM ON ELECTRONICS, MEASUREMENT AND CONTROL IN SHIPS AND SHIPBUILDING

The Scottish Electronics and Control Section of I.E.E. (Institution of Electrical Engineers) and the Scottish Section of I.E.R.E. (Institution of Electrical and Radio Engineers) have made arrangements to hold a Symposium on Electronics, Measurement and Control in Ships and Shipbuilding from 12th to 15th April, 1966 in Glasgow. The Symposium which will be open to non-members of the organizing Institutions, will cover a wide range of topics concerned with the applications of electronics in shipbuilding and ship operation. Many recent advances in this field have been reported, and it is felt that a forum should be established to enable a compatible series of papers to be presented in a manner of interest to shipbuilders and ship owners, as well as engineers specializing in these fields.

It is intended to organize a number of seminars, with adequate time for discussions, under the main topic headings of:

(1) Navigation; (2) Data logging, instrumentation, telemetry and engine control; (3) Automatic loading and discharging; (4) Economics, reliability and maintenance; (5) Safety aspects; (6) Applications for computers and numerical control; (7) Research and development.

Because of the wide range of interests of participants, it is probable that groups of such papers will be presented concurrently. The papers committee would be pleased to consider offers of papers on applications, economics and future trends under the above headings.

Further particulars may be obtained from either of the Joint Organizing Secretaries:

Kevin A. M u r p h y,
50 Holeburn Road, Newlands, Glasgow, S.3., Scotland,

or R.D. P i t t i l o,
35, Crawford Road, Burnside, Rutherglen, Glasgow, Scotld.

INSTITUTE OF MATERIALS HANDLING
4th INTERNATIONAL CONFERENCE

The 4th International Conference of the Institute of Materials Handling will take place at the Royal Garden Hotel, Kensington Gore, London, W.8. from the 13th to the 15th May, 1966. The theme of the Conference is "EFFICIENT HANDLING COSTS - INCREASES LIVING STANDARDS". Subjects for the Conference will be divided into four channels:-

TECHNIQUES AND EQUIPMENT - (1) The use of fluids as handling media. (2) Remote control of handling techniques. (3) Automation applied to retail sales. (4) Bi-lateral influences between design of products and handling equipment.

ECONOMIC ASPECTS - (1) The handling aspects of value analysis techniques. (2) The criteria for investment in handling schemes. (3) The evolution of techniques for comparing the economic effectiveness of handling systems. (4) Security and materials handling.

TRANSPORTATION AND DISTRIBUTION - (1) The practical extent of integrated handling to link different forms of transport. (2) Modern warehousing design. (3) The effect of modern handling techniques on the design and construction of transport media. (4) The effect of handling techniques on the distribution of temperature sensitive products.

THE HUMAN ELEMENT - (1) The effect of modern distribution methods on the cost and availability of consumer goods. (2) The Ergonomics of modern handling. (3) The contribution of trade unions to improve materials handling. (4) Does modern materials handling increase or reduce the risks of accidents?

FEES for the Conference are as follows:- Non-members of the Institute of Materials Handling, 18 guineas. Members of the Institute of Materials Handling and affiliated associations, 15 guineas.

INQUIRIES:- John A n d e r s o n, Conference Secretariat,
Institute of Materials Handling,
43-45 Dorset Street, London, W.1.

Yugoslavia

YOUGOSLAV SEMINAR AND EXHIBITION ON CONTROL, MEASURING AND AUTOMATION JUREMA 1966

The 11th Yougoslav Seminar and Exhibition on Control, Measuring and Automation - JUREAM 1966 will take place in Zagreb from 18th to 23rd April, 1966.

JUREMA's task is to follow, to study, to extend the knowledge and to help the development and the application of measuring, control and automation in industry. Two branches of this activity, the Seminar and the Exhibition, have the purpose of showing the experts practical and theoretical problems of measuring techniques, control and automation, as well as the possibility of their application to particular branches of industry.

Participants of the Seminar JUREMA 1966 will be working in several sections and will attend various lectures and reports. During the Seminar, debate sections will consider problems of automation of several branches of industry. There will also be technical films and excursions to plants using automation.

THEMES FOR JUREMA 1966

1. Mathematical methods in the theory of control; theory of systems control; measurements (in general); cybernetics
2. Devices and equipment for control
   - 2.1 Sensors, measuring circuits and measuring devices
   - 2.2 Transducers (converting the signal from one physical form to another)
   - 2.3 Amplifiers
   - 2.4 Servomotors and controlling units
   - 2.5 Computing and logic circuits
   - 2.6 Controllers, control devices and systems
   - 2.7 Construction, maintenance of control equipment and systems
3. Dynamics of the process to be controlled
4. Application of control techniques
5. Automation in internal transportation
6. Automation of office work
7. Economic and social aspects and problems of automation; labour organization.

APPLICATIONS for the Exhibition and the Seminar JUREMA 1966 are to be sent to the following address:-

JUREMA,
P.O.B. 123,
Zagreb, Yugoslavia.

THE YEARBOOK JUREMA 1966 will be published at the end of March 1966 in connection with the 11th Seminar on Control, Measuring and Automation. The Yearbook, published in 1000 copies, will be printed on 400 pages, size 18 x 28 cm.

WORLDWIDE AUTOMATIC CONTROL

Announcements of future international Conferences

INTERNATIONAL COMPUTATION CENTRE (ICC) ADVANCED SEMINAR FOR AUTOMATIC DATA PROCESSING

Nineteen students have now been selected from amongst numerous applications to take part in the Advanced Seminar for ADP which will last six months and has started in Rome on 7 October, 1965. As the number of places was limited, it was necessary to refuse many applicants who will have to wait until the following seminar.

The applicants who come from Argentina, Czechoslovakia, Ghana, Hungary, India, Iraq, Israel, Mexico, The Netherlands, Nigeria, The Philippines and Thailand, were chosen according to the following criteria:

- educational background and personal data
- practical experience
- whether or not from a developing country
- need of a trained man in the country or organization concerned
- ability to understand English
- number of fellowships available (where requested).

All participants attending the Seminar, which terminates on 6 April, 1966, will receive a certificate of attendance. In addition, those who wish to sit for an examination will have the possibility of receiving a diploma. The regulations of the examination will be defined by the ICC/IFIP Advisory Committee, which was responsible for the programme of the Seminar, and it is intended to invite a group of international ADP experts from IFIP to act as examiners.

The members of the ICC/IFIP Advisory Committee are: Professor R.A. B u c k i n g h a m, University of London (IFIP), Mr. O. D o p p i n g, Kungl Statskontoret, Stockholm (ICC), Mr. N.I. B e c h, Director, Regnecentralen, Copenhagen (ICC), Prof. M. E u w e, Netherlands Automatic Information Processing Research Centre, Amsterdam (IFIP), Prof. M. V e r h e l s t, University of Louvain (ICC).

The Director of the Seminar is Mr. A.A.M. V e e n h u i s of the Netherlands Automatic Information Processing Research Centre, Amsterdam.

5th INTERNATIONAL MEETING OF THE ASSOCIATION INTERNATIONALE POUR LE CALCUL ANALOGIQUE (AICA) ON HYBRID MEANS DIGITAL DIFFERENTIAL ANALYZER

The meeting will be held in Basle, Switzerland, from 29th August to 1st September, 1967.

The draft program reads as follows:

MATHEMATICAL TECHNIQUES FOR ANALOG AND HYBRID COMPUTATION

- Dynamic Behaviour of Nonlinear Systems (Limite cycles, Stability, Liapunov's Methods)
- Parameter Optimization (i.e. Gradient Method)
- Functional Optimization (Dynamic Programming, Pontriagin's Maximum Principle)
- Perturbation Techniques
- Solution of Partial Differential Equations
- Random-Process Studies
- Quantization and Sampling Errors in Hybrid Computation
- Digital Simulation Techniques

APPLICATIONS OF ANALOG AND HYBRID COMPUTERS IN:

- Chemical Industry
- Nuclear Engineering
- Aerospace Engineering
- Electrical Engineering
- Biomedical, Bionics
- New Applications (e.g. Economics)
- Education

COMPONENTS AND SYSTEMS

- Computing Design (analog and hybrid)
- New Computer Systems; Small Process Computers
- Analog/hybrid computing elements as system components
- Statistical Measurements
- Digital Simulators
- Educational Computers

DIGITAL AND HYBRID SOFTWARE

- Software for hybrid optimization, statistics etc.
- Housekeeping (checking, pot set, problem storage) software
- Block-oriented Digital-Computer Languages

The CALL FOR PAPERS to this Meeting was also issued to all National Member Organizations of IFAC.

FOURTH CONGRESS OF THE INTERNATIONAL FEDERATION FOR INFORMATION PROCESSING (IFIP)

As announced in Bulletin No. 21 (p. 46), this Congress will take place in the United Kingdom during 1968. It will take place in Edinburgh and not in London as previously annonnced, and further information can be obtained not from the Institution of Electrical Engineers, but from the British Computer Society, Finsbury Court, Finsbury Pavement, London, E.C.2.

FREE IDEAS, OPINIONS AND SUGGESTIONS

SUGGESTIONS TO IMPROVE THE INTEGRATION OF CONTROL SYSTEMS THEORY WITH CONTROL SYSTEMS PRACTICE

by M. C u é n o d and A.P. S a g e
Department of Electrical Engineering
University of Florida, Gainesville, Florida, USA

This report was written in response to the invitation of the Chairman of the Applications Committee of IFAC. Since many of the suggestions are related to educational problems, it was also submitted to the Education Committee of IFAC. In recent meetings, both Committees agreed that suggestions made in this report deserve consideration and wider distribution. In its last meeting the Executive Council of IFAC decided to publish the report in the IFAC Information Bulletin

INTRODUCTION

The conventional approach to the design of control systems has developed in part from linear circuit analysis techniques and the theory of feedback amplifiers. In recent years, this approach has become less and less commensurate with the proper formulation and solution of modern problems in systems control such as occur in space vehicle guidance, power systems control, process control, and a variety of other applications.

In recent times considerable attention has been paid to the development of a general theory of control, based in large part upon the calculus of variations, stochastic processes, vector spaces, and emphasizing optimal control theory. These developments were necessary for a variety of reasons. Among these was the desire to apply analog, digital, and hybrid computers as tools for off-line and on-line control components in sophisticated systems. Augmentation of the conventional approach to control systems design and synthesis with the methods just outlined results in what is commonly called "Modern Control". The application of this method leads to the following three steps:

(a) A mathematical model of the dynamic process is formulated. This includes the constraints and cost of particular controls.

(b) Optimization theory is then used to determine the optimal control strategy and ultimate performance limitations of the dynamic process with the constraints and control cost.

(c) Finally, synthesis of the optimal controller is accomplished.

From this very brief account of the general theory of control it is seen that it is considerably more potent than the conventional approach. However, the impact of the general modern theory of control has not been felt to any significant extent in control applications.

L.A. Z a d e h (1) cites a dual gap existing in the control area.

> "There is very little interaction between universities and industry. As a result, control engineers in industry are by and large ignorant of recent theoretical developments and fail to take advantage of the availability of effective analytical techniques for the solution of at least some of the practical problems which they are facing. On the other side of the fence, university professors are frequently ignorant of the constraints imposed by physical and economic realities and on occasion tend to become afflicted with sterile scholasticism. In effect, they become contributors to the inundation of our technical journals with papers that are acceptable for publication by virtue of the aura of respectability which is associated with academic research, even when such research is lacking in either theoretical or practical significance."

At the last IFAC Congress, the "gap" between theory and application in automatic control was recognized. It can be expected that this gap has increased since the 1963 Basle Congress. In a recent publication, G i b s o n (2) discusses present trends in automatic control and reaches the conclusion that

> "there is a great need now - and for at least the next five years - to learn how to apply some of the new theory".

Integration of control system theory and practice must be accomplished at two levels:

(a) The industrial control engineering practitioner must be made aware of the new general theory of control and must be instructed in its latent used for vastly improved control system design.

(b) Means must be provided for the engineering manager to keep in touch with recent developments and future trends in control systems engineering.

It is immediately recognized that these are at the same time very important and very difficult problems, which have been of great concern in the United States and in several other countries for the past few years and which have been the subject of extensive debate (1) among educators as well as among industrial systems engineers. While it is hopeless to comment in a brief report on all aspects of these problems, it is nevertheless felt that their importance and the ever increasing gap between theory and practice makes it all the more important to seek a workable solution - in actual practice as well as on paper.

A. TRAINING OF PRACTICING CONTROL ENGINEERS

1. Postgraduate University Study

Engineers in industry should consider the possibility of attending a university for graduate study. However, many control practitioners could not, for a variety of reasons, become "on campus" graduate students. Thus, the number of industrial personnel who could accomplish this aspect of training is a small percentage of the total. Engineers should however be encouraged to undertake industry financed graduate work as "regular on campus" graduate students, particularly when the proposed program is of mutual benefit to the student and the industry.

2. Short Courses

The University of California at Los Angeles (UCLA), the University of Michigan, the Massachusetts Institute of Technology (MIT), and others have been remarkably successful in offering intensive courses of one to two weeks duration for specialists as well as those in need of refresher courses.

The IFAC Applications Committee should promote such courses in various countries, give suggestions concerning course contents, and disseminate the idea that these courses are essential every two or three years in order for specialists to obtain a reasonably broad picture of current developments. The Committee could for instance sponsor a team of professors who could give such courses in connection with UNESCO.

Subject matter should include control engineering in general with special emphasis on practical application of Modern Control Theory as determined by the needs of the individuals and country involved. Financial responsibility should be assumed by the member organization where the course is organized. The member organizations would also have the responsibility of adapting the specific program to the needs of the country and the status of the attendants.

3. Regular "On Campus" Courses available in the Industrial Environment

Many Universities offer courses in control systems to industrial engineers in programs operated through extension divisions in one form or another. Many of the problems concerned with the gap between theory and practice as well as the problem of technological obsolescense can be solved in this way. Recent experiments with televised instruction (3) have indicated methods of solving problems of availability of professors, travel time for students and professors, classes during working hours, and other problems inherent in this form of operation.

4. Tutorial Articles

Strictly tutorial articles appearing in the various professional magazines would have great usefulness. One of the largest obstacles to be overcome in the widespread understanding of the new modern general theory of control has been the lack of suitable tutorial articles on the subject. This has prevented many, who were unfortunate enough to be absent from academic circles when the development was started, from understanding the advanced papers in the literature. Only now are tutorial texts on these new subjects beginning to appear. Papers designed to deliniate common problems and associated solutions in various areas would avoid the fragmentation of effort which occurs when several groups must solve essentially the same problem in an independent manner because of a lack of understanding or appreciation of the significance of control theory as a general tool for systems engineering. The IFAC Applications Committee might make suggestions concerning such articles and invite outstanding specialists to write them.

5. Meetings between Specialists

It should be recognized that the symposia organized by IFAC would be more complete and beneficial if they contained a reasonable variety of "panel discussions" without formal lecture or paper presentation. The joint computer conferences "discuss only" sessions have been particularly successful in this regard. A further step might be to encourage specialists in different disciplines such as mathematics and automatic control to come together for a brief period of time, perhaps a week, in order to discuss their specific needs and how they might aid and further understand one another in satisfying these needs.

To be efficient such meetings should be organized in very small groups on specific subjects such as, for example, numerical analysis applied to control problems. The small groups would be under the leadership of an outstanding professor or industrial specialist. The Applications Committee could effectively promote such meetings.

B. TRAINING OF ENGINEERING MANAGERS

Of equal, if not greater, importance is the training of the engineering executive, or engineering manager in the new control science. It appears to be impossible to achieve the proper appreciation of this new theory among practitioners unless management is made aware of the benefits, and difficulties, to be encountered and derived from the new theory. This training can also be had by combination of several approaches.

1. Yearly Survey of Major Applications of Control Theory

The IFAC Applications Committee should prepare a yearly survey covering the major trends in the applications area of control in the various countries with specific emphasis on the economic and sociological implications of these applications.

2. Professional Journal Articles Directed at Management

These management articles should explain, with a minimum of mathematics, the new concepts and methods of automatic control. Survey articles covering the more outstanding applications of these new methods should appear from time to time. Economic or cost effectiveness aspects of the new techniques must not be ignored. An example of such a presentation is the recent article by N e l s o n (4) which covered the practical application of some aspects of optimal control theory. The IFAC Applications Committee should encourage the writing of such articles.

3. Faculty-Industry Exchanges

Engineer-executives could be employed on university faculties as Visiting Professors. This method of training could probably not be used to any large extent. An even more effective use of this method for the integration of theory and practice would consist of mutual exchange arrangements between university faculty and key industrial personnel. This should lead to a mutual strengthening of research activities for both the industry and the university. It would not be necessary for the engineer-executive to be given one of the traditional professional titles since the primary purpose of the executive should be to offer his wisdom and experience in guiding, judging, defining, and evaluating the development of the control program rather than specific detailed instructional responsibilities.

One major shortcoming in many universities appears to be the dearth of laboratory facilities for accomplishing effective control applications studies. Engineer-executives could fulfill a very real need by assisting the universities with financial, physical and mental effort in the much needed development of these laboratories.

4. Courses Specifically Directed at Management

If short courses are carefully thought out and executed, they can be tremendously effective in the training of the engineering executive. Sponsorship can be by the government, the companies themselves, universities, or by professional society subgroups.

One program designed to bolster the engineering manager's understanding of modern science and technology is an intensive six weeks' course called "Modern Engineering for Engineering Executives", offered each summer by the UCLA Extension (5). In order to update management to recent engineering developments, the program aims at creating a general understanding of modern technical concepts. With the scientific and engineering background acquired during the six weeks, the engineering manager should be in a better position to give effective guidance to subordinates who have recently graduated from college.

The General Electric Company has been so enthusiastic about the program that they have had the university institute a similar program for their managers which is held three times a year. (6)

5. Managerial Symposia

The IFAC Applications Committee could take the initiative in organizing special symposia for managers, explaining the new concepts and methods of automatic control, without the use of higher mathematics. In addition, the symposia would describe some typical applications of the theory and the results achieved by these applications. By including these topics, and presumably others concerning economic and reliability considerations, the managerial decision making ability of the attendants should be enhanced.

CONCLUSIONS

Several efforts which may be taken to integrate control system theory and practice have been described. In all of these efforts, the professional societies, including the technical Applications Committee of IFAC, can, should, and must either by direct or indirect action take a leading role.

In conclusion, it would seem that the important task of the IFAC Applications Committee in promoting the applications of modern control engineering will be to provide "impedance matches" between modern control, industrial practitioners, engineering executives, and university faculty.

These matches will help control industry as the universities benefit from and at the same time to be in a position to contribute to the revolution which has occurred in control science.

R e f e r e n c e s

(1) L.A. Zadeh: "A Critical View of our Research in Automatic Control". Report of Workshop on Automatic Control Research, N.S.F., Washington, D.C., June 1962.

(2) J.E. Gibson: "From Control Engineering to Control Science". IEEE Spectrum, May 1965, pp. 69-71.

(3) T.L. Martin, Jr.: "Genesys - Florida's Weapon Against Technological Obsolescence". Engineering Facts, University of Florida, April 1965.

(4) W.L. Nelson: "On the Use of Optimization Theory for Practical Control System Design". Proceedings of the 1964 Joint Automatic Control Conference, June 1964, pp. 422-428.

(5) "Modern Engineering at UCLA". Journal of the Society for Engineering Education, May 1965, p. 266.

(6) H. Chestnut: "Bridging the Gap in Control - Status 1965". IEEE Transactions on Automatic Control, April 1965, Vol. AC-10, Number 2, pp. 125-126.

PUBLICATIONS

LIST OF PROCEEDINGS OF IFAC CONGRESSES AND SYMPOSIA

The last issue of the IFAC Information Bulletin gives welcome occasion to a survey of all proceedings of IFAC events:

1. IFAC CONGRESSES

1.1 IFAC Congress M o s c o w, June 1960

"AUTOMATIC AND REMOTE CONTROL"

published by: Butterworth & Co.,
88 Kingsway, London, WC 2, England

4 volumes, £ 45 (one volume £ 12)

1.2 IFAC Congress B a s l e, August 1963

"AUTOMATIC AND REMOTE CONTROL"

published by: Butterworth & Co.,
88 Kingsway, London, WC 2, England,

a n d R. Oldenbourg Verlag,
145 Rosenheimer Strasse,
München 8, Germany

2 volumes, £ 30 8s. The two individual volumes on THEORY (£ 20) and on APPLICATIONS AND COMPONENTS (£ 22) are now available separately.

Russian editions of the Congress Proceedings are also available. Published by Naúka, Moscow.

2. IFAC SYMPOSIA

2.1 IFAC Symposium R o m e, April 1962

"OPTIMIZING AND ADAPTIVE CONTROL"

published by: Instrument Society of America (ISA),
530 William Penn Place,
Pittsburgh 19, Pa., USA

311 pages, $ 10.50 ($ 12.00 abroad)

2.2 IFAC Symposium M o s c o w, September 1962

(a) "THEORY OF FINITE AND STOCHASTIC AUTOMATA"
(This is the English translation of the title in the Russian language)

published by: Naúka,
Podsosenski Pereńlok 21,
Moscow K-63, URRR

2 volumes; 1 rouble 94 kopecks per volume

(b) "TRANSLATED PROCEEDINGS - RELAY SYSTEMS AND FINITE AUTOMATA"
(The volume contains the English translation of the Russian language papers presented at the Symposium; papers originally presented in the English language are not included in this volume).

published by: Burroughs Corporation,
Paoli, Pennsylvania, USA

631 pages, $ 7.50

2.3 IFAC/IFIP Symposium S t o c k h o l m, September 1964

"DIGITAL COMPUTER APPLICATIONS TO PROCESS CONTROL"

published by: Plenum Press (ISA),
227 West 17th Street, New York, N.Y., USA

593 pages, $ 17.50

The following proceedings will be published within the next months:

3. IFAC SYMPOSIA

3.1 IFAC Symposium S t a v a n g e r, June 1965

"PEACEFUL USES OF AUTOMATION IN OUTER SPACE"

to be published by: Plenum Press (ISA),
227 West 17th Street, New York, USA

475 pages, $ 17.50
appx. date of issue: end of 1965

3.2 IFAC Symposium T o k y o, August 1965

"SYSTEMS ENGINEERING FOR CONTROL SYSTEM DESIGN"

to be published by: IFAC Tokyo Symposium Committee,
Tokyo Central P.O. Box 1057,
Tokyo, Japan

appx. 500 pages, appx. $ 15.30
appx. date of issue: early 1966

3.3 IFAC Symposium T e d d i n g t o n, September 1965

"THEORY OF SELF-ADAPTIVE CONTROL SYSTEMS"

to be published by: Plenum Press (ISA),
227 West 27th Street, New York, USA

appx. date of issue: early 1966

3.4 IFAC/IFIP Symposium M u n i c h, October 1965

"MICROMINIATURIZATION IN AUTOMATIC CONTROL EQUIPMENT AND IN DIGITAL COMPUTERS"

to be published by: R. Oldenbourg Verlag,
145 Rosenheimer Str., München, Germany

appx. 750 pages, appx. $ 25
appx. date of issue: summer 1966

Germany

2.3.1.4. M.A. A i s e r m a n , F.R. G a n t m a c h e r : Die absolute Stabilität von Regelsystemen (THE ABSOLUTE STABILITY OF CONTROL SYSTEMS) (Translated from Russian),München, R. Oldenbourg Verlag, 1965, 200 p., 18 illus., 34 DM

2.4.1.1. D. S c h u l t e: Logische Netzwerke (LOGIC NETWORKS), München, R. Oldenbourg Verlag, 350 p., 80 illus., 35 DM
Part 1: Boolean Algebra and two-valued logic
Part 2: Sequential networks

2.4.2.0. H. R ö s c h l a u: Handbuch der angewandten Impulstechnik (MANUAL OF APPLIED PULSE TECHNIQUES), Hamburg, R. von Decker's Verlag, 1965, 496 p., 753 illus., 66 DM

4.0.1.2. H. H a h n: Thermistoren (THERMISTORS), Hamburg, R. von Decker's Verlag, 1965, 120 p., 76 illus., 18 DM

4.0.5.1. W. A m m o n,(Editor): Schaltungen der Analogrechentechnik (CIRCUITS OF ANALOG COMPUTATION TECHNIQUES, München, R. Oldenbourg Verlag, 1965, 140 p. 170 illus., 22 DM

5.6.0. G. K o r t e: Fertigungszentralen. Automatisierte Datenerfassung in Fertigungszentralen (CENTRALIZED PRODUCTION PLANTS. AUTOMATIC DATA PROCESSING IN CENTRALIZED PRODUCTION PLANTS), Hamburg, H. von Decker's Verlag, 1965, 236 p. 61 illus., 26 DM

5.6.3.9. E. W e i s: Mess- und Regelanlagen in der Petrochemie (MEASURING AND CONTROL PLANTS IN PETROCHEMICAL INDUSTRY), München, R. Oldenbourg Verlag, 1965, 140 p., 145 illus., 25 DM

United Kingdom

1.1.3.4. A.A. A n d r o n o v: THEORY OF OSCILLATORS (Translated from Russian), Oxford, Pergamon Press, 1965, 848 p., 140 s.

1.1.6.0. P.I. K u z n e t s o v: NON-LINEAR TRANSFORMATIONS OF STOCHASTIC PROCESSES (Translated from Russian), Oxford, Pergamon Press, 1965, 512 p., 140 s.

1.1.6.0. V.S. P u g a c h e v: THEORY OF RANDOM FUNCTIONS AND ITS APPLICATION TO CONTROL PROBLEMS (Translated from Russian), Oxford, Pergamon Press, 1965, 850 p., 150 s.

1.1.9. S.B. N o r k i n (Editor): ELEMENTS OF COMPUTATIONAL MATHEMATICS (Translated from Russian), Oxford, Pergamon Press, 1965, 206 p., 40 s.

4.0.5.1. D.B. W e l b o u r n: ANALOGUE COMPUTING METHODS, Oxford, Pergamon Press, 1965, 90 p., 12s. 6d.

4.0.5.2. A.D. B o o t h: DIGITAL COMPUTERS IN ACTION, Oxford, Pergamon Press, 1965, 152 p., 15 s.

4.0.5.2. I.M. K h a b a z a: NUMERICAL ANALYSIS, Oxford, Pergamon Press, 1965, 264 p., 35 s.

4.0.5.2. K.C. P a r t o n: THE DIGITAL COMPUTER, Oxford, Pergamon Press, 1965, 132 p., 25 s.

4.0.5.3. A.V. S h i l e i k o: DIGITAL DIFFERENTIAL ANALYSERS, (Translated from Russian), Oxford, Pergamon Press, 1965, 116 p., 45 s.

4.5.1.4. J. G r o s z k o w s k i: FREQUENCY OF SELF-OSCILLATIONS (Translated from Polish), Oxford, Pergamon Press, 1965, 525 p., 100 s.

USA

2.5.3. M.D. M a r k a r i a n: A HEURISTIC FOR DECISION-MAKING UNDER UNCERTAINTY, Cleveland, Ohio, Systems Research Center, Case Institute of Technology, 1965, 124 p.

5.3.7. AUTOMATIC INDEXING: A STATE-OF-THE-ART REPORT, Washington, D.C., Government Printing Office, Catalog No. C13.44:91, 1965, 220 p., $ 1,50

5.6.2.1. OUTLOOK FOR NUMERICAL CONTROL OF MACHINE TOOLS. A STUDY OF A KEY TECHNOLOGICAL DEVELOPMENT IN METALWORKING INDUSTRIES, Washington, D.C., Government Printing Office, Catalog No. L2.3:1437, 1965, 63 p., $ 0,40

5.6.7.5. SYSTEMS ENGINEERING IN CERAMICS, Washington, D.C., Government Printing Office, Catalog No. C13.10:267, 1965, 136 p., $ 2,00

2.0. PROCEEDINGS OF THE 1965 JOINT AUTOMATIC CONTROL CONFERENCE. American Society of Mechanical Engineers, 345 East 47th Street, New York, N.Y., $ 25,00

Yugoslavia

2.0. J. B o ž i č e v i ć (Editor: Automatizacija. Mjerenje, Regulacija, Računala (AUTOMATION. MEASUREMENT, CONTROL, COMPUTING), JUREMA 1965 Yearbook. Zagreb, Tehnička Knjiga, 1965, 357 p.

What's New in Control Standards

We are indebted to The Reuben M. Donnelley Corp., New York, for permission to reprint this report originally published in CONTROL ENGINEERING, August 1965, pp. 83-85

The American Automatic Control Council's Terminology Committee reports on 1964 U. S. standards activity related to the control field. Terms and symbols for a variety of subjects and equipment like relays, annunciators, transducers, and potentiometers are covered by these standards. This updates the previous AACC report, published in the June 1964 CtE.

C. H. GOULD, National Aeronautics & Space Administration

ASA

American Standards Assn.
10 East 40th St.
New York, N. Y. 10016

American Standard C39.1-1964, *Requirements for Electrical Indicating Instruments*, is now available.

Sectional Committee Y14 Subcommittee 17 and a task group of Sectional Committee Y32 are revising *Graphic Symbols for Fluid Power Diagrams*.

A subcommittee of ASA C42 under J. D. Tebo, which is revising the 1941 *Definitions of Electrical Terms* ASA C42.05, has prepared the fourth draft of a new standard for 200 terms. This, together with six pages of changes recommended in view of comments received, is being circulated to C42 for formal vote.

ASME

American Society of Mechanical Engineers
345 East 49th St.
New York, N. Y. 10017

A proposed American Standard on *Test Codes for Control and Solenoid Valves* is being prepared by the Test Code Committee. ASA Sectional Committee C85, sponsored by ASME and chaired by D. H. Smith, is considering a supplement to C85.1-1963, *Terminology of Automatic Control*.

BEMA

Business Equipment Manufacturers Assn.
235 East 42nd St.
New York, N. Y. 10017

BEMA, as sponsor of ASA Committee X3, Computers and Information Processing, has issued:

X3.1-1962, *Signaling Speeds for Data Transmission*; X3.2-1963, *Print Specifications for Magnetic Ink Character Recognition*; and X3.3-1963, *Bank Check Specifications for Magnetic Ink Character Recognition*.

X3.4-1963, *Code for Information Interchange*, has been revised and is being circulated for approval.

Proposed American Standards have been prepared: X3.6/19, *Flowchart Symbols for Information Processing*; X3.2/16, *Perforated Tape Code for Information Interchange*; RS-273, *Interchangeable Perforated Tape Variable Block Format for Positioning and Straight Cut Numerically Controlled Machine Tools*; RS-274, *Interchangeable Perforated Tape Variable Block Format for Contouring and Contouring/Positioning Numerically Controlled Machine Tools*; *Specification for General Purpose Paper Cards for Information Processing*; proposed amendment to *Specification for General Purpose Paper Cards for Information Processing*; *Bit Sequencing of the American Standard Code for Information Interchange in Serial-by-Bit Data Transmission*; *FORTRAN and Basic FORTRAN*; *Character Set for Optical Character Recognition* (X3.1/18); *Take-Up Reels for One Inch Perforated Tape for Information Interchange* (X3.2/70); and *Parallel Signaling Speeds for Data Transmission* (X3.3/6).

Other activities of X3 include:

- Preparation of X3.1, *Optical Character Recognition*.
- A task group is working on specifications for unrecorded magnetic tape and for conventions in format and labeling of recorded magnetic tape and *Recorded Magnetic Tape for Information Interchange*.
- A task group is developing two proposals in the punched card area. The first is a physical description of the location and dimensions of holes in rectangular-hole 12-row punched cards. The second is the punched encoding of ASCII.
- A task group is developing a standard for the position of printed characters on punched tape and doing initial work on the standards for edge punched unit documents.
- A task group is revising *Specifications for One Inch Perforated Paper Tape for Information Interchange* to reconcile differences in dimensioning tolerances.
- Members of X3.2 are collaborating with X4-A9 in the development of keyboards for ASCII.
- The final draft of the *U.S.I./O for ALGOL* is being prepared for submission to ISO.
- A task group is working on specifications for APT.
- A working document specifying COBOL is being edited for the sixth issue of the CIB.
- The draft IFIP *Glossary* and the *Draft Vocabulary for Information Processing* are undergoing evaluation.
- Work is being conducted to analyze and specify the conventions for use of the flowchart symbols. A glossary of special terms is being developed.
- A standard on MICR error correction is being developed and possible needs for additional standards in the MICR are being evaluated, including possible revision of the *American Standard Bank Check Specifications for Magnetic Ink Character Recognition*.

EIA

Electronic Industries Assn.
11 West 42nd St.
New York, N. Y. 10036

The following EIA standards were issued during 1964: RS-293, *Sonic Wire Delay Lines*, prepared by Committee P-3, chaired by L. Kirkwood; RS 300, *Methods of Test for 3-Inch Image Orthicons*, Committee JT-4, E. H. Eberhardt; RS-305, *Display Storage Tube Nomenclature*, Committee JT-6, W. J. Hindman; and RS-309, *General Specifications for Thermistors, Insulated and Non-Insulated*, Committee P-1.6, H. Schwartz.

EIA Engineering Committee TR-30 on Data Transmission is preparing a proposed standard on *Interface between Data Processing Terminal Equipment and Automatic Calling Equipment for Data Communication*. It is working on standards for parallel signaling speeds, electrical characteristics of higher speed interfaces, and contact closure interface.

Engineering Committee TR-31 on Numerical Control has a task group developing a proposed standard on a universal magnetic tape cartridge for numerical control. The Committee is also considering proposed codes for programming symbols for drafting machines.

In addition to these standards, the following engineering publications were issued: Automation Bulletin No. 3B, *Glossary of Terms for Numerically Controlled Machines*, prepared by Committee TR-31, chaired by D. B. Schneider; JEDEC Publication No. 50, *Relative Spectral Response Data for Photosensitive Devices (S Curves)*, Committee JT-4, E. H. Eberhardt; Microsystems Bulletin No. 2, *Users Guide for the Preparation of Specification Formats for Digital Microcircuits*, Committee MCA, F. B. Iles; and Industrial Electronics Bulletin No. 5, *Signal Quality at the Digital Interface*, Committee TR-30.1, H. H. Smith.

EJC

Engineers Joint Council
345 East 47th St.
New York, N. Y. 10017

Publication of the *Thesaurus of Engineering Terms* marks a major milestone in literature for computer indexing. The 320-page *Thesaurus* is a list of engineering terms and their cross-reference relationships for use in vocabulary control in indexing and retrieving technical information. Included are 10,515 main terms with cross-references in more than 80,000 entries. "Scope notes" or definitions are included where necessary as well as synonomy and hierarchy (broader terms-narrower terms). Preferred terms for indexing and retrieval are indicated. More than 100 engineers organized in 10 subcommittees meeting over a period of 27 weeks full time developed the *Thesaurus*.

IEEE

Institute of Electrical and Electronics Engineers
345 East 47th St.
New York, N. Y. 10017

A set of 62 definitions of terms used in modern control technology is being formulated by Committee 26.0, under G. S. Axelby, for approval as IEEE or possibly ASA C-85 standard terms. In addition it is planned to publish brief descriptions of techniques such as the maximum principle.

The IEEE Rectifier Device Group is working on terms for bidirectional PNPN-type switches.

ISA

Instrument Society of America
530 William Penn Pl.
Pittsburgh, Pa. 15219

The following ISA Recommended Practices have been published: 8A-RP37.2, *Guide for Piezoelectric Acceleration Transducers for Aerospace Testing*, chaired by T. A. Perls; and 8A-RP37.3, *Guide for Strain Gage Pressure Transducers for Aerospace Testing*, P. S. Lederer. Each of these documents defines a drawing symbol and provides nomenclature, design and performance characteristics, and acceptance, calibration, and qualification tests.

8D-RP18.1, *Specifications and Guides for the Use of General Purpose Annunciators*, A. P. McCauley, provides standard nomenclature, circuit diagrams, operating descriptions, sequences, and purchasing specifications.

8D-RP42.1, *Instrument Tubing Fitting Nomenclature (Threaded)*, J. M. Taylor, gives standard terminology and symbols adopted for all threaded tubing fittings.

Also, ISA has reactivated one committee and

organized one; both are important to the field of automatic control. 8D-RP5, Instrument Flow Plan Symbols, chaired by George Platt. Scope: reevaluate and update existing RP5.1-1949. 8D-RP46, Direct Digital Control (Terminology), chaired by A. P. McCauley. Scope: define acceptable terminology in accordance with the guide lines for direct digital control users provided by the ISA Chemical and Petroleum Industries Div. Workshops held on this topic in May 1963 and May 1964.

NARM

National Assn. of Relay Manufacturers
P. O. Box 7765
Phoenix, Ariz. 85011

H. D. Steinback's committee will release for publication in September 1965 the *Engineer's Relay Handbook*. A 200-page terminology section will be based on NARM's "Definitions of Relay Terms" and ASA C83.16-1959.

NEMA

National Electrical Manufacturers Assn.
155 East 44th St.
New York, N. Y. 10017

The second annual supplement to AS 1-1962, *Industrial Automatic Systems*, has been issued by E. H. Vedder's group. It contains new definitions, classifications of feedback control systems and enclosures.

NFPA

National Fluid Power Assn.
P. O. Box 49
Thiensville, Wis. 53092

The fourth edition of the *Glossary of Terms for Fluid Power*, STD T3.1.64.1, is available. It is proposed as an ASA standard under ASA B93.

ASA B93.1-64, *Dimension Identification Code for Fluid Power Cylinders*, has been approved and issued.

A second edition of STD T3.11.64.1, *Recommended Practice for the Use of Fire Resistant Fluids for Fluid Power Systems*, has been prepared under the direction of R. Rynders.

PPMA

Precision Potentiometer Manufacturers Assn.
3525 Peterson Road
Chicago, Ill. 60645

Industry Standard for Wirewound Precision Potentiometers Inspection and Test Procedures is available from PPMA. W. Theola is chairman of the Standards and Nomenclature Committee working on incoming inspection standards for high resolution potentiometers (non-wirewound potentiometers).

Plans are being made to publish a *Reliability and Applications Handbook* by the Reliability and Applications Committee headed by D. L. Young.

SAMA

Scientific Apparatus Makers Assn.
20 North Wacker Dr.
Chicago, Ill. 60606

The Industrial Instrument Section has issued *Standard Load Cell Terminology & Definitions*, II 1-11-62, Revised 3-4-64. This standard covers terminology relating to electrical, hydraulic, pneumatic, and mechanical load cells used for performing accurate measurement of weight and force. Terms which clarify each performance characteristic relating to load measuring devices are included.

Measurement and Control Terminology, SAMA RC 20-11-1964, is available. This section is the first part of a glossary which, when completed, will contain terms and definitions dealing with measurement, operating variable, and performance. Work on the control phase by a subcommittee of the Recorder-Controller Section is progressing, terms and definitions being selected from ASA C85.1 and other U.S. and international societies' standards.

Measurement terminology efforts are headed by W. D. Wood; control terminology, by T. S. Imsland. The Systems Engineering Committee under J. K. Loeser is working on a proposed standard for instrument and control symbols, and, with ISA, on a standard for flow plan symbols.

SAMA is sponsor for a new ASA Sectional Committee C-100, Electrical Reference Instruments and Devices. The secretary is M. Pisciotta of ASA.

SCI

Simulation Councils, Inc.
P. O. Box 2228
La Jolla, Calif. 92037

Definition of Terms Used to Specify General-Purpose Analog Computers and Methods of Measurement was published in *Simulation*, and is proposed for ASA sponsorship.

The Standards Committee, chaired by H. Skramstad, plans to continue work on defining terms for analog computer specifications, defining testing methods to be used in determining analog computer specifications, reviewing analog computer symbols, and determining hybrid symbols.

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