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IFAC NEWS

International Symposium on Relay Systems Theory and Finite Automata

Moscow, 24th September to 2nd October, 1962

GENERAL FEATURES OF THE SYMPOSIUM

Following plans of the IFAC Technical Committee on Theory as approved by the IFAC Executive Council, the Committee jointly with the National Committee of the USSR on Automatic Control organized an International Symposium on the Theory of Relay Systems and Finite Automata from 24th September to 2nd October, 1962 in Moscow (see Bulletin No. 13, page 13). The aim of the Symposium was to discuss the present state of the Theory of Relay Systems and Finite Automata and main development trends for the future.

The Symposium was opened on 24th September by Academician V.A. T r a p e z n i k o v, Chairman of the National Committee of the USSR on Automatic Control. Academician B.N. P e t r o v, Chairman of the IFAC Technical Committee on Theory, delivered the introductory speech. Greetings were given by Academician G.C. M o i s i l (Rumania), Chairman of the Subcommittee on the Theory of Relay Systems and Finite Automata of the IFAC Technical Committee on Theory, Professor A.M. L e t o v, Past-President of IFAC, Academician A.Iu. I s h l i n s k y on behalf of the Praesidium of the Academy of Sciences of the USSR and Professor J.P. R o t h (USA).

Professor A.M. L e t o v, in greeting the Symposium on behalf of Professor Ed. G e r e c k e, President of IFAC, stressed the Federation's big role in achieving favourable conditions for the exchange of scientific information on Automatic Control between scientists and engineers from various countries. This Symposium, mentioned Professor L e t o v, was the second event of its kind organized by the IFAC Committee on Theory. The first one, organized successfully in last April at Rome with the active co-operation of the Italian National Member Organization of IFAC, was devoted to the theory of optimal and self-adjusting Systems. Professor L e t o v stated that Automatic Control science was now penetrating all aspects of human activities and even attempting to deal with processes which had been up to now the province of human intellect alone.

Professor M.A. G a v r i l o v (USSR) presented his report on "The present state of the Theory of Relay Systems and Finite Automata".

At the plenary session of 25th September, reports were read by Academician G.C. M o i s i l (Rumania), Academician A.N. K o l m o g o r o v and Iu. O f f m a n (USSR), Academician V.M. G l u s h k o v (Ukraine), and Professor R. P e t e r (Hungary).

Five working sections of the Symposium covered:

Section 1: Abstract Theory of Automata
Section 2: Stochastic Automata problems. Reliability and Codes
Section 3: Methods of Switching Structure Design
Section 4: Minimization of Boolean Functions and Design of Bridge Circuits
Section 5: Mechanization problems.

76 reports and papers were presented in English and Russian. Abstracts of papers were distributed in Russian and English to participants before the Symposium.

90 delegates from 16 countries attended the Symposium including (in order of number of participants): USSR, USA, Rumania, Poland, Hungary, Great Britain, Canada, Czechoslovakia, France, Germany, Sweden, Italy, Austria, Yugoslavia, Bulgaria, and United Arabian Republic. The total attendance with guests was about 600.

On 28th September, a meeting of the Subcommittee on the Theory of Relay Systems and Finite Automata was held under the chairmanship of Academician G.C. M o i s i l , and a draft of the Symposium final resolution was discussed. In this discussion and on the following day at the closing session the following participated: Professor Mc. C l u s k e y (USA), Professor R. T a r j a n (Hungary), Academician G.C. M o i s i l (Rumania), Professor W. S e m o n (USA), and Professor V. I. S i f o r o v , Correspondent Member of the Academy of Sciences of the USSR.

Speaking again on behalf of Professor Ed. G e r e c k e, President of IFAC, at the closing session of the Symposium, Professor L e t o v commented on the success of the Symposium and thanked both sponsoring organizations for their co-operation and for their hospitality. The active scientific co-operation between the attendants of this Symposium made him feel that similar meetings covering the whole field of Automatic Control science but each devoted to a detailed specialized investigation of a particular field should be more frequent in various countries.

Academician B.N. P e t r o v , Chairman of the IFAC Technical Committee on Theory, briefly reviewed the results of the Symposium. The draft of the final resolution of the Symposium, read by Professor G a v r i l o v , was unanimously approved.

The National Committee of the USSR on Automatic Control and the IFAC Technical Committee on Theory arranged a closing banquet which was attended by about 150 participants of the Symposium.

Technical visits to the Institute of Automatic and Remote Control, the Lomonossov State University, and the Computation Center of the USSR Academy of Sciences were organized. Trips to Leningrad, Kiev, and Tbilisi were also arranged during which participants of the Symposium visited historical monuments as well as research institutions active in the field of Automatic Control. For those who stayed in Moscow visits to research institutions, historical monuments as well as suburt of Moscow were arranged.

TECHNICAL CONTENTS OF THE SYMPOSIUM

The 76 reports and papers presented were divided into three categories:

a) 5 general reports (of 30 minutes each at both initial plenary sessions)
b) 48 papers (of 20 minutes each)
c) 23 short reports (of 10 minutes each).

They were presented in the five working sections.

General reports

- The present state of the theory of relay systems and finite automata, by M.A. G a v r i l o v (USSR)
- The development of theory of solid-state circuits in Rumania, by G.C. M o i s i l (Rumania)
- On problem solution by automata consisting of simple elements, by A.N. K o l m o g o r o v and Iu. O f f m a n (USSR)
- Digital automata synthesis problems, by V.M.G l u s h k o v (Ukraine)
- A linearization method of the Kantorovich's expression graphs with some applications, by R. P e t e r (Hungary)

Section 1. Abstract theory of automata

P a p e r s

- Minimum-amplifier synthesis of finite-state automata, by D.A. H u f f m a n n (USA)
- Minimum-state sequential circuits for a restricted class of incompletely specified flow tables, by E.J.McC l u s k e y (USA)
- Finite cellular automata, by A.W. B u r k s (USA)
- On the incorporation of the theory of automatic digital computers into the algebraic theory of automata by Moore, Mealy and Glushkov, by L. K a l m a r (Hungary)
- Minimizing the number of substantial connections between rows of a flow table, by P.P. P a r k h o m e n k o and Iu. L. T o m f e l d (USSR)

- Behaviour of discrete automata (switching systems) during transition periods, by V.N. R o g i n s k i i (USSR)
- On self-adaptive automata, by V.J. L e v e n s t e i n (USSR)
- Reduction of the number of internal states in certain classes of finite automata, by V.G. L a z a r e v and E.I. P e e l (USSR)
- Equivalence and minimization of sequential machines, by L.A. G u s e v (USSR)
- A use of graphs for obtaining minimum-relay circuits, by C. P o p o v i c i (Rumania)
- Minimum-state sequential circuits, by G. I o a n i n (Rumania)
- Simple method of synthesis of sequential switching systems, by E. S i v i n s k i (Poland)
- p-adic method in the theory of finite automata, by A.G. L u n z (USSR)
- Transformation of stages in sequential machines, by M.A. A i z e r m a n (USSR)
- Analysis and synthesis of solid-state sequential circuits, by M. C o r o i - N e d e l c u (Rumania)
- On equivalent transformations of regular expressions, by Iu.I. I a n o v (USSR)
- Asynchronous logics, by H. Z e m a n e k (Austria)
- Failure-stable elements and circuits, by V. C l e j a (Rumania)

S h o r t r e p o r t s

- On a certain class of regular events, by O.P. K u z n e t s o v (USSR)
- Operator representation of logic circuits in computers on the basis of vector switching functions, by Z.L. R a b i n o v i c h (USSR)
- Some problems in structural theory of automata, by L.V. M a t s e v i t y (USSR)
- Alphabetic mappings and finite automata, by A.A. L e t i c h e v s k i i (USSR)
- Analysis of generalized graphs by equations solution technique in some algebra, by V.G. B o d n a r c h u k (USSR)
- On commutative automata, by V.I. R e d k o (USSR)
- On some applications of semi-group representation theory to the theory of automata, by B.M. S h a i n (USSR)
- Synthesis of automation with least number of states and given response, by M.A. S p i v a k (USSR)

Section 2. Stochastic automata problems. Reliability and codes

Papers

- Information theory problems of unreliable finite automata, by G.S. G l i n s k i (Canada)
- Statistical theory of finite automata reliable operation in case of noise, by B.S. F l e i s h m a n (USSR)
- On the completeness of a system of unreliable elements realizing logical functions, by A.A. M u c h i k and S.G. G i n d i k i n (USSR)
- Affine m-ary Gray codes, by M. C o h n (USA)
- Redundancy bounds for w-error insensitive stochastic Boolean c-nets, by L. L ö f g r e n (Sweden)
- Games of automatics, by Iu. K r y l o v and M.L. T s e t l i n (USSR)
- Application of finite fields to synthesis of reliable switching structures, by R.R. V a r s h a m o v and V.M. O ș t i a n u (USSR)
- Hill-climbing: some remarks on multiple optimization, by O.G. S e l f r i d g e (USA)

Short reports

- Stochastic automata with variable structure, by V.I. V a r s h a v s k i i (USSR)
- Optimal behaviour of automation in the simplest random environment, by P.P. D a n k o v (USSR)
- Control of random huntings and biocinematics, by V.F. K r a p i v i n (USSR)
- Reliability and statistical self-control of complex systems with considerations of probabilistic use of their elements, by S.Iu. R u d e r m a n (USSR)
- Some statistical problems in the theory of finite memory load, by V.A. Z i a t i t s k i i (USSR)

Section 3. Methods of switching structure design

Papers

- Identification of threshold switching functions of a small number of variables, by L. D a d d a (Italy)
- Ternary threshold (majority decision) elements and problems of their synthesis, by I.N. B o g o l u b o v (USSR)
- A pragmatic theory of algorithm, by J.P. R o t h (USA)
- Algebra of relay-switch circuits, by V.I. S h e s t a k o v (USSR)
- Sampling as a means of compensating control systems, by M. H a m z a (Switzerland)

- The problem of selecting logically-efficient building blocks, by B. D u n h a m and J.H. N o r t h (USA)
- Synthesis of contact-diode notworks, by E. S m i t h (USA)
- A theory of uniform switching nets, by L. L ö f g r e n (Sweden)

Short reports

- General principles of combinational design, by Iu.V. K a p i t o n o v a (USSR)
- On diode circuits, by E.I. N e c h i p o r u k (USSR)
- A formalized language describing contact circuits, by E.K. V o i s h v i l l o (USSR)
- Two-terminal diode networks, by V.V. O b r a z t s o v (USSR)
- Evaluation of addition algorithm complexity, by E.L. V o i t o v a (USSR)
- Canonical method for the design of switching circuits, by A.S. B l o k h (USSR)

Section 4. Minimization of Boolean functions and design of bridge circuits

Papers

- A unified approach to functional decomposition, by R. M. K a r p (USA)
- A class of simultaneous Boolean equations, by W. S e m o n (USA)
- Solution of Boolean equations, by S. R u d e a n u (Rumania)
- On the application of linear programming to the simplification of normal forms of Boolean functions, by T.L. M a i s t r o v a (USSR)
- Algorithms of finding the absolute minimal expressions for a logical function, by V.D. K a z a k o v (USSR)
- On a group invariance of Boolean functions, by P. C o n s t a n t i n e s c u (Rumania)
- Choosing optimal codes, by J. E a r l e (USA)

Short reports

- Design of bridge structures for switching systems, by V.D. D i d e n k c (USSR)

Section 5. Mechanization problems

Papers

- Algorithmic language, cimpiler and organization of computer, by M. G r e n i e w s k i (Poland)
- A device determining the feasability of an operation function, by E. B r o m i r s k i (Poland)
- Minimization problems of normal forms of Boolean functions on all-purpose computers, by D.A. P o s p e l o v (USSR)
- Computer's simplification algorithm for Boolean expressions, by S. W a l i g o r s k i (Poland)
- Specialized machine for minimization of Boolean functions, by B.L. T i m o f e e v (USSR)
- Algorithmical system for the automation of digital automata synthesis, by A.A. S t o g n i i (USSR)
- Machine for the solution of logical problems of the switching synthesis type, by A.D. Z a k r e v s k i i (USSR)

Short reports

- The L-machine realization problem, by V.I. K a s h i r o v (USSR)
- The use of digital computers for the synthesis of threshold elements, by E.A. B u t a k o v (USSR)
- A minimization method for Boolean functions and its programming into a digital computer, by V.V. K i r i u k h i n (USSR)

FINAL RESOLUTION OF THE SYMPOSIUM

The final resolution unanimously adopted by the Symposium reads as follows:

"During the twenty-five years since the theory of switching systems and finite automata was founded, it has become one of the basic and most important sections of the theory of automatic control used at the present time for solving important theoretical and practical problems of constructing complex digital computers and control and monitoring machines, complex control systems, cybernetical devices, tele-automatic systems, systems of automatic communications and many other.

"The participants of the Symposium on the theory of switching systems and finite automata thank the IFAC Technical Committee on Theory and the USSR National Committee of Automatic Control for their initiative in convening the Symposium and the IFAC Executive Council for supporting this initiative.

"The 600 delegates and guests who have come to the Symposium from 16 countries, the 80 reports heard at the five sections of the Symposium are all an indication that this initiative found broad response among the specialists working in the field of relay technology and switching systems.

"The reports presented at the Symposium and the resulting discussion have shown that in the field of the theory of switching systems we have attained tangible achievements and have solved a number of important problems. However, there are still many problems to be solved.

"Among these are:

a) to conduct general research in the field of switching systems in order to specify the functions which they can perform and to estimate the number of elements.

b) to work out a convenient formal language for recording the operation of switching systems, which makes it possible to introduce minimization right in the initial stages of synthesis thus reducing demands in all subsequent stages.

c) to solve the problem of assignment (coding) of the states, bearing in mind the states of the switching elements and the simplicity of the structures.

d) to elaborate methods of classifying structures and switching systems, methods of minimizing their individual classes, as well as general minimization methods using restricted trial. The most pressing problem is to work out methods of minimization leading to parenthetical formulae.

e) to conduct research on the problems of reliability of switching systems by solving general problems of the theory of probabilistic automata, reliability calculation methods and selecting the scope of the minimal structural redundancy at the synthesis stage.

f) to automate the processes of syntheses both in general-purpose and special-purpose computers.

g) to work out scientifically based terminology in the field of the theory of switching systems and finite automata.

The participants of the Symposium attach special importance to the development of engineering methods of synthesis which would be available to a large group of specialists working in the field of relay technology and would contribute to its wider application for practical engineering purposes.

"With the aim of further developing the switching systems theory, the Symposium considers it expedient to introduce it on a large scale to college theoretical courses on automatic control. Such subjects as the theory of the design of digital computers and supervisory equipment for telemechanic

and remote control systems, automatic telephone stations, etc. can be to a considerable degree based on the theory of switching systems and finite automata.

"The complex theoretical and engineering problems in the field of the theory of switching systems and finite automata require closer contacts between scientists.

"The Symposium showed how fruitful discussion on this subject is when different schools of different countries participate.

"The Symposium urges greater co-operation between scientists by exchanging published papers, organizing joint discussions of the work done, etc., and appeals to the IFAC Committee on Theory to organize regular symposia on the theory of switching systems and finite automata at least once every two or three years.

"The Symposium considers it expedient to publish the proceedings in the Russian and English languages.

"The development of the theory of switching systems and finite automata helps to solve complicated and far-reaching problems of automation in technological and other processes and to accelerate the progress of humanity towards a maximum utilization of the natural resources, thus freeing man from hard labour.

"The Symposium calls on the scientists of all countries to spare no effort in attaining this noble aim."

The Proceedings of the Symposium in the Russian language will be published in summer 1963 by the Publishing House of the USSR Academy of Science. Inquiries and orders should be sent to this House through the

USSR National Committee
of Automatic Control,
Kalanchevskaja ul. 15a,
M o s c o w I 53/USSR.

An abbreviated English edition of the Proceedings will be published by the Instrument Society of America. Inquiries should be sent to

Prof. E.J. S m i t h ,
Polytechnic Institute
of Brooklyn,
333 Jay Street,
B r o o k l y n 1,N.Y./USA.

The Second IFAC Congress

DATE OF THE CONGRESS

The date of the Second IFAC Congress to be held at Basel/Basle (Switzerland) has been confirmed to be from August 27 (registration day) to September 4, 1963. From September 5 to 7, excursions to various Swiss firms, laboratories and institutions will be organized. In addition, long distance excursions will be proposed for the week from September 8 to 14.

SCIENTIFIC PROGRAM

From November 29 to December 1, 1962, the Selection Committee which had been appointed by the IFAC Executive Council, held a meeting at Zurich to make the final selection of the papers to be presented. Altogether 268 papers had been submitted, but the Executive Council had agreed with the Swiss Association of Automatic Control to admit not more than about 150 papers. Therefore it became necessary to reject about 120 papers.

The selection work had carefully been prepared by the Chairmen and Vice-Chairmen of the IFAC Technical Committees on Theory, on Applications and on Components with the very effective assistance of many experts who had reviewed the papers. Therefore it is hoped that the difficult task of screening the papers has been achieved in the best way possible. Admission and rejection of papers was decided on the grounds of newness and technical level of the paper, clarity and length, overlapping with other papers for the Congress and, last not least, field of interest. About 156 papers have finally been adopted (this figure being subject to further revision). These 156 papers have provisionally been grouped under a number of topics, each of which will determine one or several half-day sessions of the Congress. The topics are:

(1) in the field of Theory (26 sessions with 80 papers)

General Problems
Systems Dynamics
Invariant Systems
Self-adjusting Systems
Self-adapting Systems
Learning Systems
Predictive Systems
Optimal Systems
Optimal Programming
Synthesis of Optimum Systems
Stability (Liapunov)
Hill Climbing
Describing Functions
Non-linear Stochastics
Sample data Systems
On-off Systems
Finite Automata
Discrete Systems
Time varying Parameters
Distributed Parameters
Computer Control
Control Structure

(2) in the field of Applications (19 sessions with 53 papers)

Steel Industries
Oil Industries
General Applications
Hydraulic Turbines
Nuclear Power
Man and Machine
Automotive Drive
Aerospace Control
Methods

(3) in the field of Components (7 sessions with 23 papers)

Digital Devices
Electronic Components
Reliability
Electromechanical Devices and Magnetic Amplifiers
Mechanic, Hydraulic, and Pneumatic Devices
Other Components

Besides the 156 adopted papers about 10 more papers, each giving a survey on the state of science in a specialized field, have been asked from invited authors. The titles of these papers have not yet been definitely fixed.

PROCEDURE FOR THE PRESENTATION AND DISCUSSION OF PAPERS

The 156 adopted papers have been passed to publishing houses in London and Moscow for being printed in two versions: one in the English (with some papers in French), the other in the Russian language. Preprints of the full papers will be distributed in either version to all those attendants of the Congress who send in the Registration Form and pay the registration fee early enough.

The papers will not be orally presented at the Congress, the authors being allowed only to give an abstract of a few minutes or to make some remarks on additional results obtained since submitting their paper. It is hoped that this procedure will grant sufficient time for a thorough discussion of each paper assuming that the attendants have studied prior to the Congress those preprints they are especially interested in.

DISTRIBUTION OF PROGRAMS AND REGISTRATION FORMS

It is expected that the Advance Program of the Congress will be available by the end of January. Copies may be requested directly from the

IFAC Secretary, Dr.-Ing. G. Ruppel, VDI,
Postfach 10250, Düsseldorf (Germany).

The program will include all necessary information and a Registration Form to be returned not later than March 31, 1963. Until this date reduced registration fees are applicable.

It will be rather difficult to provide hotel accommodation in Basle at the time of the Congress. Therefore it is strongly recommended to book rooms early. No guarantee for providing adequate rooms can be given for applications which are submitted later than March 31, 1963. Application Forms will be included in the program.

NEWS FROM NATIONAL MEMBERS

Finland

The Finnish Society of Automatic Control, National Member Organization of IFAC for Finland, held in 1961 three meetings devoted to lectures and discussions on various Automatic Control problems, amongst which were data processing and boiler control.

The membership in 1961 increased up to 57, which means an increase of about 50 % with respect to 1960.

The officers elected for 1962 are: Phil. Mag. A. M e l a r t (President), Dipl. Ing. V. H i e t a l a (Vice-President), Dipl. Ing. A. A a l t o n e n (Secretary).

The address of the Society is: Finnish Society of Automatic Control, Tekn. lis. U. Luoto, c/o Ekono, E.Esplanadinkatu 14, Helsinki.

Japan

Society of Instrument and Control Engineers

At the end of 1961, the Society of Automatic Control and the Society of Instrument Technology were dissolved and merged into the new "Society of Instrument and Control Engineers". As control engineering progressed, it was desirable to form an inclusive society which would cover all fields of instrumentation. The new society starts with the approval of all authorities in the field and incorporates all members and activities of the above two societies. In addition, many new projects were expected. This society has branches all over the country and membership is about 2500. The "Journal of S.I.C.E." is published and a symposium on automatic control is held monthly. The special sub-committees (Data-Processing, Temperature Measurement, and Tele-Metering) will start in the near future.

The officers are: Prof. Hiroshi H a s u n u m a (President), Prof. Zenzabro S a w a i (Vice-President).

The address is: Department of Technical Measurements, Faculty of Engineering, University of Tokyo, Motofuji-cho, Bunkyo-ku, Tokyo.

Sweden

The Swedish National Member Organization of IFAC is the Swedish Committee of IFAC (Svenska Kommittén för IFAC), which is itself a subcommittee of the Swedish Joint Committee for International Conferences (Svenska Centralkommittén för Internationella Ingenjörskongresser, SCII).

At the Annual General Meeting of SCII the following officers and members were elected for the three-years term 1962-1964 to constitute the Swedish Committee of IFAC.

Chairman: G. L j u n g b e r g (Deputy Director, Royal Swedish Academy of Engineering Sciences, Stockholm).
Members: J. A g e r b e r g (Head of guidance and control theory division, Research Institute of National Defense, Stockholm), Professor L. von H a m o s (The Royal Institute of Technology, Stockholm), R. J o n a s s o n (Karolinska Institutet, Solna), Prof. B. Q v a r n s t r ö m (Chalmers University of Technology, Göteborg), K. T i s e l i u s (Chief Engineer, Finspang), N. A s l u n d (University of Stockholm, Stockholm).
Secretary: O. W i g e r t z (The Royal Institute of Technology, Stockholm).

The address of the Committee is: Svenska kommitten för IFAC, c/o Ingenjörsvetenskapsakademien, Box 5073, Stockholm 5.

United Kingdom

B.C.A.C.

At the Second Annual General Meeting of the reconstituted B.C.A.C. (British Conference on Automation and Computation) held on the 2nd October, 1962, the Chairman, Sir Walter P u c k e y , introducing the Annual Report to the B.C.A.C. Council of the Executive Committee gave an encouraging review of the range of the B.C.A.C.'s activities during the past year and stressed the important discussions which lay ahead.

As required by the Constitution, the meeting elected the Honorary Officers and Executive Committee for the ensuing year as follows:

Honorary Officers: Sir Walter P u c k e y (Chairman), Prof. G.D.S. MacL e l l a n (Vice-Chairman), C. M e a d (Vice-Chairman), Sir Stewart M i t c h e l l (Vice-Chairman), S.M.R i x (Honorary Treasurer), F.J. S m i t h (Honorary Secretary).

Executive Committee: The Honorary Officers and S.W. A d e y, Dr. E.H. B a t e m a n , E.C. C l e a r H i l l, J.F. C o a l e s, J. C o o p e r, D. Du P r e, W.M. L a r k e, Sir Charles N o r r i s, Dr. J.M.S. R i s k, T.G.P. R o g e r s, G.M.E. W i l l i a m s, W.F.S. W o o d f o r d.

WORLDWIDE AUTOMATIC CONTROL

International

INTERNATIONAL SYMPOSIUM ON
BASIC ENVIRONMENTAL PROBLEMS OF MAN IN SPACE

This Symposium - its abbreviated title "Man in Space" - organized by the International Astronautical Federation and the International Academy of Astronautics was held at the UNESCO House, Paris, from October 29 to November 2, 1962.

The initial coverage of this Symposium was restricted to problems of ecophysiology and of psychophysiology. But, at the initiative of Professor V. B r o i d a (France) representing both UATI (Union des Associations Techniques Internationales-Union of International Engineering Organizations) and IFAC (which is a member of the latter) at the preparatory meetings and at the Symposium itself, a third section, devoted to data acquisition, analysis and control was added.

Seven papers in this last section (including one by Professor K. S t e i n b u c h , selected through IFAC) were read and discussed during sessions on November 2, 1962. Short abstracts of them are given below.

Methods for somatic classification of pilots according to (1) present status of functional muscular, circulatory, and respiratory capacities and (2) possibilities of further development during training

by G. S t r ö m (Sweden)

(1) In the Swedish Defense Forces, especially the Air Force, testing of the physical capability of personnel at different ages has been carried out systematically for a number of years. A full series of measurements would appraise (a) certain body dimensions, such as height, weight, adipose tissue and lean body mass, skeletal length and breadth, total heart volume in the horizontal body position, and total blood volume; (b) functional circulatory and respiratory capacities, judged from the ventilation, oxygen uptake, heart rate, respiratory rate, blood lactate concentration and electrocardiogram reaction etc., under steady state conditions during stepwise increasing work loads of submaximal intensity and under non-steady-state conditions during maximum work load, from the circulatory responses to orthostatic testing, and from vital capacity and maximal ventilatory volume; (d) some index of endurance for work of very long duration.

(2) The results of the dynamic tests are evaluated as indices of maximal functional output and of maximal steady-state level. These indices of physical capability depend on the dimensional prerequisites as well as on the efficacy of the homeostatic regulative functions. The different indices are mutually interrelated, to a greater or lesser degree, in the normal individual. Appraisal of these interrelationships is an important part of the testing procedure.

Results from testing large personnel groups with some of the above-mentioned methods are mentioned.

Physical training of the circulatory system results in e.g. increased circulatory dimensions and increased maximal functional output, and apparently also in a higher efficacy of the homeostatic regulation - the orthostatic circulatory changes are less pronounced, and a higher proportion of the maximal output can be used under conditions of steady state.

Results from longitudinal studies capability in large personnel groups during periods of physical training are mentioned.

Biomedical Monitoring of Central Nervous System Function in Space

by W.R. A d e y and D. F l i c k i n g e r (USA)

Initial results obtained from monitoring human performance during manned orbital flight of 9 hours duration (USA) and 96 hours duration (USSR) indicate little, if any, demonstrable degradation from these levels achieved during ground-based simulator runs. With available biomedical instrumentation in current use, however, no critical assessment of central nervous system function has been possible during the US missions. Recognizing the extreme importance of monitoring and evaluating alertness, judgment, purposeful motor responsiveness during critical stages of future space missions, the authors have developed prototype electroencephalogram recording equipment which meets the unique and rigid requirements imposed during space flight.

Concomitantly with the required equipment and test and development a series of studies has been conducted on animals exposed to simulated stresses of space flight up to 14 days duration. These studies have included the effects of acceleration, vibration, sensory deprivation, hallucinogenic drugs on discriminative performance, alertness and sleep-wakefulness cycles, with concomitant essays being made of steroid and catecholamine metabolism.

As a basic keystone around which the final objective could be realized, the UCLA Space Biology Laboratory has pioneered in the application of 3 complex computer techniques to the analysis of the electroencephalogram data recorded. Differences in the various quantitative and qualitative functions analyzed have been seen in many of the responses studied and the results thus far encourage the view that these techniques are more revealing of early indicative changes than most others in current use.

Bio-medical Methods and Techniques under Space Flight Conditions

by I.T. A k u l i n i c h e v, R.M. B a y e v s k i and O.G. G a z e n k o (USSR)

1. Research work in space biology and medicine includes the theoretical analysis of factors affecting the living organisms, laboratory investigations with models of particular factors or a complex of factors, and finally experiments under flight conditions.

Flight experiments are conducted with aeroplanes, balloons and high-altitude rockets. However the experiments of more vital significance are those performed with artificial earth satellites and space ships.

2. The purpose and programme of the research work determines the choice of biological subjects, some of which are more sensitive than others to the influence of particular flight factors.

Soviet bio-medical research in space covers a wide variety of representatives of organic life on earth, ranging from biochemical structures and the most rudimentary organisms to the highest vertebrates.

3. Biological telemetry has been widely used to obtain the necessary scientific information. Biological measurements during flight can be roughly divided into three categories: medical control, medical research and the collection of biological data.

The latest achievements in biology, electronics and computing techniques must be applied in order to ensure the high quality and necessary range of results.

Pre- and post-flight examinations are also extremely important; they should cover a very wide range, designed to extract the maximum biological and medical information from every flight experiment. Lengthy observation of cosmonauts and biological subjects during the post-flight period is of considerable importance in this respect.

4. The prospect of increasing the duration and range of space flights poses extremely serious problems as regards the devising of new ways and means of conducting biomedical research and dynamic medical control.

5. These principles are illustrated by concrete examples drawn from bio-telemetric measurements made in the course of biomedical research on the 2nd, 3rd, 4th and 5th sputniks and the "Vostok" space ships.

Biomedical Data Collection for Future Space Programs

by S.C. W h i t e (USA)

Man has demonstrated his ability to survive in the space environment. The tasks now under way in the manned space flight programs of the United States are directed toward the proper integration of the crewman into the vehicle and the flight operations in such a manner that the advantages which man offers can be used. The paper devotes itself to a discussion of the biomedical data system first used in manned space flight and the approaches now being developed for future flights. The discussion reviews the philosophy and events which led to the early program of data collection and how present events have changed the approach.

The biomedical data gathering system first used in the United States was directed toward the question of answering whether man could survive in space flight. Flight safety was of prime importance. This objective dictated the requirement for animals to precede man in flight. Additional information which could be gleaned from the mission directed data system was gratefully accepted but did not dictate the choice of instruments or the methods of data handling. Gross screening studies were carried out in an attempt to identify body system problems.

The goals of the biomedical data gathering systems have shifted to the objective of gathering information which will permit better integration of man into a useful position in the spacecraft operation. The system still must meet the flight safety requirements, however, the instruments must search for the mechanisms by which the body systems meet space flight.

The large payloads and the shifting to the new spacecraft permit the use of the full spectrum of data sources. Not only can biosensors placed on the man be used, but now the use of small inflight experiments, the obtaining of special samples and the more elaborate inflight data available through direct study become possible.

Some Problems of Physiological Monitoring

by P. H o w a r d (United Kingdom)

Measurement of the physiological responses of an astronaut to the conditions of space flight may be employed for clinical or for experimental purposes, although no clear distinction between the two is usually attempted. The primary object of the former is the detection and diagnosis of disease or frank illness; the ultimate purpose is to ascertain the cause of death of the astronaut. Experimental observations, on the other hand, are concerned with the effects of the special conditions existing in space on the normal mechanisms of the body, and with the altered responses evoked by known stimuli applied in a strange and ill-defined environment.

These two types of monitoring require different methods, but certain basic problems are common to both. In the first place, it is often difficult to decide on the physiological variables which will give the desired information. Secondly, both the physician and physiologist may be severely handicapped by the absence of techniques of measurement which can safely be used. Thirdly, it may be impossible to relay the information obtained to the groundbased laboratory. Another problem is that of ensuring a uniform interpretation of any abnormal responses observed at widely scattered monitoring stations, to which is allied the question of deciding upon the action to be taken should such an abnormality occur. Finally the collection, storage and analysis of large quantities of recorded data presents difficulties which will become more acute as longer flights are made.

It is probable that recent developments in electronics and in computer techniques will help to solve some of these problems, and some promising approaches are discussed in the paper. For the most part, however, progress in the field of physiological monitoring must depend upon new ideas from the research worker and the clinician.

Man or Automaton in Space?

by K. S t e i n b u c h (Germany)

(paper selected through IFAC)

Pushing forward into space can be accomplished either by manned or by unmanned space vehicles (automata). Space flight in manned vehicles is difficult because of the fact that the human organism can only bear small amounts of acceleration, irradiation and changes of temperature. For automata the corresponding ranges are larger. Further, it is difficult to secure respiration and nutrition of a man aboard a space vehicle, to eliminate his excrements, to control the physiological results of weightlessness on muscles and circulation and to secure that he does not break down psychically. On the other hand, man is less sensitive than automata with respect to the perception of mechanical or electromagnetical vibrations. Only in the relatively small ranges of frequency which are adequate to the human ear and eye does a comparable sensitivity of man exist.

In spite of these numerous disadvantages of the human constitution it is planned to send manned vehicles into space. This is due to the fact that a large part of "functions of intelligence" cannot yet be realised by automatic systems. The basic problem is less the question of "higher" intellectual functions than to perform relatively simple functions reliably at the right moment.

Connected herewith is the important problem to recognize "patterns" independent of their relative position in which they are presented, of their size, or spatial position, etc.

It is supposed that most of the "functions of intelligence" essential for space flight will be realized by technical systems within some decades. To reach this aim two problems are especially important:

(1) The development of a "technical perceptor" (solving the problem of automatic pattern recognition) and

(2) the development of electronic systems with a considerably higher package density and the ability of self-correction.

These problems being "solved" there will no longer be technical reasons to equip space vehicles with human pilots. However other reasons for continuing to do this will probably subsist.

Data Sensors and Information Acquisition

by A.M. M a y o, C.L. B u d d e c k e and
G.R. T e n e r y (USA)

Much of the knowledge potential from space exists as energy patterns not directly accessible through the human sense organs to the intellect. Accelerated effort toward the acquisition of information in a form directly comparable to existing knowledge shows promise of improved effectiveness of space exploration. Transformations used in improving the intelligibility of information include:

(1) Energy frequency transforms exemplified by the shift of frequency occurring when certain minerals exposed to ultraviolet energy, radiate various colors of visible light.

(2) The amplification of energy patterns as exemplified by radio and television reception.

(3) Temporal transforms as exemplified by ultra-high-speed and time lapsed photography.

(4) Sensor modality transforms exemplified by the increased use of hearing and touch senses of the blind.

(5) Classification transforms exemplified by the "self-programming" computer techniques of organizing geometric and temporal sensed energy patterns.

The transformation processes are explored as a means to stimulate ingenuity in instrumenting scientific payloads for improved effectiveness. Improved understanding of human and other biosensory and cognitive functions is fundamental to effective progress.

I.F.I.P.

INTERNATIONAL FEDERATION FOR INFORMATION PROCESSING

The next I.F.I.P. Congress will be held in New York in May, 1965.

The Council of I.F.I.P. during its March meeting in Munich, Germany, authorized the setting up of a working group on ALGOL (an algorithmic computer programming language) as part of I.F.I.P. Technical Committee No. 2 on Programming Languages. Mr. Isaac L. A u e r b a c h , President of I.F.I.P., said that the ALGOL Working Group was charged with the responsibility for the development, specification and refinement of ALGOL.

Professor Dr. W. van der P o e l of the Hague, Netherlands, was appointed by the President of I.F.I.P. as Chairman of the Working Group ALGOL. Dr. H. Z e m a n e k , Vienna, Austria, Chairman of TC No. 2 with assistance from his committee will designate the membership of this Working Group.

The Programming Languages Technical Committee No. 2 reconvened in Rome during the I.C.C. (International Computation Center) sponsored Symposium on Computer Programming Languages from March 26 to March 31, and appointed the members of the ALGOL Working Group. The original authors of ALGOL, who also met in Rome at the same time, accepted I.F.I.P.'s invitation to join the Working Group. They will continue their activities under I.F.I.P. auspices, thus obtaining official international support for ALGOL.

G.C. T o o t i l l (United Kingdom), Chairman of I.F.I.P. Technical Committee No. 1 on Terminology and Symbols, will also be Chairman of the Joint I.F.I.P.-I.C.C. Terminology Committee. The I.F.I.P. TC No. 1 has also assumed responsibility on behalf of I.S.O.'s Technical Committee 97 Working Group A on Terminology to develop a basic multilingual information processing glossary as the starting point for their efforts. This glossary will be approached on a language area basis including six language groups in which concepts rather than terms will be defined, then translated into appropriate national languages.

I.F.I.P. represents twenty professional data processing technical societies from twenty different nations - Argentina, Australia, Belgium, Canada, Czechoslovakia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Norway, Poland, Spain, Sweden, Switzerland, United Kingdom, United States, and the USSR.

INTERNATIONAL SYMPOSIUM ON

ANALOGUE AND DIGITAL COMPUTATION IN AIRCRAFT TECHNIQUES

The International Association of Analogue Computation, the Belgian Society for the Application of Scientific Management Methods, the Royal Belgian Society of Engineers and Industrialists and the Belgian Institute of Automatic Control will jointly organize in Liège, Belgium, from September 9 to 12,1963 an international symposium on modern computation applied to aircraft techniques. This symposium replaces the international seminar on applications of analogue computation to aeronautics, scheduled in London for September 1962, announced in our Bulletin No. 12 (page 8).

Aim of the symposium

The aim of the organizers is to achieve direct personal contacts between experts of different computation disciplines applicable to aircraft techniques and to provide a comparison of computation methods used and of the results achieved.

Programme

The provisional programme proposed by the Organizing Committee covers the following:

(1) Aerodynamics (investigation of permanent, non-stationary and random flows)

(2) Structures (static, dynamic and thermal behaviour of structures)

(3) Aircraft dynamics (influence of aerodynamic, mass and structural characteristics on the response of aircraft to various inputs - classical aircraft, S/VTOL and helicopter)

(4) Investigation of mechanical components (servomechanisms)

(5) Kinematics and navigation (particular trajectories, approach, landing, medium and large distance navigation problems)

(6) Investigation of flight test results (interpretation of test results)

(7) Flight simulator (piloting, aircraft behaviour in course of project, human pilot characteristics).

Organizing Committee

The Organizing Committee of the symposium includes:

Chairman: Professor F. Haus, Universities of Gent and Liège
Vice-Chairman: Professor M.M. Linsman, University of Liège
Secretary: Mr. J. Florine, University of Liège
Treasurer: Mr. P. Van Remoortere, Royal Military School

Members: Professor M. de Winne, University of Gent; Professor L. Blanjean, Agricultural Institute of Gembloux; Mr. Van der Voorst, University of Louvain; Mr. M. Mauroy, Polytechnic Faculty of Mons; Mr. J.M. Archambeau, Royal Military School.

Organisation of sessions

The papers will be presented in French, English or German. Time allotted to authors of papers will be limited to twenty minutes.

Participation and registration

Individuals wishing to take part in the symposium and authors of papers are kindly requested to communicate with the secretariat of the symposium:

Mr. Jean F l o r i n e ,
50, Avenue Franklin D. Roosevelt,
B r u s s e l s 5 (Belgium).

They will be kept informed on details of the meeting. The registration fee agreed for all registrations entered after 1st July, 1963:

Members of organizing societies:	$ 12.50
Authors of papers:	$ 7.50
Other attendants:	$ 15.-

A reduction of 20 % on the above figures will be granted for all registrations received by the Secretariat of the symposium before 1st July, 1963. Persons accompanying attendants of the symposium pay no registration fee.

Notice to authors of papers

Authors of papers are kindly requested to let the Secretariat of the symposium have the title of their paper as soon as possible and to send, before 15th April, 1963, a short abstract of the paper of no more than 500 words.

The Organizing Committee would prefer the abstract to be accompanied by translations into the other languages of the symposium.

The full text of the paper, of no more than 5000 words, must be handed with two copies to the Secretariat of the symposium before the end of the symposium. Drawings relating to the text must be made in Indian ink on white paper or on tracing paper to allow their easy stereotyping. Maximum width of drawings is either 80 or 160 millimeters.

Individuals registering before 31st December, 1962, will receive a more detailed circular letter towards the end of January, 1963. A second circular letter will be issued towards the end of May, 1963.

Austria

The ÖAA (Österreichischer Arbeitsausschuss für Automatisierung Austrian Working Commission for Automatization), National Member Organization of IFAC for Austria, recently organized the following lectures:

20th Sept. 1962: "The small computer as a component of computing installations" by Prof. H. H o c h r a i n e r .

11th Oct. 1962: "Automation and technical progress in the West German industry" by Dr. G. F r i e d r i c h s .

Germany

CYBERNETICS

The D.A.G.K. (Deutsche Arbeitsgemeinschaft Kybernetik - German Working Group of Cybernetics) will organize in Karlsruhe, on 23rd to 25th April 1963, a meeting on cybernetic problems similar to that held in April 1961 in Karlsruhe. The 1963 meeting will be sponsored by the NTG (Nachrichtentechnische Gesellschaft im VDE - Information Techniques Society in the Association of German Electrical Engineers).

The papers will cover three main topics:

- Logic and mathematics, including information theory,
- Automatic Control,
- Conversion and transmission of information.

The conference will cover equally their application to living organisms as well as machines.

Under the three main topics, papers are planned on the following particular subjects:

- Technical learning process applications,
- Learning process simulation on electronic computers,
- Learning models,
- Formalized nerve connections,
- Reading, hearing and translating machines,
- Search processes,
- Invariant automatic searches,
- Theory of games, heuristics,
- Self-optimization,
- Special logic problems,
- Learning processes in animals,
- Sense and nerve system physiology,
- Control in organisms.

Films will be shown and equipment and models demonstrated.

Registrations should be sent to:

Deutsche Arbeitsgemeinschaft Kybernetik (D.A.G.K.),
VDE-Haus,
Stresemann Allee 21,
F r a n k f u r t / M., S.10 (Germany).

INTERKAMA

The 3rd INTERKAMA (International Congress and Exhibition for Measurement and Automation) will not be held in 1963 as originally planned, but on 10th to 16th November 1965, at Düsseldorf.

United Kingdom

1st Nov. 1962: THE BRITISH COMPUTER SOCIETY held an all day meeting at the Northampton College of Advanced Technology, London, on the subject of "Large Scale Problems in Numerical Analysis". The Chairman was Dr. M.V. W i l k e s .

28th Nov. 1962: THE INSTITUTE OF PERSONNEL MANAGEMENT and the INSTITUTE OF OFFICE MANAGEMENT organized a one-day conference in London on "The Electronic Computer's Challenge to Personnel Management". Mr. N.C. P o l l o c k was in the chair.

11th Dec. 1962: INSTITUTE OF MATERIALS HANDLING. A talk on Automatic Warehousing was given to the Coventry Section of the Institute.

THE INSTITUTION OF ELECTRICAL ENGINEERS

London Meetings at Savoy Place

13th Nov 1962: "Some Aspects of the Use of Computers in Process Control Application" by J.F. R o t h .

5th Dec. 1962: "Character Recognition", Discussion opened by P.M. H a l l .

16th Jan. 1963: "Modern Transducers with an Electrical Output" by Dr. J. T h o m s o n .

Specialised Courses

A list of Advanced Courses in Process Control, Automatic Control, Servomechanisms and Computers available during the coming months, can be obtained from the Honorary Secretary of B.C.A.C., Mr. F. Jervis Smith, c/o The Institution of Electrical Engineers, Savoy Place, London W.C. 2. More than 60 Courses are listed at Universities and Colleges of Technology throughout the country and cover a wide range of subjects

Symposium on Automatic Production in Electrical and Electronic Engineering, October, 1963

The Institution of Electrical Engineers will hold a two-day Symposium at The Institution in October, 1963, on the above subject in connection with the National Productivity Year.

The Symposium will be in two parts. The first deals with the design of components to facilitate the application of automatic production techniques, the second concerns the design and operation of, and experience with, plant for automatic fabrication and assembly of relatively complicated equipment.

Written material for the Symposium will consist of contributions between 1.000 and 1.500 words in length. Copies of all material included in the programme will be made available to those attending the Symposium.

Further details are available from

The Secretary,
The Institution of Electrical Engineers,
Savoy Place,
London W.C. 2.

IFAC President's Report 1962

In Bulletin No. 13 (pp. 7 and 8) a statement made in the President's Report 1962 mentioned the VDI/VDE Group (Germany) as the only national organization actively working on graphical symbols.

THE BRITISH STANDARDS INSTITUTION asks us to draw the readers' attention to the following British Standards:

No. 1646 (1950): Graphical symbols suitable for use in automatic control flow sheets (this standard is at present being revised, the new edition will be available towards the end of the year).

No. 2917 (1957): Standard partially applicable to automatic control systems. (This being revised).

No. 3238 (1960) Part 1: Transductors and magnetic amplifiers.

USA

CONFERENCE ON SELF-ORGANIZING SYSTEMS

This Conference, sponsored by the Armour Research Institute (Illinois Institute of Technology) was held in the Museum of Science and Industry, Chicago, on May 22 to 24, 1962.

The following papers were read:

- The Organisation of Organization, by O. Selfridge, Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Mass.
- Self-Organizational Systems, by M.D. Mesarovic, Case Institute of Technology, Cleveland, Ohio.
- Self-Organization in the Time Domain, by D.M. MacKay, University College of North Staffordshire, Dept. of Communication, Keele, Staffordshire, United Kingdom.
- Integrative Processes, by J.D. Cowan and W.S. McCulloch, Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, Mass.
- Information Input Overload, by J.G. Miller, Mental Health Research Institute, University of Michigan, Ann Arbor, Mich.
- Learning Signal Detection, by M. Kac, Rockefeller Institute, New York, N.Y.
- Optimisation through Evolution with Sexual Recombinations, by H.J. Bremermann, University of California, Dept. of Mathematics, Berkeley, Calif.
- The Automatic Formation of a Program which Represents a Theory, by S. Amarel, Princeton, N.J.
- Natural and Artificial Synopses, by L.D. Harmon, Murray Hill, N.J.
- Logical Aspects of Neuristor Systems, by H. Crane, Stanford Research Institute, Menlo Park, Calif.
- Some Probabilistic Aspects of Automata with a Pushdown Memory, by M.P. Schultzenberger, Harvard University Medical School, Boston, Mass.
- Efficient Adaptive Systems and their Realization, by J.H. Holland, University of Michigan, Ann Arbor, Mich.
- Empirical Laws and Physical Theories; Discussion of the Respective Roles of Information and Imagination, by L. Brillouin, Columbia University, New York, N.Y.
- Majority Logic, by S. Muroga, Yorktown Heights, N.Y.
- Interaction between a Group of Subjects and an Adaptive Automaton to Produce a Self-Organizing System for Decision Making, by G. Pask, Richmond, Surrey, United Kingdom.
- Cybernetic Ontology and the Transjunctional Operator, by G. Gunther, University of Illinois, Urbana, Ill.
- Some Problems of Basic Organization in Problem-Solving Programs, by A. Newell, Carnegie Institute of Technology, Pittsburgh, Pa.
- Training Sequences for Mechanized Induction, by R.J. Solomonoff, Cambridge, Mass.

- Adaptive 'Neuron' Memory System, by B. W i d r o w, Stanford University, Stanford, Calif.
- A Comparison of several Perceptron Models, by F. R o s e n b l a t t , Cornell University, Ithaca, N.Y.
- A New Class of Multi-Layer Series in Coupled Perceptrons, by A.G. K o n h e i m , Yorktown Heights, N.Y.
- Simple Tests for Linear Separability as Applied to Self-Organizing Machines, by R.C. S i n g l e t o n, Stanford Research Institute, Menlo Park, Calif.
- Remarks on the Algebra of Functors, by K. M e n g e r, Illinois Institute of Technology, Chicago, Ill.
- A Feedback Coding Theory of Learning and Cognition, by H.H. K a n t n e r, Armour Research Foundation, Illinois Institute of Technology, Chicago, Ill.
- Some Similarities between the Behaviour of a Neural Network Model and Electrophysiological Experiments, by P.G. F a r l e y , Lincoln Laboratory, Massachusetts Institute of Technology, Lexington, Mass.
- The Representation of Information by Neural Net Models, by P.H. G r e e n e , University of Chicago, Chicago, Ill.

The Proceedings can be obtained from:

Armour Research Institute,
10 West 35th Street,
C h i c a g o 16, Illinois (U.S.A.)

at a price of $ 10.00.

FIRST INTERNATIONAL CONFERENCE ON NON-LINEAR MAGNETICS

The American Institute of Electrical Engineers and the Institute of Radio Engineers will jointly organize the first international conference on non-linear magnetics to be held in Washington, D.C., from April 17 to 19, 1963.

This conference will be devoted to non-linear magnetic methods systems and devices in:

- computers,
- amplifiers and control devices,
- measuring systems,
- combined uses with semiconductors.

Further particulars can be obtained from the

American Institute of Electrical Engineers,
345 East 47th Street,
N e w Y o r k 17, N.Y. (U.S.A.).

THE 17th ANNUAL INSTRUMENT-AUTOMATION CONFERENCE

This conference, organized by the Instrument Society of America, was held in New York on October 15 to 18, 1962.

Many of the papers presented were devoted to measurement problems only or associated subjects. However, many other papers dealt with control problems and related fields. A selection of these is given below with their titles and author's names plus the indication of the session in which they were presented. These papers can be obtained - grouped by sessions only - at a price of $ 0.75 per paper (after each session, the total number of papers read, and the corresponding total price of the preprints of this session is given) from:

Instrument Society of America,
530, William Pen Place,
P i t t s b u r g h 19,
Pennsylvania (U.S.A.).

Session 4. Computer Clinic: Industrial Application of Military Computer Techniques (4 papers, $ 3.00)

- Industrial Applications of Military Computer Techniques, by Lowell B. M i c h e l s .
- Computer Centered Satellite Command and Control System, by Norman L. D a w i r s .
- Evolution of Automatic Checkout Equipment, by E.S. L o n g e e and B. G o l l o m p .
- Computer-Control Concepts for a Mobile Nuclear Power Plant, by Harvey De C o v n i c k .

Session 5. Physical Properties Analysis (4 papers, $ 3.00)

- Temperature Control of Exothermic Reactions in packed Bed Reactors, by Bruce E. P o w e l l .

Session 6. Pulp and Paper Instrumentation (3 papers, $ 2.25)

- A User-Oriented Approach to Mill Automation, by J.E. B a r r e t t .
- Refiner Control by Temperature Difference, by Martin O. B a l t a r e l l i .

Session 12. Computer Clinic: Rudiments of Computers and of Computer Applications (4 papers, $ 3.00)

- Logical Design Aspects of a Batch Sequence Controller, by Frank I n n e s .

Session 17. Power Instrumentation (3 papers, $ 2.25)

- Effective Use of Computer Techniques for Optimizing Power Plant Operation, by C.H. B a r n a r d .

Session 21. Instrumentation for Thermal Measurements (6 papers, $ 4.50)

- Temperature Control Using Infrared Radiation Techniques Independent of Emissivity and Ambient Surroundings, by Morris Weiss.

Session 22. Data handling and Computation (4 papers, $ 3.00)

- Evaluation of a Computer Control System for Synthetic Rubber Production, by Everett E. Eddy.

Session 25. Aero-space Instrumentation (3 papers, $ 2.25)

- Remote Control of Space Vehicles, by Jack S. Green.

Session 26. Management in Control (4 papers, $ 3.00)

- Modern Control and How it Pays Off, by Byron K. Ledgerwood, Control Engineering.
- Invest Now in Your Control Future, by Thomas C. Wherry.
- Getting the Control Systems Engineering Done, by Marvin D. Weiss.

Session 29. Data handling and Computation (4 papers, $ 3.00)

- What the User should know about Reliability of Control Computers, by R.W. Sonnenfeldt and G.C. Hendrie.
- Program for Real-Time Process Control Computers, by Charles L. Foster.

Session 32. Chemical and Petroleum Instrumentation (4 papers, $ 3.00)

- The Design of Pneumatic Computing Systems, by John A. Harrower, Jr.
- Small Special-Purpose Analog Computers for Process Control, by John D. Warnock.
- The Design of a Compatible Electronic Control System for the Process Industries, by Charles J. Swartwout.

Session 33. Space Vehicle Instrumentation and Control (5 papers, $ 3.75)

- State of the Art of Inertial Devices in Space, by Dr. John Hovorka, Massachusetts Institute of Technology.
- State of the Art in Instrumentation for Manned Flight Control in Space, by Raymond F. Bohling, National Aeronautics and Space Administration.
- State of the Art of Stabilization of Space Vehicles, by Lael B. Taplin and B.R. Teitelbaum.

Session 34. Measurement and Control Instrumentation: Final Control Elements (4 papers, $ 3.00)

- Development of a Pneumatic Valve Positioner, by Richard G. Beach.

- Selection of Control Valves for Continuous Chemical Processes, by E. Ross Froman and D.J. Oriolo.
- The Introduction of a Critical Flow Factor for Valve Sizing, by Hans D. Baumann.
- Packing Temperatures in Control Valves for High Temperature Service, by Robert D.K. Crown.

Session 41. Chemical and Petroleum Instrumentation (5 papers, $ 3.75)

- Application of Noninteracting Feedforward Feedback Control Technique on a Fluidized Catalytic Cracking Unit, by Dr. Wen-Shao Wu.
- Unattended Analog Computer-Controlled Pilot Plant, by A.V. Baker and T.A. McIlheran.
- Satellite Computer for Process Control, by Dr. Donald P. Eckman (deceased), Case Institute of Technology, A. Bublitz and E.F. Holben.
- Time-Shared Digital Process Control System, by E.W. Yetter and C.W. Sanders.
- Pulse Actuator for Computer Control Applications, by Robert J. Bussolari.

Session 43. Measurement and Control Instrumentation: Final Control Elements (5 papers, $ 3.75)

- Applied Valve Design for Energy Absorption, by A.J. Hansen and R.L. Morrisson.
- Precise Pressure Control, by Earl C. Hutchison.
- Modulating Electric Control Drive, by J.A. Danvic and J.E. MacEvoy.
- The Dynamics of Moving Coil Transducers, by Charles B. Bahuder and Sheldon G. Lloyd.

Session 48. Oxygen Steelmaking Instrumentation and Control (4 papers, $ 3.00)

- The Effect of Instrumentation Errors on Basic Oxygen Furnace Control, by Melvin M. Fischer.
- Computer Control and Data Handling System for Oxygen Steelmaking, by J.E. Clough, F.L. Johnston and Dr. T.M. Stout.
- Digital Computer Control of the Oxygen Steelmaking Process, by Martin Wyrod.
- The Application of Computer Control to the Stora Kaldo Basic Oxygen Steelmaking Process, by Louis H. Jaquay.

Session 49. Solid State Controls and Instrumentation (5 papers, $ 3.75)

- A Failsafe Monitoring and Control System, by Leslie Norde.
- Transistorized Elements in High-Accuracy Control Loops, by H.H. Koppel.

Session 51. Measurement and Control Instrumentation (3 papers, $ 2.25)

- Nonlinear Theory and Application, by Dr. Rufus O l d e n b u r g e r , Purdue University.
- A Critical Analysis of Exact Techniques for the Analysis of Finite Pulsed Feedback Systems, by Richard Arthur V o l z, Northwestern University.

Session 57. Blast Furnace Instrumentation and Control (3 papers, $ 2.25)

- Instrumentation for a Blast Furnace Control System, by Peter J. Z o r e n a and Thomas J. C o n n o r s .
- Blast Furnace Stove Analysis and Control, by James C. B u k e r .

Session 60. Measurement and Control Instrumentation (3 papers, $ 2.25)

- Better Start-Ups for Process Control, by C.L. P l e a s a n c e .

The price of $ 0.75 per paper is reduced to $ 0.50 only for members of the Instruments Society of America, of the American Meteorological Society and of the Institute of Aerospace Science. Members of these three Societies will pay for preprints only two-thirds of the prices mentioned above.

11th ANNUAL JOINT INDUSTRIAL ELECTRONICS SYMPOSIUM

This Symposium sponsored by the Institute of Radio Engineers, the American Institute of Electrical Engineers and the Instrument Society of America, was held on September 19 to 20, 1962, at the Sheraton-Chicago Hotel, Chicago. Short abstracts of the four papers more especially devoted to Automatic Control and related fields are given below:

Versatile Automation

by Harold J o h n s o n , Elk Grove Village, Illinois.

A new type of general purpose, versatile transfer machine is described. Movements of a mechanical manipulator are electronically controlled from a tape memory system which can be taught new operations by guiding the manipulator through required operational sequences. Many unique control features that insure maximum utilization and reliability are incorporated.

Future of Numerical Control in Industry

by Dr. S h i s u o H o r i, Armour Research Foundation, Chicago, Illinois.

Various digital computer programs to aid in the preparation of input signals have been developed to overcome the time consuming tedium of numerical signal preparation. The most advanced and capable of these systems has been the APT system, which accepts simple English-like instructions and automatically fabricates parts in conformance with these statements. Descriptions of the APT language and system are included in the paper. Some of the far-reaching implications of symbolic control for future manufacturing are suggested in the paper.

Fully Integrated Digital Graphic Processor

by Norman T a y l o r , Lexington, Massachusetts.

Limitations on input and output communication between human being and computers arise from the computer requirement for special language inputs and the human need for graphic images to facilitate data comprehension. A system is described which permits the human operator to communicate graphic information directly to the computer memory. Output information is displayed graphically by several techniques. Details of the system and its advantages are presented.

Digital Applications of Thermoplastic Recording

by R.W. R e e v e s , Schenectady, New York.

The unique combination of the optical, electrical and thermal properties of thermoplastic film results in a versatile information storage medium with both digital and analog applications. The medium construction, recording techniques, and readout methods employed for digital storage are described. Characteristics of the information storage and transfer capabilities are discussed.

PUBLICATIONS

Germany

4.0.5.2 DIGITAL INFORMATION PROCESSING IN AUTOMATIC CONTROL (Digitale Signalverarbeitung in der Regelungstechnik). Papers read at a Conference organized by the VDI/VDE-Fachgruppe Regelungstechnik at Heidelberg, March 1962. (in German). Published by VDE-Verlag GmbH. Berlin-Charlottenburg 2, 1962. 324 p., DM 24.--.

6.4 Draft German Standard DIN 19226: AUTOMATIC AND REMOTE CONTROL, TERMS AND SYMBOLS (DIN Entwurf 19226 "Regelungstechnik und Steuerungstechnik, Begriffe und Benennungen). (in German). Published by Beuth Vertrieb GmbH. Berlin W 15 and Cologne, May 1962.

2.1.2 CONTROL DYNAMIC PROPERTIES OF STEAM GENERATORS (Regeldynamische Eigenschaften von Dampferzeugern) by S c h n e i d e r and S p l i e t h o f f (in German). München, R. Oldenbourg Verlag, 1962, 96 p., 103 illus., DM 28.--.

4.0.5.0 COMPUTERS IN AUTOMATIC SYSTEMS (Rechengeräte in automatischen Systemen by A.A. F e l d b a u m (translated from Russian into German). München, R. Oldenbourg Verlag, 1962, 469 p., 244 illus., DM 78.--.

Japan

2.0 THEORY AND EXERCISE OF AUTOMATIC CONTROL by K. Ichikawa (in Japanese). Tokyo, Sangyo-Tosho Co., 1962, 369 p.

2.3.2.0 STATISTICAL STUDIES ON NON-LINEAR CONTROL SYSTEMS by Y. S a w a r a g i, N. S ù g a i and Y. S u n a h a r a (in English). Osaka, Nippon Printing and Publishing Co, 1962, 322 p., $ 18.

4.0.0 CONTROL COMPONENTS MANUAL (in Japanese), Tokyo, Ohm-Sha Co, 1962, 1816 p., 3000 illus.

4.7.6.2 SERVOMECHANISMS AND THEIR COMPONENTS by Y. I k e b e K. M a t s u s h i m a and K. N a k a n o (in Japanese). Tokyo, Ohm-Sha Co, 1962, 350 p., 300 illus.

Roumania

4.0.1.2 TRANSISTORIZED CIRCUITS (Circuite cu transistori) by G. M o i s i l (in Rumanian). Bucarest, 1962. Vol. 1 98 p., 94 illus, Vol. 2 99 p., 113 illus.

United Kingdom

4.0.5.0 PROGRAMMING SYSTEMS FOR ELECTRONIC COMPUTERS by D.N. O h o r a f a s (in English). London, Butterworths, 1962, XV + 187 p., 50 shillings.

4.0.5.1 ANALOGUE COMPUTING AT ULTRA-HIGH SPEED: AN EXPERIMENTAL AND THEORETICAL STUDY by D.M. MacK a y and M.E. F i s h e r (in English). London, Chapman & Hall, 1962, XV + 395 p., 63 shillings.

4.0.5.2 COMPUTERS IN STRUCTURAL ENGINEERING

The Institution of Structural Engineers has published a new report "The Use of Digital Computers in Structural Engineering". The Report has been prepared by a Committee which made a special study of the field. It is intended as a guide for Structural Engineers contemplating using electronic digital computers for the first time. The Foreword to the Report concludes: "Engineers intending to adopt the use of computers should consider first availing themselves of the various computer services. As the volume of their computer work increases so they will form an opinion as to the type best suited to their needs and may consider purchasing or hiring one of their own."

The Report is available from the Institution of Structural Engineers, 11 Upper Belgrave Street, London, S.W.1, price 11/- including postage.

USA

6.7 IMPLICATIONS OF AUTOMATION AND OTHER TECHNOLOGICAL DEVELOPMENTS, A SELECTED ANNOTATED BIBLIOGRAPHY

This annotated bibliography is a guide to the voluminous literature recently published about the benefits and problems of automation and related technological changes. It lists over 300 references, including books, articles, reports, pamphlets, speeches, conference proceedings and other readily available material. Washington U.S. Government Printing Office, Division of Public Documents, 1962, 136 p., $ 0.65.

6.9.1 THE 1962 JOINT AUTOMATIC CONTROL CONFERENCE PAPERS

An announcement in our Bulletin No. 13 (pp. 42 to 46) gave the titles of papers read at this Conference and stated that a bound volume containing complete copies of all papers presented was available at a price of $ 15, from the American Institute of Electrical Engineers.

Supplies of this bound volume of preprints are now exhausted. It is expected that all papers will ultimately find publication in the journals of the participating societies.

However, some papers are still available in the two special publications:

(1) The 7 papers contained in sessions "State Space Techniques for Control Systems I" (Bulletin No. 13, p. 44) and "State Space Techniques for Control Systems II" (Bulletin No. 13, p. 45) are available under the general heading "Workshop on State Space Techniques for Automatic Control", at a price of $ 2.75.

(2) The 8 papers contained in sessions "Discrete Adaptive Processes I" (Bulletin No. 13, p. 45) and "Discrete Adaptive Processes II" (Bulletin No. 13, p. 46) are available under the general heading "Proceedings of the Discrete Adaptive Processes Symposium", at a price of $ 3.00.

Both publications can be obtained by making out the check to the Joint Automatic Control Conference and by sending it with the request to:

Professor L.J. H o l l a n d e r ,
New York University,
University Heights,
N e w Y o r k 53, N.Y. (U.S.A.).

NOTE ON INFORMATION BULLETIN NO. 15

Information to appear in the Information Bulletin No. 15 should reach the Editor:

Professor Ing. Dr. V. Broida,
Honorary Editor of I.F.A.C.,
13, rue de la France-Mutualiste,
Boulogne-sur-Seine (Seine), France,

not later than 28th February, 1963.