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Honorary Editor of IFAC

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CONTENTS

WORLDWIDE AUTOMATIC CONTROL

IFAC NEWS

Reports on past IFAC events

IFAC SYMPOSIUM ON AUTOMATIC CONTROL IN THE PEACEFUL USES OF SPACE

As announced in Bulletin No. 20 (pages 5 to 7), this Symposium has been held in Stavanger, Norway, from 21st June to 24th June, 1965. It has been personally attended by the Honorary Editor who is therefore in a position to give the following additional information.

This Symposium has proved to be a real success. It has been attended by 108 participants from 12 countries accompanied by 27 ladies. These countries (with the number of participants in brackets) are as follows: Austria (1), Belgium (2), France (8), Denmark (1), Germany (19), Netherlands (1), Norway (13), Sweden (2), Switzerland (1), United Kingdom (4), USA (29), USSR (27).

Out of the 31 papers listed in Bulletin No. 20, pages 5 to 7, two were not at all presented; these are:

"The AGENA Attitude Stabilization System - A Case Against Optimization" by L.E. Jenkins (USA).

"Design Considerations for Space Vehicle Control Computers" by H.L. Ergott (USA).

A third paper previously mentioned has neither been presented but its text has been made available to the participants; the paper concerned is:

"Automatic Startup for Nuclear Reactor Rocket Engines" by B.G. Strait (USA).

On the other hand, the following 13 papers from USSR, not listed in Bulletin No. 20, have been read and discussed:

"Programming of Thrust in a Central Gravitational Field" by A.I. Lurie

"An Optimal Program of Correction of Motion Using Limited Power in a Gravitation Field" by V.V. Tokarev

"Optimal Guidance of the Flight of Space Vehicles" by A.K. Platonov, A.A. Dashkov, V.N. Kubasov

"The Use of Single-Axis Orientation for Artificial Earth Satellites" by R.F. Appazov, V.P. Legostaev, B.V. Raouschenbakh

"On One Class of Satellite Attitude Control" by V.A. B o d n e r, K.B. A l e k s e e v, G.G. B e b e n i n

"Some Problems of the Optimal Control of Three-dimensional Motion of a Space Vehicle" by R.V. S t u d n e v

"Asymptotically-Stable Stationary Rotational Motion of a Satellite" by V.A. S a r i c h e v

"Thermal Noise in Measuring Devices and the Limiting Precision of Guidance of a Space Vehicle" by A.A. K r a s o v s k y

"Investigation of the Motion of Space Vehicles in the Atmosphere" by D.E. O k h o t s i m s k i, N.I. Z o l o t u k h i n a

"Review of the Theory of Optimal Guidance of Space Vehicles" by N.N. M o i s e e v, B.N. L e b e d e v a

"Some Questions of Rendez-vous with an Orbital Station" by G.Yu. D a n k o v, F.A. M i k h a i l o v

"Predicting the Trajectory of Flight for a Discretely-Guided Space Vehicle" by V.A. Y a r o s h e v s k i

"Orbital Orientation Systems Classification for Artificial Earth Satellites" by E.N. T o k a r, V.N. B r a n e t s

A fourteenth paper from USSR, not listed in Bulletin No. 20, has not been presented but its text has been made available to participants; the paper concerned is:

"Determination of the Orbit of a Space Vehicle by Means of an Automatic Measuring Complex" by E.L. A k i m, M.L. K i s l i k, P.E. E l y a s b e r g, T.M. E n e e v

A fifteenth paper from USSR, not listed in Bulletin No. 20, but announced in the final Symposium programme has been finally discarded; the paper concerned is:

"On some Nonlinear Guidance Laws for Gliding Winged Vehicles During Transition from a Circular Orbit to the Runway" by V.S. V e d r o v, G.P. V l a d i c h i n, A.A. K o n d r a t o v, G.L. R o m a n o v, V.M. S h a l a g i n o v.

A most interesting P a n e l D i s c u s s i o n on

THE PROBLEMS OF CONTROL OF THE SPACE FLIGHT IN THE FUTURE

took place on the 22nd June under the chairmanship of Prof. A.M. L e t o v (USSR).

(Predictions for the Future of Automatic Control in Space)

After INTRODUCTORY SPEECHES by Prof. A.I. L u r' e (USSR) on the points for which knowledge seems to be still lacking in space vehicle problems and by Prof. C.S. D r a p e r (USA) on the future prospects of space vehicle measuring and computing equipments, a vivid discussion was initiated on the last

topic. Dr. Dean G i l l e t t e (USA) supported the idea that the future computing equipment should be, first of all, safety-oriented taking care, in the first place, of the crew safeguard and ensuring the utmost efficiency to eventual human interventions in manoeuvring even if the resulting operation was no more optimal. He, therefore, was in favour of relatively non-sophisticated, special-purpose and highly-reliable computing equipments. In a quite opposite way, Dr. E.A. F e d o s o v (USSR) supported the idea already expressed in his introductory speech by Prof. D r a p e r and according to which the high reliability of the computing equipment - already obtained or to be achieved in the near future - would enable to look forward, first of all, to optimality of operation, reducing thus to a minimum (or even to zero, in case of unmanned flights) the tasks of the crew. This is why Dr. F e d o s o v was in favour of more complex and standardized computing equipments.

DISCUSSION from the floor during the panel session itself - and, later on, in course of presentation, of other papers - seemed to indicate a rather paradoxal situation, according to which speakers from the USSR were more in favour of the position taken by Dr. G i l l e t t e - i.e. a relative non-optimality of automatic operation, specialized computing equipments designed according to the specific tasks considered and a relatively large place for human initiative for the sake of safety - rather than that taken by Dr. F e d o s o v - i.e. a larger place devoted to automatic operation in view of its optimality and, therefore, more sophisticated and standardized computing equipments.

Large h o s p i t a l i t y was displayed to attendants by their Norwegian hosts. A reception of attendants accompanied by their wives was given in a private house and all the attendants and ladies were welcomed to a cocktail reception by the City Mayor. A tour of the fjord, a folcloric evening with smorgasbord, bus tours and a banquet were organized during the Symposium and a trip to Bergen on board a hydrofoil and visits to Bergen, Trondheim and Oslo took place afterwards.

The P r o c e e d i n g s of the Symposium, including 40 papers will be edited by John A. A s e l t i n e and published by Plenum Press, 227th West 17th Street, New York, N.Y., as an ISA publication. Price $ 17.50.

IFAC SYMPOSIUM ON SENSITIVITY ANALYSIS

General Outline of the Symposium

The IFAC Symposium on Sensitivity Analysis was held in Dubrovnik, Yugoslavia, from 31st August to 5th September, 1964. There were about 100 participants from 17 countries (Bulgaria, Canada, Czechoslovakia, France, Germany, Hungary, India, Israel, Italy, Norway, Poland, Sweden, United Kingdom, United Arab Republic, USA, USSR and Yugoslavia). Mr. L. R a d a n o v i ć, Head of the Dynamic Analysis Department, "Boris Kidrič" Institute, Belgrade, reports hereafter on this symposium.

The original idea of the organizers of the Symposium was: to have an international selection committee to review the papers submitted for presentation and to select those that would be most stimulating for a fruitful discussion on the topic of sensitivity. It soon turned out, however, that there was no unified opinion as to what is meant by the term sensitivity. It was therefore decided to leave it to the Symposium to clarify ideas about the notion of the sensitivity and to postpone the selection of papers until the fundamental concepts have been more precisely defined. Although the discussion at the Symposium did much to clarify the basic ideas, it was still a very difficult task to select and classify material relating to a subject whose scope is still a matter of discussion and controversy.

The concept of the sensitivity in its embrionic form is almost as old as the concept of feedback. One of the basic purposes of introducing feedback was to reduce the effect of parameter changes upon system performance, and it was natural that a quantitative measure of the effect of feedback should be found in the concept of sensitivity to the variation of individual loop parameters. This is the well known Bode sensitivity. The advancement of circuit theory and computer technology saw a renewed interest in the problems of parameter variations and its direct outgrowth were the methods for dynamic accuracy analysis of electric and mechanical networks (Byhovski, Poli-vanov) and the error analysis of differential analysers (Miller and Murray, Meissinger). All of these methods found a solid basis in some of the results of the theory of differential equations (Andronov, Tikhonov, Pontryagin, Minorsky, Levinson, Malkin and others). A new attack upon the problem of sensitivity ensued as a reaction to the evolution of modern adaptive systems. The many concepts and methods developed during the last decade for the solution of problems associated with parameter variations claim a legitimate right to have their own place within the General scope of control theory. Hence the term "sensitivity theory" or "sensitivity analysis".

Owing to the fact that the accumulated material relating to the problems of sensitivity is the result of many efforts invested in many countries to solve many specific and sometimes isolated problems, it is hardly possible at this stage to define strictly the scope and the methods of sensitivity analysis. It is, however, possible to outline briefly its four main objectives:

1. Starting from a reference solution of the equations describing the system under analysis determine a family of solutions in some specified function space, i.e. imbed the reference solution in an appropriate parametric family to obtain a quantitative measure of the variation of reference solution when one or more parameters are given slightly different values. The results of this imbedding process are sensitivity functions which determine the additional motion of the system caused by parameter variations. Depending on the process of imbedding, these sensitivity functions will be valid in the large or only in the small. Since no general method of constructing the parametric family of solutions seems to be possible, one of the large areas of research in sensitivity analysis is the development of specific method for specific problems (discontinuities, parameters changing the system order, functions treated as parameters, etc.).

2. Analysing the additional motion revealed by the sensitivity functions, devise appropriate method for compensating the effect of parameter variations. This objective is closely related with the techniques of synthesis and is essentially concerned with the problem of providing a structure that has originally been designed to satisfy certain performance criteria with the additional property of being insensitive or little sensitive to parameter variations. It is therefore natural that such synthesis should rely heavily upon the analysis of additional motion and the sensitivity functions. Depending on the methods applied, the compensation will be valid for large or only for small parameter variations.

3. Starting a priori from the requirement that parameter changes should not affect the performance of a system, synthesize structures which will be insensitive to plant parameter variations. This is predominantly a synthesis problem and the methods applied need not necessarily rely upon the sensitivity functions. Among the systems that possess, under certain conditions, the property of being insensitive to plant parameter variations are those with infinite gain and the systems with variable structure.

4. Starting from some more general criteria, including those of optimality, device synthesis procedures which will directly result in systems that are optimal both from the viewpoints of performance and of sensitivity. This can be considered as one of the future and more ambitious objectives of sensitivity theory which may depart from the now classical methods of parametric imbedding and rely on some new concepts such as game theory.

The four objectives summarized above were reflected in all discussions at the Dubrovnik Symposium. By "imbedding" each of the selected papers in these Proceedings into an appropriate family under the headings "Basic Approaches", "Sensitivity Functions", "Compensation of Parameter Variations", "Synthesis of Insensitive Systems" and "Sensitivity and Optimality". It was hoped to discern a common note in all these concepts.

papers despite of the fact that they were written in different forms and that some of them perhaps failed to present a clear-cut outline of the basic idea.

Basic approaches to the problem of sensitivity

In the paper by I. Gumowsky the concept of sensitivity was related to the problem of parametric imbedding and some specific types of imbedding were considered. Relation was further established with Lyapunov stability and the classical works of Andronov, Pontryagin and Malkin. The concept of invariant imbedding based on functional equations was introduced by Bellman, Kalaba and Sridhar. In a paper by Ya. Z. Tsypkin the sensitivity was related with the absolute stability of processes in sampled data systems. Cruz and Perkins extended the formulation of the sensitivity of feedback structures to linear time-varying multivariable systems. In a paper by Dorato and Drenick the game theory approach to the sensitivity problem was introduced in a conceptual form. In a paper by R. Tomović the role of sensitivity in engineering problems was discussed.

Determination and computation of sensitivity functions

After an introductory paper by L. Bykhovski, there was a series of papers dealing with specific problems such as determination of sensitivity functions with respect to the change of system order (Kokotović and Rutman), sensitivity functions for discontinuous systems (De Backer, Roberts, Tsypkin and Rutman), sensitivity to parameters changing the frequency of oscillation (Roberts), sensitivity to quantization errors in hybrid computers (Vidal, Karplus and Kaludjian), sensitivity of the characteristics of nonlinear systems to the variation of amplitude of self-excited oscillations (Stojić and Šiljak). This section also included two papers which presented some straightforward methods for the determination of sensitivity functions using structural approach (Sedlar, Vusković and Ćirić) and a paper introducing topological approach to the evaluation of sensitivity of network functions (Milić).

Methods for the compensation of parameter variations

Such methods were presented in the papers by J. Rissanen, S. Bingulac, H. Ur and other authors. J. Rissanen introduced the functional derivative as a generalisation of the sensitivity function which is essential for the design of self-adjusting systems. In a comment by Rutman and Eppelman it was shown that the problem of parameter compensation in linear time-varying system can be solved "in the large" and the necessary and sufficient conditions for parametric invariance were derived.

Synthesis of insensitive systems

This synthesis relies upon the new concept of variable structure and the well known principle of infinite gain. On a practical example it was shown that both the variable structure approach (Petrov, Emelyanov et al) and the infinite gain approach (Meirov) yield insensitive structures which may be less complicated than adaptive systems.

Problems of optimal control

It may be concluded from the papers of this part of the Symposium that the classical sensitivity approach fails to provide methods of immediate use and that some other approaches and mathematical tools are to be sought.

One might add in conclusion that whatever the scope and methods of sensitivity analysis or sensitivity theory, its objectives are doubtlessly appealing. The fact that the attribute "insensitive" is now as important for a modern control system as the attributes "adaptive" or "optimal" is a sufficient reason to encourage this new field of research and to hope that in the near future we shall be witnesses of new, important results.

Announcement of future IFAC events

IFAC SYMPOSIUM ON THE THEORY OF SELF-ADAPTIVE CONTROL SYSTEMS

As announced in Bulletin No. 18/19 (pages 37/38) and No. 2o (pages 11/12), this Symposium will be held at the National Physical Laboratory, Teddington, United Kingdom, from 14th to 17th September, 1965.

We are now in a position to give the following detailed programme:

- K.S. Fu : A learning control system using statistical decision processes

- Controllers using Stochastic Decision Processes

- H. Kwakernaak : Admissible adaptive control

- D.Q. Mayne : A gradient method for determining optimal control of non-linear stochastic systems

Adaptive Control in Biological Systems

- J.J. Kulikowski : Self-adaptive retinal processes and their implications to adaptive control

- Y.T. Li, L.R. Young & J.L. Meiry : Adaptive functions of man in vehicle control systems

- I.P. Priban & W. Fincham : Automatic control of respiration.

- A.S. Iberall & S.Z. Cardon : Metabolic control in the mammalian micro-circulation

System Identification

- P. Alper: An open-loop procedure for process parameter optimisation using a hybrid computer
- K.J. Åström & T. Bohlin: Numerical identification of linear dynamic systems from normal operating records
- H.A. Barker: Multivariable models for control systems
- R.L. Butchart & B. Shackcloth: Synthesis of model reference adaptive systems by Liapunov's second method.

Adaptive Controllers using Deterministic Models

- R. Kulikowski: Adaptive optimization of multi-level control systems
- J.F. Meredith & A.J. Dymock: A self-adaptive system employing high-speed parameter identification
- J.D. Pearson: Multilevel control systems
- A.P. Roberts: An adaptive lagging system
- J.G. Balchen & A.B. Aune: Semi-dynamic optimal control
- R.M. Bakke: Adaptive direct digital control with multi-parameter adjustment
- S.P. Bingulac: On the compensation of small parameter variations

Controlling using Perturbation Techniques

- J. Dawkins: A method of optimal process control using weighting functions as system description
- M. Masubuchi & H. Kanoh: An optimal control system having no unique solution.
- G. Broekstra & C.J.D.M. Verhagen: A dynamical multidimensional self-optimizing control system
- J.L. Douce: The use of pseudorandom binary signals in adaptive control
- V.W. Eveleigh: Limit cycle conditions in optimalizing controllers
- M.H. Hamza: Extremum control in the presence of variable pure delay
- R.E. Kronauer & P.G. Drew: Design of the adaptive feedback loop in parameter-perturbation adaptive controls

- M. Orban: Some questions of the learning optimisation of large scale processes
- J.C. Hill & J.E. Gibson: Hill-climbing on hills with many minima
- A.J. Kisiel & D.W.T. Rippin: Adaptive optimization of the performance of a water gas shift reactor.

IFAC / IFIP SYMPOSIUM ON MICROMINIATURIZATION IN AUTOMATIC CONTROL EQUIPMENT AND IN DIGITAL COMPUTERS

We have announced in Bulletin No. 20 (pages 12/13), this Symposium, to be held in München, Germany, from 21st to 23rd October, 1965, sponsored by IFAC and IFIP (International Federation for Information Processing) and organized by the VDI/VDE-Fachgruppe Regelungstechnik together with Nachrichtentechnische Gesellschaft im VDE.

The programme will be as follows:

Thursday 21st October 1965

1. PNEUMATIC AND HYDRAULIC COMPONENTS

1.1. H.H. Glättli, IBM Zürich, Switzerland: Miniaturisierungsprobleme bei strömungsmechanischen Elementen (Microminiaturization Problems of Fluid Components)

1.2. A. Kuhlenkamp, Technische Hochschule Braunschweig, Germany: Ölhydraulische Rechenverstärker (Hydraulic Computer Amplifiers)

1.3. H. Töpfer, Deutsche Akademie der Wissenschaften, Dresden, Germany: Pneumatische Logikelemente und zugehörige periphere Geräte (Pneumatic Logic Elements and Appropriate Peripheral Equipment)

1.4. S. Pilz, Deutsche Akademie der Wissenschaften, Dresden, Germany: Realisierung von beliebigen Speichertypen mit Grundbausteinen eines neuentwickelten pneumatischen Logiksystems (Realization of Arbitrary Memory Types by Basic Units of a Newly Developed Pneumatic Logic System)

1.5. C.J.C. Charnley, The College of Aeronautics, Cranfield, Bedford, UK: The Design of a Pneumatic Position Encoder

1.6. A. Rechten, Siemens & Halske, München, Germany: Stabilität und Belastbarkeit bistabiler Fluidelemente (Stability and Loading of Bistable Fluid Elements)

1.7. P. Kupec, Siemens & Halske, München, Germany: Elektropneumatischer Wandler ohne bewegte Teile (Electropneumatic Transducer without Moving Parts)

1.8. K. Bantle, Siemens & Halske, München, Germany: Pneumatische Sicherheitseinrichtung mit strömungsmechanischen Verstärkern (Fluid Amplifiers) für die chemische Industrie (A Safety Device with Fluid Amplifiers for the Chemical Industry)

(continued...)

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

1.10. R.W. Warren, Harry Diamond Labs., Washington, USA: The Digital Fluid Amplifier

2. OPTIMAL COMPONENTS

2.1. J.G. van Santen, Philips' Research Lab., Eindhoven, Netherlands: Opto-electronic Circuits

2.2. H.G. Grimmeiss and H. Scholz, Philips Zentrallab. Aachen, Germany: Einige neue Bauelemente aus GaP (Some New GaP-Components)

2.3. H.F. Storm and T.C. Mapother, General Electric Co., Schenectady, resp. Syracuse, N.Y., USA: Infrared-triggered Silicon Controlled Switch

2.4. J. Kilby, Texas Instruments, USA: The Use of Optical Diodes in Integrated Circuits

2.5. H.N. Toussaint and W. Schmidt, Siemens & Halske, München, Germany: Elektro-optische Gatterschaltungen zur Steuerung von Elektrolumineszenz-Leuchtfeldern (Electro-optical Gate Circuits for Controlling Electroluminescent Display-Devices)

3. STORAGE COMPONENTS

3.1. E. Heimbach, Siemens & Halske, München, Germany: Digitale Schnellspeicher und ihre Weiterentwicklung (Digital High-Speed Stores and Their Advanced Development)

3.2. H. Rabl, Siemens & Halske, München, Germany: Speicher- und Schaltringkerne für ein sehr weites Betriebstemperaturgebiet (Memory and Switching Ring Cores for a Very Wide Operating Temperature Range)

3.3. V.A. Schuckhman, S.V. Odenov, Dzh. G. Chigvinadze, Academy of Sciences, Tibilis, USSR: On Reliability of Operation of a Memory Superconducting Cell-Persistotron in a Memory Matrix

3.4. G.W. Hill, British Scientific Instrument Research Ass., Chislehurst, Kent, UK: Organic Insulating Films for Cryogenic Storage Systems

3.5. L.J. Page and R.A. Scantlebury, Ministry of Technology, National Physical Lab., Teddington, Mx., UK: Etching as a Method for Fabricating a Cryogenic Store

3.6. H. Stopper, Telefunken, Konstanz, Germany: Eine integrierte Schaltung zur Realisierung eines Halbleiterspeichers (An Integrated Circuit as Cell of a Semiconductor Memory)

4. INTEGRATED CIRCUITS

4.1. H. Rüchardt, Siemens & Halske, München, Germany: Integrierte Schaltungen als Evolution (Integrated Circuits as Evolution)

Friday 22nd October 1965

4.2. P. Hospel, Philip's Semiconductor Lab., Nijmwegen, Netherlands: Realisation of Monolithic Semiconductor Integrated Circuits

4.3. C.P. Sandbank and A.W. Horsley, Standard Telecommunication Labs., Harlow, Essex, UK: Methods of Increasing the Functional Flexibility of Integrated Circuits

4.4. H. Fuchs and K. Heime, Forschungsinstitut des Fernmeldetechnischen Zentralamtes der Deutschen Bundespost, Darmstadt, Germany: Eine Codiermatrix in Dünnschichttechnik (Coding Matrix in Thin Film Technology)

4.5. J. Erber, Siemens & Halske, München, Germany: Dünnschicht-Schaltkreise auf Tantal-Basis (Thin Film Circuits on Tantalum Basis)

4.6. G. Mayer, Siemens & Halske, München, Germany: Dünnschicht-Schaltkreise in Aufdampftechnik und ihre Herstellung (Thin Film Circuits in Evaporation Technique and Their Production)

4.7. A. Rademakers, Philip's Development Lab., Eindhoven, Netherlands: A Cheap and Versatile Method for Making Hybrid Integrated Circuits

4.8. E.M. Davis, IBM, East Fishkill, N.Y., USA: A Flexible Digital and Analogue Hybrid Integrated Circuit Technology

4.9. H.W. Ehlbeck, Telefunken, Heilbronn, Germany: DCTL-Schaltkreisfamilie sehr kleiner Verlustleistung (A Low Power DCTL-Family)

4.10. F. Vogler, Telefunken, Ulm, Germany: Verfahrensgerechte Schaltungsentwicklung für die Keramik-Siebdrucktechnik (Development of Circuits Suitable for the Ceramic Silk Screen Technique)

4.11. N.C. de Troye, Philip's Research Labs., Eindhoven, Netherlands: Relations between Dissipation, Fan-out and Resistance Tolerances in Microminiature Digital Circuits

4.12. P. Barbier, La Société Européenne des Semi-Conducteurs, Paris, France: Principes de Réalisation d'Amplificateurs Integres à Large Bande (Basic Conceptions and Requirements for Circuits Used in Integrated Large Band with Amplifiers)

5. CONSTRUCTION AND INTERCONNECTION TECHNIQUES

5.1. L.A. Steipe, Amphenol-Borg, Deisenhofen, Germany: Möglichkeiten für die Verbindung mikro-miniaturisierter Bauelemente (Interconnection Methods for Microminiaturized Components)

5.2. E. Assmann, Siemens & Halske, München, Germany: Verbindung von Miniaturbauelementen durch stromlose Verkupferung (Interconnection of Miniature Components by Electroless Copper Plating)

5.3. H.F.C. Daniels and Th.P.J. Botden, Philip's Research Labs., Eindhoven, Netherlands: Ultrasonic Welding in Microminiaturisation.

5.4. C. van Osenbruggen, G. Luijmes, A. van Dijk and J.G. Siekman, Philip's Research Labs., Eindhoven, Netherlands: Micro Spark Erosion as a Technique in Microminiaturization.

5.5. S.J. Angello, University of California, Santa Barbara, Calif. USA, and M.N. Larkin, Westinghouse Electric, Pittsburgh, Pa., USA: The Role of the Scanning Electron Microscope in the Fabrication of Future Micro-electronic Systems

5.6. K. Petermann, Telefunken, Ulm, Germany: Aufbau von integrierten Halbleiter-Schaltkreisen auf keramischem Trägermaterial (Construction of Integrated Semiconductor-Circuits on Ceramic Substrats)

5.7. M. von Ardenne, S. Schiller, Forschungsinstitut Manfred von Ardenne, Dresden, and O. Thieme, VEB-Keramische Werke Hermsdorf, Hermsdorf, Germany: Elektronenstrahl-Aufdampfen von Dünnschicht-Widerständen mit kontinuierlichem Durchlauf durch die Prozeßkammern (Electron Beam Deposition of Thin Film Resistors in Continuous Through-Put Through the Process Chambers)

5.8. M. von Ardenne, U. Heisig, S. Panzer, Forschungsinstitut Manfred von Ardenne, Dresden, and O. Thieme, VEB-Keramische Werke Hermsdorf, Hermsdorf, Germany: Automatisiertes Elektronenstrahl-Abgleichen von Dünnschichtwiderständen mit kontinuierlichem Durchlauf der Bauelemente durch die Bearbeitungskammer (Automatic Electron Beam Balancing of Thin Film Resistor with Continuous Linear Through-Put of the Electronic Components Through the Machining Chamber)

5.9. U. Heisig, S. Schiller, G. Beister, Forschungsinstitut Manfred von Ardenne, Dresden, and J. Henneberger, VEB-Keramische Werke Hermsdorf, Hermsdorf, Germany: Eigenschaften mittels Ionenstrahlzerstäubung hergestellten Widerständen (Properties of Resistors Made by Ion Beam Sputtering)

6. COMPUTER TECHNIQUES

6.1. C.S. Evans and P. Wolstenholme, Ferranti Ltd., Automation Systems Div., Wythenshawe, Manchester, UK: A New Microminiature Digital Computer

6.2. I.V. Prangishvili, E.V. Babicheva and V.V. Ignatushchenko, Institute of Automatics and Telemechanics, Moscow, USSR: Uniform Microelectronic Structures and New Principles of Realization of Logical and Sequential Functions

6.3. W.C. Seelbach, Motorola, Phoenix, Arizona, USA: Computer Sub-Systems on a Chip of Silicon

6.4. H.W. Mergler and J.F. Walker, Case Inst. of Technology, Cleveland, Ohio, USA: Studies on Microminiaturized Digital Controllers

G. Kohn, IBM, Zürich, Switzerland: Grundlagen und Grenzen der Miniaturisierung (Principles and Limits of Microminiaturization)

PANEL DISCUSSION on General Problems of Microminiaturization.

Saturday 23rd October 1965

7. MEASURING DEVICES AND TRANSDUCERS

7.1. I.V. Prangishvili, Institute of Automation and Telemechanics, Moscow, USSR: Microelectronics Gives Birth to New Construction Techniques for Instruments and Devices

7.2. L. Kuhn, Staatliches Forschungsinstitut für Wärmetechnik, Běchovice/Prague, Czechoslovakia: Über die Anwendung nichthomogener dendritischer Kristalle für Halbleiter-Dehnungsmeßstreifen und Hallmultiplikatoren (Piezoresistive and Hall Effect in N-Type Germanium Dendrites)

7.3. H. Brauer, Siemens & Halske, München, Germany: Der Kaltleiter als Temperaturfühler hoher Empfindlichkeit (The PTC-Thermistor as a Highly Sensitive Temperature Sensor)

7.4. W. Touchy, Siemens & Halske, München, Germany: Untersuchungen über die Druckempfindlichkeit von Dioden und Transistoren (Examination on the Stress Sensitivity of Diodes and Transistors)

7.5. M. Börner and H. Schüssler, Telefunken, Ulm, Germany: Mechanische Miniaturfilter für Zwischenfrequenzen (Miniaturized Mechanical I.F.-Filters)

7.6. B. Lang, Siemens & Halske, Karlsruhe, Germany: Gleichspannungsverstärker und analoge Rechenschaltungen mit magnetisch steuerbaren Widerständen (DC-Amplifiers and Analog Computing Elements Based on Magnetic Flux Dependent Resistors)

7.7. K. Kraus, Technical School, Plzen, Czechoslovakia: Indirectly heated PTC-Resistor for Measuring Air Flow.

CLOSING LECTURE

H. Tischner, Technische Hochschule Hannover, Germany: Schaltungen des Nervensystems von Organismen im Vergleich zu Schaltungen der Mikroelektronik (Circuits of the Nervous System of Organisms as Compared to Those of Microelectronics)

REGISTRATION

to be directed to the Verein Deutscher Ingenieure, Abt. Organisation, Düsseldorf 1o, Postfach 1o25o, Telephone: Düsseldorf 44 33 51, ext. 258, Telex: 0858 4840

REGISTRATION FEE

- registration prior to 31st August, 1965   DM 160
- registration after that date   DM 200

The number of participants in the Symposium will be limited. Registration will take place in the order of incoming payments.

HOTEL RESERVATION

exclusively through the Fremdenverkehrsamt München, Abt. Information, München 2, Bahnhofsplatz 2, Telephone: 55 58 81. It is strongly recommended to make the reservation at an early date because of other events taking place in Munich at the time of the Symposium.

IFAC EDUCATION TECHNICAL COMMITTEE MEETING

The IFAC Education Technical Committee meeting will be held on 9th and 10th September, 1965, in Warsaw, Poland.

The agenda of the meeting is as follows:

I. Discussion of topics with a comparison of National Reports on University level Education received from: Austria, Belgium, Canada, Czechoslovakia, France, Germany (East), Germany (West), Hungary, India, Italy, Japan, Netherlands, Poland, Sweden, United Arab Republic, UK and USA.

Prof. M.G. Chilikin announced the USSR report to come later.

II. Exchange of views on future trends in automatic control education

III. Points to be included in the Education Committee report to the IFAC Congress in London 1966

IV. Suggestions concerning doctoral and postdoctoral education on an international basis.

V. Reports on Sub-Committees activity of IFAC

VI. Problems connected with future relations of IFAC with UNESCO

NEWS FROM NATIONAL MEMBERS

New Member Organisations of IFAC

In addition to the 29 national member organizations of IFAC which have been listed in Bulletin No. 20, page 4, two new organizations have been admitted as members of IFAC:

1. Cuba: Dirección de Automatización, Havana
2. North Corea: Central Committee of Automation Association, Senkyo, Kuek, Pyongyang

Czechoslovakia

The Czechoslovak National Committee for IFAC recently was constituted as follows:

Chairman: Jiří Beneš
Vice-Chairman: Josef Škákala
Secretary: Jaroslav Šindelář
Members: M. Balda, J. Bartoš, B. Franko-
vič, B. Hanuš, J. Haškovec, A.
Klímek, M. Knotek, Zd. Kotek,
J. Křížek, J. Nekolný, Vl. Strejc,
M. Šalamon, Zd. Trnka, M. Ullrich.

Finland

The Finnish member organization of IFAC elected K. Numminen M.A. (Tech.) to be its president and V. Appelberg M.A.. (Tech.) to be its secretary, at its annual meeting on the 24th March, 1965. The address of the organization has been also altered and it is now:

Suomen Säätöteknillinen Seura ry,
c/o Outokumpu Oy, Töölönkatu 4, Helsinki.

The name of the organization has been given in Swedish in the lists of IFAC until now, but as 90 % of its members are Finnish speaking, it is suggested that the name of the organization be altered to the above mentioned Finnish form.

Republic of South Africa

We have given in Bulletin No. 16 (pages 27/29) the names of
the 15 member organizations and of the 7 affiliate member or-
ganizations of the S.A.C.A.C. (South African Council for Auto-
mation and Computation). Since that time, 3 more member orga-
nizations:

Rand Mines Limited,
University of Cape Town,
University of Pretoria

and 4 more affiliate member organizations:

Project Evaluation Consultants (Pty) Ltd.,
Siemens S.A. (Pty) Ltd.,
South African Railways,
Western Industries (Pty) Ltd.,

have joined S.A.C.A.C.

The Executive Committee of the latter is presently composed of
the following personalities:

Dr. O. B r u n e   Ex officio
Mr. A. A. M i d d l e c o t e   President
Mr. J.D.N. v a n W y k   Vice-President
Mr. G.A. H a r v e y
Dr. D.S. H e n d e r s o n
Prof. G.P.R. von W i l l i c h
Mr. T. W e i c k e r.   Treasurer

Reports on past events

France

INTERNATIONAL SYMPOSIUM ON HYDRAULIC AND PNEUMATIC TRANSMISSIONS

This Symposium sponsored by A.F.R.A. took place in Paris on
17th to 20th May, 1965, with the following 27 papers read and
discussed:

- "Possibilities and performances of hydraulic controls " by
  M. G u i l l o n

- "Trends of electro-hydraulic components" by G. L i b o i s

- "Some solutions of various hydraulic problems in connection
  with electronic control circuits" by C.R. H i m m l e r

- "Hydraulic controls in automatic machine-tools" by R.
  v e r g n e

- "Hydraulically-controlled positioning" by R. M o l l e
  (Belgium)

- "Hydraulic equipment of Captain Cousteau's diving saucers"
  by F. d e R a u c o u r t

- "Electro-hydraulic thickness gauging in rolling mills" by
  M. C a m b o r n a c

- "Hydrostatic control of cooling unit blowers on Diesel
  locomotives" by J. G i m e l

- "Historical glance on hydrostatic controls" by J. F a i -
  s a n d i e r

- "Theory and practice of hydrostatic transmissions" by J.
  T h o m a (Switzerland)

- "Small automation with pneumatic components" by K. S t o l l

- "Construction and applications of quick-acting electro-
  pneumatic distributors" by G. E i c h e r t (Germany)

- "Fundamental electro-hydraulic systems. Feedback hydraulic
  systems and their applications to mechanical motion" by B.R.
  H o r n e (USA)

- "Characteristic magnitudes in hydrostatic plants and their
  measurement" by U. B a u m g a r t e n (Germany)

- "Pneumatic logic and its application to industry" by P.
  P i q u e t

- "New copying techniques: a stage of complete automation
  achievement" by J. B r o n f o r t (Belgium)

- "Future aspects of controlled valves technology", their in- tregration into a complex automation scheme" by F. B o b o t
- "Pneumatic automation of remote valve control" by P.L. Cowper C o l e s
- "Representation of basic pneumatic logic functions" by V. v e h i n g e r (Germany)
- "Slow hydraulic actuators and their applications" by R. B e y e r (Germany)
- "Sliding phenomena in hydrostatic transmissions" by W.M.J. S c h l o s s e r (Netherlands)
- "Fields of applications and concerns of high pressures" by J. B o u r g e o i s
- "Hydraulic transmissions in presses with variable-flow, adjustable-displacement pump" by R. G a l d a b i n i (Italy)
- "Pressure converters and their applications" by M. F u l - h a b e r
- "Hydraulic and hydro-electronic control of a cold-reducing steel-tube diameter machine" by F.P. L e v e t u s
- "Measurement problems in pneumatics" by A. B o u r d i l - l a t
- "Towards a method of dimensional design of pneumatic cir- cuits" by D. B o u t e i l l e

USA

1965 JOINT AUTOMATIC CONTROL CONFERENCE

As announced in Bulletin No. 17 (page 16) the 1965 JACC was held at the Rensselaer Polytechnic Institute, Troy, New York, from 22nd to 25th June, 1965.

The following papers - preprints of which may be obtained from the Automatic Control Division of the ASME (American Society of Mechanical Engineers) - were read and discussed. They were presented through:

AIAA - American Institute of Aeronautics and Astronautics
AIChE - American Institute of Chemical Engineers
ASME - American Society of Mechanical Engineers
IEEE - Institute of Electrical and Electronics Engineers
ISA - Instrument Society of America.

Papers marked "C.P." are conference papers only, not to be published in any society journal.

SESSION I SIMULATION LANGUAGES (TUTORIAL SESSION)

1. "Analog Algol - A Program language for Simulation" by A. L a v i and G. R e i l l y, Westinghouse Research and Development Center, Pittsburgh, Pa.;

2. "SCADS - A Programming System for Simulation of Combined Analog-Digital Systems" by J.C. S t r a u s s and W.L. G i l b e r t, Carnegie Institute of Technology, Pitts- burgh, Pa.;

3. "GASP - A General Activity Simulation Program" by J. B e l - k i n, U.S. Steel Corp.; Monroeville, Pa.; P.J. K i v i a t, Rand Corp.,and A. C o l k e r, Management Control Systems.

4. "Digital Simulation for Control System Design" by R. L i l - n e b a r g e r and R. B r e n n a n, IBM, San Jose, Calif.,

5. "Models for Plant and Digital Control System Simulation" by G.E. A d a m s, University of Arizona.

SESSION V NONLINEAR CONTROLS

1. "Special Graphical Construction Method for the Study of Nonlinear Systems" by R.F. W h i t b e c k, Flight Research Department, Cornell Aero Labs. Inc., Buffalo, N.Y. IEEE

2. "A Method for the Exact Determination of Periodic Motions in Relay Control Systems" by H. M u f t i, Div. of Mech. Engg., National Research Council, Ottawa, Ontario, Canada IEEE

3. "Sensitivity Analysis of Self-Excited Nonlinear Oscilla- tions" by D.D. S i l j a k and M.R. S t o j i c, Dept. of Electr. Engg., University of Santa Clara, Santa Clara, Calif.

4. "Transient Responses from the Liapunov Stability Equation" by W.G. V o g t, University of Pittsburgh, Pa. ASME-C.P.

5. "Bang-Bang Aspects of Manual Control in High Order Systems" by L.R. Y o u n g and J.L. M e i r y, Massachusetts In- stitute of Technology, Dept. of Aeronautics and Astronau- tics, Cambridge, Mass. IEEE

SESSION VI DECISION AND ESTIMATION

1. "Differential Games and Optimal Pursuit-Evaluation Strate- gies" by Y.C. H o, A.E. B r y s o n and S. B a r o n, Harvard University, Div. Engg. and Applied Physics, Cam- bridge, Mass. IEEE

2. "A Sample-Average Filter for Linear Control Systems" by G.L. P a r k, Michigan State University, Dept. Electr. Engg., East Lansing, Mich. IEEE

3. "Estimation of Nonlinear System States and Parameters by Regression Methods" by C. G i e s e and R.B. M c G h e e, Electr. Eng. Dept., University of South California, University Park, Los Angeles, Calif.
IEEE

4. "Sequential Estimation of States and Parameters in Noisy Non-Linear Dynamical Systems" by R. S r i d h a r and D. M. D e t c h m e n d y, School of Electrical Engineering, Purdue University, West Lafayette, Ind.
ASME

5. "Solution of a Linear Mean Square Estimation Problem when Process Statistics are Undefined" by D.E. J o h a n s e n, Applied Research Labs., Waltham, Mass.
AIAA

SESSION VII OPTIMAL CONTROLS

1. "The Evolution of Control System Standards" by H.L. M a s o n, U.S. Dept. of Commerce, National Bureau of Standards, Washington, D.C.
ASME-C.P.

2. "Feasible Optimization Methods for Interconnected Systems" by C.B. B r o s i l o w, L.S. L a s d o n and J.D. P e a r s o n, Systems Research Center, Case Inst. of Technology, Cleveland, Ohio
AIChE

3. "A Multi-Level Technique for Optimization" by L. L a s - d o n and J.D. S c h o e f f l e r, Case Inst. of Technology, Cleveland, Ohio
IEEE

4. "A Multi-Level Structure for a Class of Linear Dynamic Optimization Problems" by J.D. P e a r s o n, Y. T a k a h a - r a and M.D. M e s a r o v i c, Case Inst. of Technology, Cleveland, Ohio
IEEE

5. "Multi-Level Approach Applied to Control System Design" by I. L e f k o w i t z, Case Inst. of Technology, Cleveland, Ohio
ASME

SESSION VIII THE STATE OF THE ART IN APPLICATIONS, 1 (INVITED)

1. "State of the Automatic Control Art in the Electric Power Industry of the United States" by N. C o h n, Leeds & Northrup Co., Philadelphia, Pa.

2. "Automatic Control in the Metallurgical Industry" by W.E. M i l l e r, General Electric Co., Schenectady, N.Y.

3. "The Chemical Process Industries" (no paper) by R.S. S i l v a

4. "Aerospace Industries" (no paper) by T.A. S a v o, Hughes Aircraft Co.

SESSION IX CONTROL COMPONENTS

1. "A Rate Gyroscope Based on Interaction of Sonic Waves" by G.C. N e w t o n, Jr., Electronic Systems Lab., Dept. of Electr. Engg., Massachusetts Institute of Technology, Cambridge, Mass.
IEEE

2. "Analysis of a Pulse-Width-Modulated Hydraulic Servo" by P.N. N i k i f o r u k, P.R. U k r a i n e t z and W. W r i s t e n, Mech. Engg. Dept., University of Saskatchewan, Saskatoon, Sask., Canada
ASME-C.P.

3. "Small Displacement, Self-Balancing Differential Manometer" by W.H. B e l l, Westinghouse Electric Corp., West-Mifflin, Pa.
ASME-C.P.

4. "Proposed Test Standards for NOR and NAND Fluid Digital Amplifiers with some Preliminary Experimental Results" by F.R. G o l d s c h m i e d, Sperry Utah Co., Div. Sperry Rand, Salt Lake City, Utah
ASME-C.P.

5. "Development of a Pure Fluid Power Amplifier" by P.A. O r - n e r, Giannini Controls Corp., Malvern, Pa.; and C.K. T a f t, Case Inst. of Technology, Cleveland, Ohio
ASME-C.P.

SESSION X MODELING

1. "Functional Representation of Nonlinear Systems, Interpolation and Lagrange Expansion for Functionals" by D. G o r - m a n and J. Z a b o r s z k y, Washington University of St. Louis, St. Louis, Mo.
ASME

2. "The effect of Coordinate Transformations on a Class of Control System Models" by W.J. C u l v e r, Surface Div., Westinghouse Electric Corp., Baltimore, Md.
IEEE

3. "Control Model Simplification Using a Two Level Decomposition Technique" by R.C. D u r b e c k, IBM, San Jose, Calif. and L.S. L a s d o n, Systems Research Center, Case Inst. of Technology, Cleveland, Ohio
AIChE

4. "A Unified Approach to the Synthesis of Orthonormal Exponential Functions Useful in Systems Analysis" by J.M. M e n - d e l, Douglas Aircraft Corporation, Santa Monica, Calif.
IEEE

5. "Performance of Process Models" by S.C. G u p t a, Research & Development Center, Leeds & Northrup Co., North Wales, Pa.
ISA

SESSION XI OPTIMAL CONTROLS 2

1. "On Synthesis of Optimal Bang-Bang Feedback Control Systems with Quadratic Performance Index" by R.W. B a s s and R. F. W e b b e r, Hughes Aircraft Co., Culver City, Calif.
IEEE

2. "Closed-Loop, Approximately Time-Optimal Control of Linear Systems" by J.L. M e l s a and D.G. S c h u l t z, University of Arizona, Dept. of Electr. Engg., Tucson, Ariz.
IEEE

3. "The Frequency Domain Solution of Regulator Problems" by B.H. W i l l i s, R.W. B r o c k e t t, Mass. Inst. of Technology, Dept. of Electr. Engg., Cambridge, Mass.
IEEE

4. "On a Class of Constrained Control, Linear Regulator Problems" by A. Tchamran, Syracuse University, Electr. Engg., Dept., Syracuse, N.Y. ASME

5. "A Technique of Quasi-Optimum Control" by B. Friedland, General Precision Aerospace, Little Falls, N.J. Calif.

SESSION XII STATE OF THE ART IN APPLICATIONS II (INVITED)

1. "Developments in Automatic Controls for Machine Tools" by C.K. Taft, Case Inst. of Technology, Cleveland, Ohio, and M. Mazoh, The Warner & Swasey Co., Cleveland, Ohio

2. "Biomedical Control Developments" by N.A. Coulter, Dept. of Physiology, Ohio State University, Columbus, Ohio, and O.L. Updike, Div. of Biomedical Engg., University of Virginia, Charlottesville, Va.

3. "Functional Description and Development of an Automatic Train Control System" by J.K. Howell, Westinghouse Electric Corp., Transportation Systems Dept, Pittsburgh, Pa.

4. "Developments in Automatic Warehousing and Inventory Control" by R. Dallimonti, Honeywell Inc., Philadelphia, Pa.

SESSION XIII DESIGN

1. "An Approach to Interacting Control System Synthesis" by I. Birta and M.D. Mesarovic, Case Inst. of Technology, Cleveland, Ohio

2. "A Method of Determining Minimal Order Linear Controllers" by M.E. Jensen, Stanford Linear Accelerator Center, Stanford, Calif. IEEE

3. "A Paper and Pencil Control System Design Technique" by R.D. Gustafson, School of Mech. Engg., Purdue University, West Lafayette, Ind. ASME

4. "High Order System Design Via State Space Consideration" by R.W. Bass and I. Gura, Hughes Aircraft Co., Aerospace Group, Culver City, Calif. IEEE

5. "The Design of Nonlinear Multivariable Control Systems for State Dependant Linear Models" by H.A. Fertik and J. D. Schoeffler, Case Inst. of Technology, Cleveland, Ohio ASME

SESSION XIV ESTIMATION

1. "A Self-Adaptive System with Auxiliary Adjustment Prediction" by H.J. Perlis and H.J. Rutgers, The State University, Dept. of Electr. Engg., New Brunswick, N.J.

2. "A Learning Control System Using Stochastic Approximation for Hill-Climbing" by J.D. Hill and K.S. Fu, Bellcomm Inc., Washington, D.C. IEEE

3. "Control of a Linear System with a Markov Property" by D.D. Sworder, University of South California, Los Angeles, Calif. IEEE

4. "The Scientific Inferential Relationships between Statistical Estimation, Decision Theory and Modern Filter Theory" by G.L. Smith, NASA- Ames Research Center, Moffett Field, Calif. AIAA

5. "Uncertainty and Imprecision" by S. Lees, Thayer School of Engineering, Dartmouth College, Hanover, N.H. ASME

SESSION XV OPTIMAL CONTROLS III

1. "Function Space Methods for the Optimum Control of a Class of Distributed Parameter Control Systems" by E.I. Axelband, Hughes Aircraft Co., Space System Div., El Segundo, Calif. IEEE

2. "Minimum Mean Square Error Design of Distributed Parameter Control Systems" by D.A. Pierre, Montana State College, Bozeman, Mont.

3. "Optimal Control of Systems with Distributed Parameters" by R.E. Goodson and H.C. Khatri, Mech. Engg. Dept., Purdue University, West Lafayette, Ind. ASME

4. "Minimum Energy Control of a Linear Plant with Magnitude Constraint on the Control Input Signal" by A.R. Stubberud and J.M. Swiger, University of California, Los Angeles, Calif.

5. "The Application of Quality Control Data in Feedback Systems" by C.K. Taft, Case Inst. of Technology, Cleveland, Ohio, and J. Loeb, Corning Glass Works, Corning, N.Y. ISA

SESSION XVI THE STATE OF THE ART IN COMPONENTS 1 (INVITED) NEW SOLID STATE POWER COMPONENTS

1. "Integrated Circuits for Automatic Control" by M.O. Thurston, Ohio State University, Columbus, Ohio

2. "Present-Day Solid-State Power Switches" by J.D. Harnden Jr., General Electric Co., Advanced Technology Lab., Schenectady, N.Y.

3. "Application Features of the Gate-Controlled Switch Compared to Transistors Operating in the Switching Mode" by J.W. Motto Jr., Westinghouse Electric Corp., Semi-Conductor Div., Youngwood, Pa.

4. "Some Industrial Power Applications of Silicon Thyristors" by A.H.B. Walker and I.A. Schlabach, Westinghouse Electric Corp., Research Labs, Pittsburgh 35, Pa.

5. "Gate Controlled A-C Switches" by H.F. Storm and D.I. Watrous, General Electric Co.

SESSION XVII IDENTIFICATION

1. "State Identification in Finite State Systems Having Input-Output Noise" by R.M. G a g l i a r d i, University of South California, Los Angeles, Calif. IEEE

2. "Statistical Structural and Regression Models in Linear Process Identification" by R.B. K e r r, Lockheed Missiles & Space Co., Huntsville, Ala.

3. "Accurate Determination of Complex Root Transfer Functions from Frequency Response Data" by C.P. C h e n and B.I. P h i l l i p, Christian Brothers College, Dept. Electr. Engg., Memphis, Tenn.

4. "The Identification of Linear Systems" by E.E. F i s h e r, Honeywell Inc., St. Paul, Minn. ASME-C.P.

5. "Approximate Identity in Linear Continuous and Sampled-Data Servomechanisms" by A.J. R a u l t, Kansas State University, Dept. Electr. Engg., Manhattan, Kan. IEEE

SESSION XVIII SPACE AND CONTROL APPLICATIONS

1. "Application of Optimization Theory to the Design of a Missile Control" by R.R. D u e r s c h, General Electric Co., Schenectady, N.Y. IEEE

2. "An Optimal Discrete Control Strategy for Terminal Guidance" by F. T u n g, Lockheed Missiles & Space Co., Palo Alto, Calif. IEEE

3. "A Missile Adaptive Roll Autopilot with a Small-Amplitude Limit Cycle" by D.V. S t a l l a r d, Raytheon Co., Missile Systems Div., Bedford, Mass. IEEE

4. "Stabilization and Control of a Cable-Connected Spinning Space Station" by I.N. H u t c h i n s o n, R.F. M o r r i s o n and J.L. K e l l e r, Sperry Gyroscope Co., Div. of Sperry Rand Corp., Great Neck, N.Y. IEEE

5. "Closed-Loop Stepping Motor Application" by T.R. F r e d r i k s e n, IBM Corp., Products Div., San Jose, Calif. IEEE

SESSION XIX OPTIMAL CONTROLS 4

1. "Optimum Discrete Systems with Amplitude and Energy Constrained Control Function" by M. K i m, School of Electr. Engg., Cornell University, Ithaca, N.Y. ISA

2. "A Study of Minimum Norm Control for Sampled-Data Systems" by J.A. C a d z o w, State University of New York, Buffalo, N.Y. IEEE

3. "A Successive Sweep Method for Solving Optimal Programming Problems" by S.R. M c R e y n o l d s and A.E. B r y s o n, Pierce Hall, Havard University, Cambridge, Mass. AIAA

4. "Optimum Nonlinear Control of a System with Two Inputs and One Output" by R. O l d e n b u r g e r and K. O k a m u r a, Purdue University, Automatic Control Center, West Lafayette, Ind. IEEE

SESSION XX STATE OF THE ART IN COMPONENTS II (INVITED)
FLUID CONTROL COMPONENTS

1. "Component Parameter and Characteristics Specification" by H.R. W e e d, Ohio State University, Columbus, Ohio

2. "A Candid Look at Fluid Control Systems 1965" by J.L. S h e a r e r, The Pennsylvania State University, University Park, Pa.

3. "The Future of Fluid Amplifiers in Commercial Controls" by B.G. B j o r n s e n, Johnson Service Co., Milwaukee, Wis.

4. "The Univac Fluid Computer" by R.S. G l u s k i n, Univac Division of Sperry Rand, Blue Bell, Pa.

5. "New Fluid Amplifiers Techniques for Speed Control" by W.A. B o o t h e, General Electric Co., Advanced Technology Lab., Schenectady, N.Y.

SESSION XXI STABILITY 1

1. "Stability - Boundary Approximation for Relay-Control Systems via Steepest Ascent Construction of Liapunov Functions" by S. W e i s s e n b e r g e r, Lockheed Missiles & Space Co., Sunnyvale, Calif. ASME

2. "On the Liapunov Functions for a Class of Nonlinear Nonautonomous System" by N.N. P u r i, General Electric Co., Philadelphia, Pa. ASME

3. "Extension of the Integral Method of Liapunov Function Generation to Coupled Nonlinear Autonomous Systems" by J.A. W a l k e r, The Technical Institute, Northwestern University, Evanston, Ill. ASME-C.P.

4. "New Theorems and Examples in the Liapunov Theory of Stochastic Stability" by H.J. K u s h n e r, Center for Dynamical Studies, Brown University, Providence, R.I. ASME-C.P.

5. "On the Application of Hydrodynamics to the Study of the Stability of Singular Points of Differential Equations: Autonomous Systems" by D. B a y a n o v i t c h, Grumman Aircraft Engineering Corp., Betpage, N.Y. ASME

SESSION XXII POWER APPLICATIONS

1. "Fluid Centerline-Velocity Effect on Fluid Temperature Transients in a Heat Exchanger" by H. T h a l - L a r s e n, Mech. Engg., University of California, Berkeley, Calif. ASME

2. "Control Aspects of a Large Dual-Purpose Nuclear Reactor Plant" by D.W. L e i b y, N-Reactor Dept., General Electric Co., Richland, Wash. ASME-C.P.

3. "Application of the Maximum Principle for Bounded State Space to the Hydro-Steam Dispatch Problems" by E.B. D a h l i n and D.W.C. S h e n, General Products Div., Development Lab., San Jose, Calif. IEEE

4. "Sensitivity Methods for Economic Dispatch of Hydroelectric Plants" by R.J. Ringlee, General Electric Co., Schenectady, N.Y. IEEE

5. "Steam Generator Water Level Control" by A.N. Nahavandi and A. Batenburg, Westinghouse Electric Corp., Atomic Power Div., Pittsburg, Pa. ASME-C.P.

SESSION XXIII SAMPLED DATA SYSTEMS

1. "Upper Bound on Dynamic Quantization Error in Digital Control Systems via the Direct Method of Liapunov" by G.W. Johnson, Space Systems Group, IBM-Federal Systems Division, Cambridge, Mass. IEEE

2. "Error Bounds for Jittered Sampling" by B. Liu and T.P. Stanley, Princeton Univ., School of Engg. & Applied Science, Princeton, N.J. IEEE

3. "A Consideration of Discrete Volterra Series" by P. Alper, Div. Automatic Control, Technical University of Norway, Trondheim, Norway IEEE

4. "An Application of Sampled Data Adaptive Optimization" by A.L. Frey and W.B. Deem and R.J. Altpeter, Dept. Chemical Engg., University of Wisconsin, Madison, Wis. AIChE

5. "Time Domain Matrix Analysis of Nonlinear Quantized Hybrid Systems" by R.E. King, Electr. Engg. Dept., Columbia University, New York, N.Y., and D. Williamson, Electr. Engg. Dept., Queen's University, Belfast, North Ireland ASME

SESSION XXIV STATE OF THE ART IN COMPONENTS III (INVITED) NUMERICAL CONTROL - THE COMPONENT VIEWPOINT

1. "Numerical Control - The Component Viewpoint" by P.P. Filscher, General Electric Co., Philadelphia, Pa.

2. "Software a Vital Component in Numerical Control" by R.A. Thomas, Specialty Control Dept., General Electric Co., Waynesboro, Va.

3. "Servo Components of Numerical Control" by L.U.C. Kelling, Indust. Controls Div., General Electric Co., Waynesboro, Va.

4. "An Industrial Robot" by M.J. Dunne, Unimation, Inc.

5. "Application of Numerical Controls to a Manufacturing Department" by C.P. Seymour, Hewlett-Packard Inc., Palo Alto, Calif.

SESSION XXV STABILITY 2

1. "Frequency Domain Stability Criteria, Part I" by R.W. Brockett and S.L. Willem, Mass. Inst. Technology, Dept. of Electr. Engg., Cambridge, Mass. IEEE

2. "Frequency Domain Stability Criteria Part II" by R.W. Brockett, Mass. Inst. of Technology, Dept. Electr. Engg., Cambridge, Mass. IEEE

3. "On Two Theories Concerning the Dangerousness of Stability Boundaries in Non-Linear Systems" by J.R. Amyet and R.A. Johnson, University of Manitoba, Dept. of Electr. Engg., Winnipeg, Canada IEEE

4. "The Use of Lur's Forms to Establish a Sufficient Condition for Stability of a Class of Discrete Feedback Systems with Parallel Nonlinear Elements" by G.J. Murphy and S.H. Wu, Information Processing & Control Systems Lab., Northwestern University, Evanston, Ill. ASME

5. "Extension of Popov's Theorems for Stability of Nonlinear Control Systems" by Y.H. Ku and H.T. Chieh, The Moore School of Electr. Engg., University of Pennsylvania, Philadelphia, Pa. ISA

SESSION XXVI SIMULATION AND DESIGN APPLICATIONS

1. "Dynasar Input/Output Concepts" by J.M. Watson, Simulation Council, General Electric Co., Schenectady, N.Y. ASME-C.P.

2. "Dynasar Analysis Methods Developed for the Dynamic Systems Analyzer" by V.H. Lucke, Mech. & Engg. Systems Unit, General Electric Co., Cincinnati, Ohio ASME-C.P.

3. "Dynasar Applications" by H.P. Durand, Simulation Council, General Electric Co., Cincinnati, Ohio ASME-C.P.

4. "Design of Minimum Inertia Servo Gear Trains" by G. Lance and J. Lilittschwager, The University of Iowa, Iowa City, Iowa ASME-C.P.

5. "The Use of Magnetostriction to Achieve Fast Adjustment of Roll Separation in Multi-Stand Rolling Mills" by B.S.M. Granborg, University of Hawaii, Dept. of Electr. Engg., Honolulu, Hawaii IEEE

SESSION XXVII TIME VARYING SYSTEMS

1. "Dynamic Analysis of Some Time Varying Distributed Systems" by G.W. Seaton, Dept. of Chemical Engg., Lehigh University, Bethlehem, Pa. AIChE

2. "Drift Compensation of Linear Systems by Parameter Adjustments" by J. Rissanen, EAI, Princeton, N.J. ASME

3. "Design and Synthesis of Linear Time-Variant Automatic Control Systems" by H. D'Angelo, University of Denver, Colo., and T.J. Higgins, Dept. of Electr. Engg., University of Wisconsin, Madison, Wis. ISA

4. "Optimization of Time-Varying Systems" by L.E. McBride, Jr., Princeton University, School of Engg. & Applied Science, Princeton, N.J. and K.S. Narendra, Harvard University, Cambridge, Mass. IEEE

5. "A Function Space Approach to the Identification of Linear Systems, Part I: Formulations for Time Invariant and Time Varying Systems; on the Uniqueness and Construction of Solutions" by A.E. Pearson, Div. of Engg., Brown University, Providence, R.I. ASME

SESSION XXVIII RELIABILITY

1. "Mathematical Concepts in Reliability" by R.L. Madison, Booz Allen Applied Research Inc., Bethesda, Md.
2. "Applied Reliability Analysis" by D.W. Weiss and D.M. Butler, Booz Allen Applied Research Inc., Bethesda, Md.
3. "The Moment Technique for Predicting the Drift Reliability of Control Systems" by J.B. Wertz, R.E. Mesloh and J.L. Easterday, Battelle Memorial Institute, Columbus, Ohio.

Sessions I, II, III, IV were either tutorial or panel sessions without preprints.

SYMPOSIUM ON SYSTEM THEORY

As announced in Bulletin No. 18/19 (pages 60/61) this Symposium was held at the MRI (Microwave Research Institute) of the Polytechnic Institute of Brooklyn from 20th to 22nd April, 1965. The following papers - which will be published in the fall of 1965 by the Polytechnic Press as Volume XV of the MRI Symposia Series - have been read and discussed:

WHAT IS SYSTEM THEORY?

- "An Appraisal of the Status and Future of System Theory" by R.F. Drenick, Polytechnic Institute of Brooklyn (on leave at Technische Hochschule, Munich, Germany)

- "Mathematical Aspects of System Theory" by R. Bellman, The Rand Corp., Santa Monica, Calif.

- "A New View of System Theory" by L.A. Zadeh, University of California, Berkeley, Calif.

REPRESENTATIONS OF SYSTEMS

- "Monotonic Operators and Certain Systems of Differential Equations" by G.J. Minty, University of Michigan, Ann Arbor, Mich. and Courant Inst. of Mathematical Sciences, New York University, New York, N.Y.

- "Nonlinear Networks" by R.K. Brayton, IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.

- "A Theory of Linear Systems with State Space of Non Finite Dimensions" by A.V. Balakrishnan, University of California, Los Angeles, Calif.

- "Partitioning and Tearing Large Systems of Equations" by D.V. Steward, University of Wisconsin, Madison, Wisc.

SYSTEM DYNAMICS

- "Concepts and Problems of Modern Dynamics" by L.A. MacColl, Polytechnic Inst. of Brooklyn

- "Dynamical Systems with Inputs" by E.O. Roxin, University of Buenos Aires, Argentina

- "Some Notions of Stability and Recurrence in Dynamical Systems" by J. Auslander, Yale University, New Haven, Conn.

- "Instruction-Controlled Machines" by C.C. Elgot, IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.

- "Computability" by M. Davis, Yeshiva University, New York, N.Y.

NON DETERMINISTICS SYSTEMS

- "On System Measurement and Identification" by W.L. Root, University of Michigan, Ann Arbor, Mich.

- "The Word Decomposition Problem" by D.L. Hanson, University of Missouri, Columbia, Mo.

- "A Group Theoretic Approach to Causal Systems" by R. Goodman, Mass. Inst. of Technology, Cambridge, Mass.

- "Applications of Function Space Integrals to Non-Linear Differential Equations" by M.D. Donsker, Courant Inst. of Mathematical Sciences, New York University, New York, N.Y.

- "Stochastic Stability and Design of Feedback Controls" by H.J. Kushner, Brown University, Providence, R.I.

OPTIMAL SYSTEMS

- "Prediction and Filtering Theory" by R.E. Kalman, Stanford University, Stanford, Calif.

- "Information Theory and Real Information" by N.M. Abramson, University of California, Berkeley, Calif.

- "A Survey of Deterministic Optimal Control Theory" by L.W. Neustadt, University of Southern California, Los Angeles, Calif.

- "Optimum Demodulation of Signals Through Randomly Fading Media" by M. Schwartz, Polytechnic Institute of Brooklyn

- "Linear Mean Square Filtering and Smoothing When Process Statistics Are Undefined" by D.E. Johansen, Sylvania Electronic Systems, Waltham, Mass.

APPLICATIONS OF SYSTEM THEORY

- "System Engineering" by J.G. Truxal, Polytechnic Inst. of Brooklyn
- "A Feedback Realization of a Continuous-Time Optimal Filter" by S.L. Fagin, Sperry Gyroscope Co., Great Nack, N.Y.
- "Certain Problems in the Application of Mathematical Economics" by M.D. Godfrey, Princeton University, Princeton, N.J.
- "Mathematics in Biology" by H. Cohen and S.I. Rubinow, Cornell School of Medicine, New York, N.Y.

8TH NATIONAL POWER INSTRUMENTATION SYMPOSIUM

This Symposium - sponsored by the Power Industry Division of the ISA (Instrument Society of America) has been held in New York City from 12th to 14th May, 1965. The following papers - short abstracts of which are given hereafter and the full texts of which are contained in the Proceedings available from the ISA - were read and discussed:

1.1. "Comparison of Results of Analysis of Boiling System Dynamic by Analog and Digital Methods" by M. Bogaardt, Technical University of Eindhoven, Holland, C.L. Spigt, A.N.J. Verheugen and F.J.M. Dijkman, Laboratory for Heat Transfer and Reactor Engineering.

This paper describes and compares experimental and theoretical results of analysis of boiling water system dynamics in terms of transfer functions obtained by direct analog and digital computations, on the basis of either noise analysis or of direct transfer functions measurement on a high pressure boiling system.

1.2. "Large Boilers Dynamic Analysis and Control Systems Adjustment" by P. Jonon, Special Test Lab., Electricité de France, Paris, France.

Step response analysis permits, using the V. Strejc method to determine the approximate transfer functions matrix of a boiler. P. Naslin damping criterion is then applied to calculate the controller optimal adjustment. Open-loop actions may afterwards be introduced to take account of interactions and disturbances. This method is now used for adjusting the control systems of the high power boilers in several plants of Electricité de France.

2.1. "Dynamic Testing of a Once-Through Boiler Turbine System" by J. Adams, Systems Analysis, D.R. Clark, Systems Analysis, Bailey Meter Co., Cleveland, Ohio, and J.B. Cliffton, Instrumentation and Control, Babcock & Wilcox, Barberton, Ohio.

This paper describes dynamic field testing of a subcritical once-through boiler-turbine system including auxiliaries. Instrumentation, test facilities, and testing methods are discussed. Typical open-loop system responses are compared with the responses predicted by analog simulation. Controlled and open-loop responses of the system are compared at three levels. Also presented are responses of alternate boiler turbine control systems.

2.2. "Power Station Automation in Germany Today" by M. Sack, Kraftwerk Westfalen, Vereinigte Elektrizitätswerke Westfalen, Dortmund, Germany.

A high degree of automation is common practice in block-aggregates with Benson boilers, widely spread in Germany. Technical development in the last two decades has resulted in the increasing centralization of operation and in the further development employing the most complete degree of automation. The techniques and data of operation controlled by digital computers are discussed.

2.3. "Operation of No. 2 Once-Through Unit Control System of Himeji No. 2 Station" by T. Tsukuda, The Kansai Electric Power Co., Inc., Osaka, Japan.

The paper describes the unit control system, which is of the boiler following type, using the ratio of first stage pressure as a measure of boiler change required to satisfy turbine demand. The boiler input open-loop parallel control and pressure and temperature closed-loop control, including plus and minus features for temperature control, are also discussed.

3.1. "The State of Instrumentation and Control in Modern Danish Power Plants" by W. Daub, Sect. Engg. for Mech. Planning Dept., Isefjord Power Co., Copenhagen, Denmark, and M. Mortensen, Electric Planning Dept., The South East Zealand Electricity Co., Ltd., Haslev, Denmark.

This paper deals with the principles of instrumentation and control in the most modern Danish power plants under study.

3.2. "Control of Canadian Nuclear Electric Generating Stations" by E. Elston, Hydro-Electric Power Commission of Ontario, Canada

This paper discusses the main control features of the present and planned Canadian Nuclear Power Stations. It includes such items as: Centralized control; Application of Digital Computers to Flux Tilt Control; Liquid Poison Computation and Control; Turbine Generator run-up and Shutdown; Overall Plant Power Auctioneering; and the use of Analogues in Reactor-Boiler Regulation and Protection.

3.3. "Some Insight into Manual-Automatic Switching and The-Back Problems" by C.R. Johnson and G. Rouvalis, Hagan Controls Corp., Subsidiary of Westinghouse, Pittsburgh, Pa.

In recent years a great deal of emphasis has been placed on the design of reliable electronic controllers. Of equal importance from an overall plant operating standpoint is the design and operation of the manual automatic panel stations. This paper describes some of the problems encountered in the application of various panel stations in respect to large system design, and suggests terminology for future equipment and system specifications.

4.1. "Instrumentation and Control of a Pumped Storage Plant in Scotland" by J. Hammill, Merz & McLellan, Newcastle-upon-Tyne, England.

4.2. "A Simulated Boiler and Control Board for Operating Pro-cedures Training" by Ch. W. Kellstedt, Consolidated Edison Co. of New York, Inc., New York, N.Y.

The paper describes the design and functions of a boiler operating procedures trainer utilized for training control board operators. The devices used in simulating a multifuel fixed boiler and its control systems are discussed.

4.3. "The Human Operator and Automated Power Plants" by A.J. Schager, Cleveland Electric Illuminating Co., Cleveland, Ohio.

This paper presents a brief comparison of plant operators ten years ago with today. It points out what he has lost and gained, and tells what he should be required to know concerning large boiler-turbine units of today, and the tools we can give him. It gives a brief review of simula-tors being used and being built by Cleveland Electric Il-luminating Co., and summarizes by showing how they serve as another phase of improved reliability and safety.

5.1. "Computer Applications in the Power Plants of Today and Tomorrow" by E.C. Yaw, Ebasco Services, New York, N.Y.; and D.I. Aswell, Louisiana Power & Light Co...

6TH INTERNATIONAL PULP AND PAPER SYMPOSIUM

This Symposium organized by the ISA Pulp and Paper Division, was held from 5th to 7th May, 1965, at Green Bay, Wisconsin. The following papers - published in the Proceedings, available from the Instrument Society of America - may be of interest to control engineers:

- "Paperstock Drainage and Freeness Recording and Controlling" by M. Krofta, Krofta Engineering Corp.

- "Use of Conductivity for Continuous Digester Control" by D.G. Sutherland, The Black Clawson Comp.
- "An Advanced Refiner Control System Utilizing Delta T" by R.F. McMahon and R.M. Tonsi, Beloit Corp.
- "Digital Simulation Applied to Paper Machine Dryer Studies" by E.B. Dahlin and R.N. Linebarger, IBM Corp.
- "Some Experiences with Process Control Computers" by J.D. Maloney, The Mead Corp.

Announcements of future events

Belgium

SEMINAR ON AUTOMATIC CONTROL IN PRODUCTION AND DISTRIBUTION OF ELECTRICAL POWER

From the 18th to 22nd April, 1966, the Institut Belge de Ré-gulation et d'Automatisme and the Société Royale Belge des Electriciens will be organising a seminar on

Automatic Control in Production and Distribution of Electrical Power

in Brussels. The languages provided will be French, English and German. There will be simultaneous translation.

The aim of the seminar sponsors is to strike the balance of the contribution of automation techniques to operation re-liability, and to power production and distribution optimi-sation, by an international meeting of automation specialists and power utilities staffs.

The following topics will be under discussion:

A. AUTOMATIC CONTROL IN ELECTRICAL POWER PRODUCTION

The automatic control problems of the following units will be discussed:

1. Basic units (thermal and nuclear);
2. Units of average size (thermal units with a simplified cycle, gas turbine generators, free-piston genera-tors pumped storage plants);
3. Peaking Power units (turbo-reactor units).

The investments made for automatic control will also be con-sidered from the economist's viewpoint.

A.1. Automatic Control of steam Ge-nerators (boilers, nuclear reac-tors)

The automatic control of boilers and nuclear reactors is a

problem of most complex nature. It is a well-known fact that
the many control loops of boilers and nuclear reactors will in-
sure satisfactory operation only in the neighborhood of a gi-
ven load. Every load modification means the necessity of manual-
ly adjusting the set-points of a certain number of controllers.
It is the purpose to examine in this seminar all contributions
towards an improvement of the dynamic behaviour of boilers and
nuclear reactors with their control loops and towards an exten-
sion of the domain of correct automatic operation.

It is quite obvious that this aim also includes all analytical
work made "in vivo" and all approaches by computer simulation
in order to obtain the most fitting mathematical model.

A.2. **A u t o m a t i c   C o n t r o l   o f   T u r b o -
g e n e r a t o r   s e t s**

This automatic control can be done either by mechanical, elec-
trical or electronic means.

The latest improvements on this subject will be discussed in
this session: particularly from the viewpoint of easiness of
introduction of external variables, which is a feature required
for including the units in the overall production planning.

A.3. **A u t o m a t i c   s t a r t - u p   p r o c e d u r e s**

Automatic start-up procedures are already known; they either
use wired-in logic or digital computers with a stored sequential
programme.

A discussion of day-today experience, of success and frustra-
tion will set forth a better synthesis for future progress and
will stress the nature of the equipment best suited for this
complex and delicate task of automatic start-up.

A.4. **U t i l i s a t i o n   o f   c o m p u t e r s   f o r
p u r p o s e s   o f   s u p e r v i s i n g,   p e r -
f o r m a n c e   e v a l u a t i o n   a n d   a u t o -
m a t i c   m o n i t o r i n g   o f   p o w e r   g e -
n e r a t i o n   u n i t s**

Much experimental work in this area is being done; some of it
already succeeded. There is, however, little agreement as to
which tasks should be entrusted to power generation monitoring
computers. A confrontation of ideas and realizations in this
field will accelerate the shaping of a synthesis, and will pre-
lude to efficient action.

With this purpose in mind, the contribution of computers to the
hereafter mentioned subjects will be studied:

- the monitoring of units, and more particularly the possi-
bility of better approaching the limits of safe operation;

- the evaluation of performance;

- The control of large units by acting upon their control
loops so as to optimize the efficiency.

B. AUTOMATIC LOAD DISTRIBUTION BETWEEN PRODUCTION CENTERS

a) Most economical load distribution with respect to efficien-
cy losses and constraints

b) Frequency and power control
Automatic load distribution, based on various criteria, has
been applied in many countries. A survey of this question
will be conducted by examining the most promising realisa-
tion and their merits.

C. AUTOMATIC CONTROL OF ELECTRICAL POWER TRANSMISSION

In view to assure to the customer an ever increased quality
of service (permanency, constance of frequency and voltage)
with any kind of unforeseen situation or accident occuring in
the network, it is important that the network configuration
should be automatically adapted.

It is the purpose to select as a guidance in the discussion
every attempt for automatic adaptation of the network confi-
guration to the requirements of permanence, protection and
rentability.

On the other hand, the electric utility companies strive to
increase the security by automatic analysis and interpreta-
tion of accident data and by subsequent elaboration of logi-
cal decisions preventing a spectacular and disastrous break-
down of the whole network. This task of elaborating logical
decisions could be requested from digital computers.

The solutions of this problem are difficult to compare, be-
cause any optimisation depends on many criteria and parame-
ters. It should be found out how far centralisation of net-
work control is desirable.

This problem will be approached from the following angles:

C.1. **M o s t   r e c e n t   p r o g r e s s   m a d e   i n
t h e   d e s i g n   o f   c o n t r o l   r o o m s
f o r   m a i n   p o w e r   s t a t i o n s**

This topic will enable to discuss the most recent techniques,
such as remote control, automatic data logging. All techniques
enhancing safety and reliability will be particularly stressed.

C.2. **T r e n d s   i n   t h e   d e v e l o p m e n t   o f
A u t o m a t i c   c o n t r o l   o f   n e t w o r k s**

A synthesis of the paths to be followed in the next future
leading to an overall control of electrical power networks
should be made now. In doing so the incidence of the evolu-
tion of protection methods and of the increasing importance
of the spare generating capacity with fast start-up on the
possibility of decentralisation should be considered.

This will lead to an investigation into the feasibility of sub-
dividing the network into hierarchically organised func-
tional subunits.

One method of dealing with this problem is to investigate which information can be really used for a limited, local action.

PRESENTATION OF PAPERS

Authors wishing to contribute papers for the Seminar should communicate the exact subject of their paper and an abstract of two typed pages in single line spacing before the 3oth September, 1965.

Title and summary shall be submitted in the language chosen by the author for introduction of his paper; it is recommended to the authors also to submit translations of this summary in the two other languages of the Seminar.

The papers submitted shall be original, i.e. they should not have been published nor presented orally before the Seminar.

No author will be able to present his paper at the Seminar unless he has previously submitted the text of the paper in due form to the Secretariat of the Institut Belge de Régulation et d'Automatisme. Each author will be informed in due time on the regulation concerning texts and figures.

Up to 28th February, 1966, the Seminar registration fee is B.Fr. 2,5oo for each participant. From 1st March, 1966 this fee will be raised to B.Fr. 3,000. Such fee includes the supply of the "Seminar Proceedings" volume, to be sent six months after the closing date of the Seminar, to participants having settled their account.

Authors whose papers are accepted for contribution to the Seminar, will be entitled to a 5o % reduction of the registration fee.

Further particulars can be obtained from:

I.B.R.A.
3, Rue Ravenstein
Brussels.

France

9TH SYMPOSIUM ON HYDRAULICS

This Symposium will be held from 1st to 3rd June, 1966 in Paris with, on the 4th June, a visit to the tide-power plant on the Rance river, near Saint Malo.

The Programme of the Section IV, devoted to controls using fluids, covers the following items:

- Special controllers for power-generating plants
- Special controllers for machine-building shops
- Special controllers for chemical plants
- Special devices such as valves, actuators etc.

Authors should sent to:

Société Hydrotechnique de France,
199 Rue de Grenelle
Paris (7e)

- as soon as possible, the statement of their intention to contribute a paper
- not later than 3oth September, 1965, three copies of an abstract of 1o lines
- if the latter is accepted, not later than 31st January, 1966, the full text of the paper, limited to 8 pages of 2,500 characters each, plus one page of drawings and a half-page of photographs. The language used will be French.

Hungary

CONFERENCE ON THE PRODUCTION OF AUTOMATION ELEMENTS, Budapest, 16th and 17th September, 1965

Inquiries: Hungarian Society of Mechanical Engineers, Szabadság Tér 17, Budapest 5, Hungary

CONFERENCE ON AUTOMATION IN METAL-CUTTING, Budapest, 25th to 27th October, 1965.

Inquiries: Hungarian Society of Mechanical Engineers, Szabadság Tér 17, Budapest 5, Hungary.

Poland

JUBILEE SESSION OF THE AUTOMATIC CONTROL DEPARTMENT OF THE WARSAW TECHNICAL UNIVERSITY

The session will be held on 7th and 8th September, 1965, in the Telecommunications Faculty Building, Nowowiejska 15, Warszawa.

Date and place:

Programme (all papers and discussions will be in Polish):

- "1o years of the Automatic Control Department" by W. Findeisen
- "The shape and characteristics of the automatic control engineer as educated at the ACD" by A. Gosiewski
- "Post-graduate education at the ACD" by R. Ladzinski
- "Educational laboratories of the ACD" by J. Pulca-ewski

- "Some problems of the Systems Theory" by R. Kulikow-ski
- "Optimal design of large transportation and communication systems" by J. Felicki
- "Synthesis of optimal and sub-optimal sampled-data systems with random disturbances" by A. Manitius
- "Digital equipments in the Hierarchiv System for automatic control" by W. Traczyk and J. Kostro
- "A study of the possibilities of integrated control for a sulphuric acid plant" by W. Findeisen et al.
- "A study of the possibilities of optimal control for an arc furnace" by A. Gosiewski et al.

Republic of South Africa

INSTRUMENT AND AUTOMATION EXHIBITION

Johannesburg, from 20th to 25th September, 1965. Instrument and Control Society of South Africa, 409 Netherlands Bank Building, 80 Fox Street, Johannesburg.

FIRST NATIONAL CONFERENCE ON AUTOMATION AND COMPUTATION

"THE IMPACT OF AUTOMATION ON THE PRODUCTIVITY OF SOUTH AFRICA"

This Conference, sponsored by the S.A.C.A.C. (South African Council for Automation and Computation), will be held from 13th to 15th September, 1965, at the Wanderers Club, Johannesburg. It will have as its theme:

Five sessions will cover the Conference and these deal with the economic, sociological, and technical aspects and their influence on the industrial and economic growth of the Republic. The outstanding speakers representing the State, Industry, Labour, and the Universities will provide management, scientists, engineers, and educators with an opportunity to explore an area of immediate and future concern.

A bound copy of the proceedings will be available after the Conference, but a roneoed set of papers will be sent to all who register before the Conference.

As the Instrument and Control Society of South Africa will be holding an exhibition of automation hardware at the University of the Witwatersrand at the same time, delegates will have the opportunity of seeing some of the equipment available for implementing this new technology.

The definition of automation for the purpose of the Conference is: The technology involving handling methods, processes, and design as applied to materials and/or information to achieve

an integrated mechanization of thought and effort, resulting in a controlled or self-regulating system.

13th September:

Opening by Dr. N. Diederichs
Main Paper - Prof. J. Goudriaan

Session A - MANAGEMENT ASPECTS

1. "New Dimensions in Management" by B.F. Hurndall
2. "Meeting the Challenge to Management" by D. Woolley
3. "Practical Aids to Management" by C.P. Linsell

14th September:

Session B - LABOUR ASPECTS

1. "The Demands of Automation in terms of High Level Manpower" by R.S. Hall
2. "The Effects of Automation on the Skilled and Unskilled Worker" by T. Murray
3. "Automation and the Problem of Training and Retraining (within Industry)" by S. Biesheuvel
4. "Personnel Management and Automation" by A.W. Grant

Session C - APPLICATION IN THE PROCESSING INDUSTRIES

1. "Automation in the Processing Industries" by J. Zawels
2. "Automation of a Chlorine Dioxide Plant" by J.H. Potgieter
3. "Automation as Applied to the Handling of Components in Engine Assembly"

15th September:

Session D - COMPUTER APPLICATIONS

1. "Survey of Computer Developments in Australia" by G.N. Lance, Australia
2. "Computers in Hydraulic Engineering" by D.C. Midgley
3. "Computers in Mining" by P.C. Pirow
4. "Computers in Scientific Research" by C. Jacobsz
5. "Man-Machine Communication" by V. Marting
6. "Data Transmission" by C.F. Boyce
7. "Computers Reliability" by L. Weatherill

Session E - EDUCATIONAL ASPECTS

1. "Automation and Changing Concepts in Education" by H.J. van der Schroeff, Netherlands

2. "Academic Field" by G.R. Bozzoli
3. "Non Academic Field" by M.C. Erasmus

Registration Fee - R 3o (S.A.C.A.C. Non-Members)

United Kingdom

BRITISH AUTOMATION CONFERENCE 1965

As already mentioned in Bulletin No. 2o (page 27) this Conference will be held from the 7th to the 1oth November, 1965, at the Congress Theatre and Winter Garden, Devonshire Park, Eastbourne, England.

It is planned to deal particularly with the broader aspect of automation, emphasising the social and economic problems rather than technology. The discussions will be based on four Keynote Addresses. These Keynote Addresses will set the stage for a series of papers which will follow; each discussion paper developing a section of the Keynote address in greater detail.

The fee is £ 1o or £ 12 if accompanied by wife. This fee includes: all Conference papers, refreshments at meetings, the President reception and the civic reception. It does not include hotel accommodation. Delegates are asked to make their own hotel reservations; a detailed list of hotels in and near Eastbourne can be obtained from:

The Secretary, Institution of Production Engineers, 1o Chesterfield Street, Mayfair, London W. 1.

PROGRAMME

Sunday, 7th November, 9.00 p.m.
Reception by the President,
Buffet Supper in the Winter Garden

Monday, 8th November

1o.3o Formal Opening (Plenary)
11.3o Keynote Addresses (Plenary):
- "Automation and Society" by Lord Robens, Chairman, National Coal Board
- "Automation and Production" by J.F. Coales, President, International Federation of Automatic Control (IFAC), Chairman, U.K. Automation Council (UKAC)

15.oo Keynote Addresses (Plenary)
- "Automation and the Market" by Lord Nelson of Stafford, Chairman, English Electric Co. Ltd.

- "Automation and Management" by D.L. Nicolson, Chairman, P.E. Consulting Group Ltd.

Discussion Groups Schedule

	Group A Automation and Production	Group B Automation and Market	Group C Automation and Management	Group D Automation and Management
Monday 8 1o.3o = 2.3o = 4.oo =	1. The Changing U.K. Economy by Sir John Toothill	Process Industries by A.J. Young	The Future Demand for Automation Equipment by Basil de Ferranti	Investment by A.M. Alfred
	9.3o Address (Plenary) by the Minister of Technology			
Tuesday 9 November 9.15 1o.45	2. Manpower Utilisation	Manufacturing Industries by S. Carlisle and T.B. Flanagan	Automation and Product Design by John Sargrove	Company Structure and Organisation
11:15 =12.45	3. Social Change by Professor H.Q. Roberts	Packaging and Distribution	The Effect of Automation on Product Research and Development by W.A.Wall	Industrial Relations by W.Jarke
3oo = 4.3o	4. Education by Bowman Scott	Transport and Communications by D.B. Foster	Exports	Planning and Control by B.E. Stokes

17.15 Address (Plenary) by the Minister of Labour

21.30 Reception in the Winter Garden by the Mayor of East-bourne. Buffet Supper

Wednesday, 10th November

9.15 Discussion Group Reports (Plenary)

12.15 Closing Address

AUTOMATIC CONTROL IN ELECTRICITY SUPPLY

As previously announced in Bulletin No. 20 (pages 27/28) a symposium on "Automatic Control in Electricity Supply", arranged by the North Western Centre of the IEE under the aegis of the United Kingdom Automation Council, will be held at the Renold Building, Manchester College of Science and Technology, Manchester, from the 29th to 31st March, 1966. Some further details are given below.

Over thirty contributions have been offered, which will be discussed in six sessions, and an exhibition of suitable equipments will be held.

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.

Delegates can be accommodated in halls of residence of the University of Manchester.

Further details and registration forms will be available from the Honorary Secretary of the Symposium Organising Committee, Dr. R. Feinberg, Transformer Division, Ferranti Ltd., Hollinwood Avenue, Chadderton, Lancs.

AUTOMATIC WAREHOUSING CONFERENCE

In conjunction with the Automatic Control Group of the Institution of Mechanical Engineers, the Research and Development Panel of the United Kingdom Automation Council is organizing a one day Conference on Automatic Warehousing, which will be held in London at the Headquarters of the Institution of Mechanical Engineers on 28th October, 1965. Accommodation will be limited to 300 delegates. Inquiries: Secretary, Information and Publication Panel, U.K.A.C., c/o Institution of Production Engineers, 10 Chesterfield Street, Mayfair, London W.1.

WORLDWIDE AUTOMATIC CONTROL.

Announcements of future international Conferences

INTERNATIONAL SYMPOSIUM ON ECONOMICS OF AUTOMATIC DATA PROCESSING

The International Computation Centre, Rome, will organize this Symposium which is to be held in Rome from 19th to 22nd October, 1965. The main topics of the Symposium are as follows:

- Economical criteria in Automatic Data Processing (ADP)
- General Aspects of Measuring and Analysing Costs
- Managing an ADP Centre
- Implementation of Applications (Case Studies)
- Value, Savings and Profitability
- Lease or Purchase
- On line vs. Batch Processing
- Panel Discussion: ADP in banking
- Computers in Planning
- Panel Discussion: ADP in public utilities
- Teleprocessing and Remote Stations

Registration forms are available from

International Computation Centre
P.O. Box 10053
Rome, Italy.

4TH IMEKO CONGRESS, WARSAW, 1967

The General Committee of IMEKO held its 7th Session in Warsaw from 9th to 12th June, 1965. At this Session the Member Organisations of IMEKO from Bulgaria, China, Czechoslovakia, Eastern Germany, Western Germany, Hungary, Italy, Japan, Poland, Roumania, Sweden, United Kingdom, USA and USSR have ratified a new Constitution, according to which they reconstituted IMEKO into the

INTERNATIONAL MEASUREMENT CONFEDERATION.

The General Committee also accepted the application of the Egyptian Organization for Standardization representing measurement and instrument specialists in the United Arab Republic.

The most important immediate objective of the reconstituted Federation was to outline a structure and a scientific programme of the 4th IMEKO CONGRESS to be held in Warsaw in July 1967.

In addition to the fields covered at previous IMEKO Conferences (new methods of measurement including basic and derived standards; instrument design; manufacturing technology and economics), the 4th IMEKO Congress in 1967 is to appeal to a much

greater degree to those interested in the industrial applica-
tion of instruments. This is intended to bring to light new
solutions to the problems of applying instruments for measure-
ments in space, research and industry in difficult situations,
for example flow measurement of slurries or very viscous fluids;
temperature measurement in oxygen-blown steelmaking furnaces or
inside food cans being processed; measurements in conditions
of high or low temperature, in presence of dirty atmosphere or
high vibration or measurement of fast moving objects; new
sample-taking procedures to permit on-stream quality control.

Also may be included new procedures for on-stream automatic
inspection or testing of quality of a product (for example in
metallurgy, metal-working industries or manufacture) whether
it be an electronic component or not. Special attention might
be given to instrument applications in medical and biological
engineering and other areas.

FOURTH CONGRESS OF THE INTERNATIONAL FEDERATION OF
INFORMATION PROCESSING, LONDON, 1968

The fourth Congress of the International Federation of Informa-
tion Processing will be held in the United Kingdom during 1968.
With the agreement of the United Kingdom Automation Council,
the British Computer Society will organize this Conference,
assisted, it is hoped, by other member societies of the United
Kingdom Automation Council.

The first International Congress was held in Paris in 1959,
the second in Munich in 1962, and the third in New York during
May 1965.

Further information may be obtained from: - The Secretariat,
United Kingdom Automation Council, The Institution of Electri-
cal Engineers, Savoy Place, London, W.C. 2.

INTERKAMA 1965, DÜSSELDORF (GERMANY)

The International Congress with Exhibition for Measuring Tech-
niques and Automatic Control - INTERKAMA 1965 - is connected
with an Exhibition which has increased by more than 50 % with
respect to previous years and will require an area of 70,000
square meters.

The Congress will take place during all working days from the
13th to the 19th October, 1965 and will give - outside of the
following plenary LECTURES:

- "Automation and social structure" by S. B a l k e , München
- "Applications of the electronic prediction principle in
  controlled plants and instrument displays" by H. Z i e -
  b o l z , USA and Japan

- "Applications of computers in chemical techniques" by J.
  H e n g s t e n b e r g , Ludwigshafen
- "Analog, digital and hybrid techniques" by H. K r o c h -
  m a n n , Berlin
- "Basic considerations on the introduction of computing ele-
  ments in automatic systems" by G. S c h n e i d e r , Berlin
- "Progress with simple-means automation" by R. O e t k e r ,
  Erlangen

Fifteen DISCUSSION PAPER groups on the following topics:

1. Automation in power plants
2. Measuring techniques for human safeguard
3. Correlation methods in measuring and control techniques
4. Automation and remote control techniques in electric utili-
   lity networks
5. Recording and storing of measured values
6. Pneumatic digital techniques in measurement and control
7. Automatic measuring devices for the testing and checking
   field
8. Trace analysis
9. Electronic digital techniques in measurement and control.
10. Investigation of raw materials, intermediate and final
    products in industry
11. Automation in manufacturing
12. Application of new physical effects to the measurement of
    non-electric magnitudes
13. Plant protection
14. Vibration measurement techniques in manufacturing
15. Component operational reliability

Registrations and inquiries should be directed to:

NOWEA, D ü s s e l d o r f 10, Postfach 10 203.

Germany

SYMPOSIUM ON ENERGY ELECTRONICS
AND CONTROLLED ELECTRIC DRIVES

A Symposium on "Developments of Energy Electronics and Con-
trolled Electric Drives" organized jointly by the VDI/VDE-
Fachgruppe Regelungstechnik and the VDE-Fachgruppe Energie-
elektronik will be held in Aachen, Germany, from 21st to 24th
September, 1965. 34 papers will deal with controlled semicon-
ductors (thyristors), self-controlled converters, electronic
positioners, feed-back controllers for rectifiers, controlled
electric drives with static supplies - e.g. for rolling mills,
for the paper industry and for various transport installations -,
to numerical and programmed control, rotating-field machines
fed by converters, etc.

A detailed programme and registration forms may be obtained
from Verein Deutscher Ingenieure, Abt. Organisation, Postfach
16250, Düsseldorf 10.

PUBLICATIONS

(The classification indexes given hereafter are those of the International Bibliography of Automatic Control.)

PROCEEDINGS OF IFAC CONFERENCES

DIGITAL COMPUTER APPLICATION TO PROCESS CONTROL

edited by W.E. Miller. Proceedings of IFAC/IFIP 1st International Conference held in Stockholm, Sweden, under the sponsorship of IFAC and IFIP (The International Federation of Automatic Control / The International Federation for Information Processing). A publication of the Instrument Society of America. 540 pages, $ 17.50. Published 1965 by Plenum Press, 227 West 17th Street, New York, N.Y.

This volume contains 22 papers with complete conference discussions. The objective was to provide actual application experience on both technically and economically successful installations. By including various industry categories, experiences could be exchanged to provide a broader and more value-oriented base in planning for new installations.

Partial Contents: A review of closed loop control of an 8,500 BPD crude unit; operating experience with direct digital control; basic philosophy of computer control in the processing industry; computer control of an oxygen steelmaking process; using computers for management and process control: Survey; electric power station start-up and control; operation optimization in an electric power system; integrated electricity system operation; a process computer controls a gas pipeline network; experiences with an on-line computer in papermaking; application of a digital computer to the cement making process.

PEACEFUL USES OF AUTOMATION IN OUTER SPACE

edited by J.A. Aseltine. Proceedings of the IFAC Symposium on Automatic Control in Peaceful Uses of Space held at Stavanger, Norway, June 1965. A publication of the Instrument Society of America, 475 pages, $ 17.50. To be published towards the end of 1965 by Plenum Press, 227 West 17th Street, New York, N.Y.

The 40 invited and submitted papers present the newest concepts and equipment design on the following topics:

1. Injection into Space
2. Attitude Stabilization
3. Remote Control in Space Vehicles
4. Problem of Manned Systems
5. Ground Systems
6. Reports on Control of Space Systems
7. Advanced Components for Space Vehicle and Instrumentation Control Problems

8. Digital and Analog Computers as Used in Automatic Control Systems in Space Vehicles or Ground Stations
9. Future Control Problems.

All papers, including discussions, appear in English and reflect current advances in Belgium, Denmark, France, Germany, Japan, UK, USA and USSR.

SYSTEMS ENGINEERING FOR CONTROL SYSTEM DESIGN

Proceedings of the IFAC Tokyo Symposium on "Systems Engineering for Control System Design" will be published early in 1966 by the IFAC Tokyo Symposium Committee.

The reduced post-paid price 4,700 yen (approx. $ 13.10) will be in effect for early orders received by November 30th, 1965. After this date the price of the Proceedings will be 5,500 yen (approx. $ 15.30).

Order forms (as attached to this Bulletin) are available at the IFAC Tokyo Symposium Committee, Tokyo Central P.O.Box 1057, Tokyo, Japan.

France

1.1.2.0. J.A. Aseltine: Les méthodes de transformation dans l'analyse des systèmes linéaires (TRANSFORM METHODS IN LINEAR SYSTEMS ANALYSIS), Paris, Dunod, 1964, 346 p., 262 illus., 69 F

1.1.6.0. J. Beneš: Dynamique statistique des circuits de régulation (STATISTICAL DYNAMICS OF CONTROL CIRCUITS), Paris, Dunod, 1964, 372 p., 164 illus., 76 F

1.1.6.1. G.M. Russel: Modulation et codage dans les systèmes automatiques (MODULATION AND CODING IN AUTOMATIC SYSTEMS), Paris, Dunod, 1964, 266 p., 129 illus., 54 F

2.3.2.6. R.E. Bellman, S.E. Dreyfus: La Programmation dynamique et ses applications (DYNAMIC PROGRAMMING AND ITS APPLICATIONS), Paris, Dunod, 1965, 408 p., 97 illus., 68 F

2.4.1.1. P. Naslin: Circuits logiques et automatismes à séquences (LOGIC CIRCUITS AND SEQUENTIAL AUTOMATA), Paris, Dunod, 1965, 494 p., 540 illus., 96 F

2.5.5.5. P. Lefèvre: Optimalisation statistique des systèmes dynamiques (STATISTICAL OPTIMIZATION OF DYNAMIC SYSTEMS), Paris, Dunod, 1965, 228 p., 90 illus., 48 F

2.5.5.5. (CONTINUED) A.Ia. Lerner: Commandes optimales (OPTIMAL CONTROL), Paris, Dunod, 1965, 114 p., 67 illus., 24 F

Germany

New German Draft Standards

DIN 4o7oo, Sheet 18, Draft June 1965. "SYMBOLS, ANALOG COMPU-
TER TECHNIQUE AND AUTOMATIC CONTROL".

DIN 19227, Draft May 1965. "GRAPHICAL AND LETTER SYMBOLS FOR
MEASUREMENT, CONTROL AND REGULATION IN CHEMICAL ENGINEERING"

Both drafts are submitted to the public for comments. They
may be obtained from:

Beuth-Vertrieb, Berlin 15, Uhlandstr. 175

1.1.6.o Layos T a k a c s: Stochastische Prozesse (STOCH-
ASTIC PROCESSES), München, R. Oldenbourg Verlag, 1965, 150 p.,
25 DM

1.1.7. H. F r e u d e n t h a l: Einführung in die Sprache
der Logik (INTRODUCTION TO THE LOGIC LANGUAGE), München, R.
Oldenbourg Verlag, 1965, 1o6 p., 6 illus., 14,5o DM

1.1.7. W. Wesley P e t e r s o n: Prüfbare und korrigier-
bare Codes (TESTABLE AND CORRIGIBLE CODES), München, R. Olden-
bourg Verlag, 1965, 320 p., 67 illus., 5o DM

2.o. F. P i w i n g e r: Regelungstechnik für Praktiker.
Elementare Einführung in die Prozessregelung (AUTOMATIC CON-
TROL THEORY FOR PRACTICIANS. ELEMENTARY INTRODUCTION TO PRO-
CESS CONTROL), Düsseldorf, VDI-Verlag, 1965, 132 p., 1o4
illus., 19,8o DM

4.o.1.2. A. H a i d e k k e r, H. S c h w a r z: Transi-
storen und Halbleiterdioden zur Automatisierung in Maschinen-
bau und Fertigungstechnik (TRANSISTORS AND SEMI-CONDUCTOR
DIODES FOR AUTOMATION IN MACHINE-BUILDING AND MANUFACTURING
TECHNIQUES), Hamburg, R. von Decker's Verlag, 1964, 98 p.,
49 illus., 8,8o DM

4.o.5.2. K.L. P e d e l l: Elektronische Informationsverar-
beitung und Fertigungssteuerung (ELECTRONIC AUTOMATIC DATA
PROCESSING AND MANUFACTURING CONTROL), München, R. Oldenbourg
Verlag, 1965, 150 p., 44 illus., DM 25

United Kingdom

Books

2.o. G.M. U l a n o v: EXCITATION CONTROL, Oxford, Per-
gamon Press, 1964, 98p., 3o s.

2.5.5. J. F o r m b y: AN INTRODUCTION TO THE MATHEMATI-
CAL FORMULATION OF SELF-ORGANIZING SYSTEMS. London, Spon, 1965,
200 p., 35 s.

4.o.5.o. B.A. M a y n a r d, Editor. MANUAL OF COMPUTER SY-
STEMS. Volume 4, London, Gee, 1965, 206 p., Price of the set
of 4 volumes: £ 48.12.o.

4.o.5.1. K.A. K e y: ANALOGUE COMPUTING FOR BEGINNERS. Lon-
don, Chapman & Hall, 1965, 164 p., 25 s.

4.4.1.o. D.E. P o l o n n i k o v: SERVO-AMPLIFIERS. London,
Temple Press Books, 1965, 351 p., 80 s.

4.7.6.2. A.A. B u l g a k o v: ENERGETIC PROCESSES IN FOLLOW-
UP ELECTRICAL SYSTEMS. Oxford, Pergamon Press, 1965, 126 p., 4o s.

5.6.4.2. J.B. A i t k e n: AUTOMATIC WEAVING. Manchester and
London, Columbine Press, 1964, 150 p., 3o s.

6.2. Sir L. B a g r i t: THE AGE OF AUTOMATION (The B.B.C.
Reith Lectures 1964). London, Weidenfeld & Nicolsen, 1965,
86 p., 15 s.

List of UKAC Publications

The following publications of the United Kingdom Automation
Council are obtainable from the Institution of Production
Engineers, 1o Chesterfield Street, London W. 1, unless other-
wise stated.

A u t o m a t i o n C o u n c i l N e w s
A news sheet published at approximately monthly intervals at
1o s. per annum.

B C A C R e c o r d 1 9 6 1 - 1 9 6 2
(the first issue of the Record (published under the UKAC's
former name, the British Conference on Automation and Compu-
tation), contains the history of the BCAC, the first and se-
cond Annual Lectures:

- "Mathematics - Friend or Foe?" by D.G. C h r i s t o -
p h e r s o n

- "Automation - The Next Phase: Can Managers be Automated?"
by D.V. B o w d e n

together with other items. A few remain available from the
Honorary Secretary, UKAC, c/o IEE, Savoy Place, London W.C. 2,
price 3s.10d, post free.

U K A C R e c o r d N o. 1
contains the Third Annual Lecture "Computers and Management"
by Sir Edward P l a y f a i r, and the Report and Accounts
for 1962-63. Price 5s.6d, post free.

U K A C R e c o r d N o. 2
contains the Proceedings of the UKAC Conference on Education
and Training for Automation and Computation held at Cranfield
in March 1965. This is obtainable from the Institution of Me-
chanical Engineers, 1 Birdcage Walk, Westminster, London S.W. 1,
price 1os, post free.

U K A C R e c o r d N o . 3
contains the Fourth Annual Lecture "The Future of Automation
in the Iron and Steel Industry" by W.F. C a r t w r i g h t,
and the Report and Accounts for 1963-1964, price 5 s, post free.

U K A C R e c o r d N o . 4
paper by B. S c o t t entitled "Education and Training Needs
for Progress in Automation and Technology"

U K A C R e c o r d N o . 5
report prepared by G.E. C a r t e r on an "Investigation
Concerning Technicians Associated with Automated Processes".

Magazine

A new magazine called "E l e c t r o n i c L e t t e r s"
has been started by the Institution of Electrical Engineers,
Savoy Place, London W.C. 2. The aim of the Electronics Letters
is to publish in the shortest possible time contributions on
the newest developments in the fields of electronic science
and engineering, radio and automatic control. The published
letters are not more than 1,200 words long. Thus very quick
and short information may be given on the latest developments.

USA

2.0. C.T. L e o n d e s, Editor: MODERN CONTROL SYSTEMS
THEORY. New York, McGraw-Hill, 1965, 448 p., $ 16

2.0. PREPRINTS OF THE 1965 6TH JOINT AUTOMATIC CONTROL
CONFERENCE. New York, American Society of Mechanical Engineers,
1965, 875 p.

2.5.5. N.J. N i l s s o n: LEARNING MACHINES: FOUNDATIONS
OF TRAINABLE PATTERN-CLASSIFYING SYSTEMS. New York, McGraw-Hill,
1965, 200 p., $ 10

4.0.5.0. ADVANCES IN COMPUTERS. Volume 5. New York, Academic
Press, 1964, 397 p., $ 14

4.0.5.2. CONFERENCE PROCEEDINGS OF THE AMERICAN FEDERATION OF
INFORMATION PROCESSING SOCIETIES. Volume 24: Fall Joint Compu-
ter Conference 1963. Baltimore, Spartan Books, 1964, 647 p.,
$ 18

4.0.5.2. CONFERENCE PROCEEDINGS OF THE AMERICAN FEDERATION
OF INFORMATION PROCESSING SOCIETIES. Volume 25: Spring Joint
Computer Conference 1965, Baltimore, Spartan Books, 1965,
629 p., $ 18

4.0.5.2. W.E. M i l l e r, Editor: DIGITAL COMPUTER APPLI-
CATIONS TO PROCESS CONTROL (Proceedings of the First IFAC/IFIP
International Conference, Stockholm, 1964). Philadelphia, In-
strument Society of America, 1965, 540 p., $ 17,50

4.0.5.2. S.C. P l u m b: INTRODUCTION TO FORTRAN: A PROGRAM
FOR SELF INSTRUCTION. New York, McGraw-Hill, 1964, 203 p., $ 6