Special Conference Report

1965 Joint Automatic Control Conference

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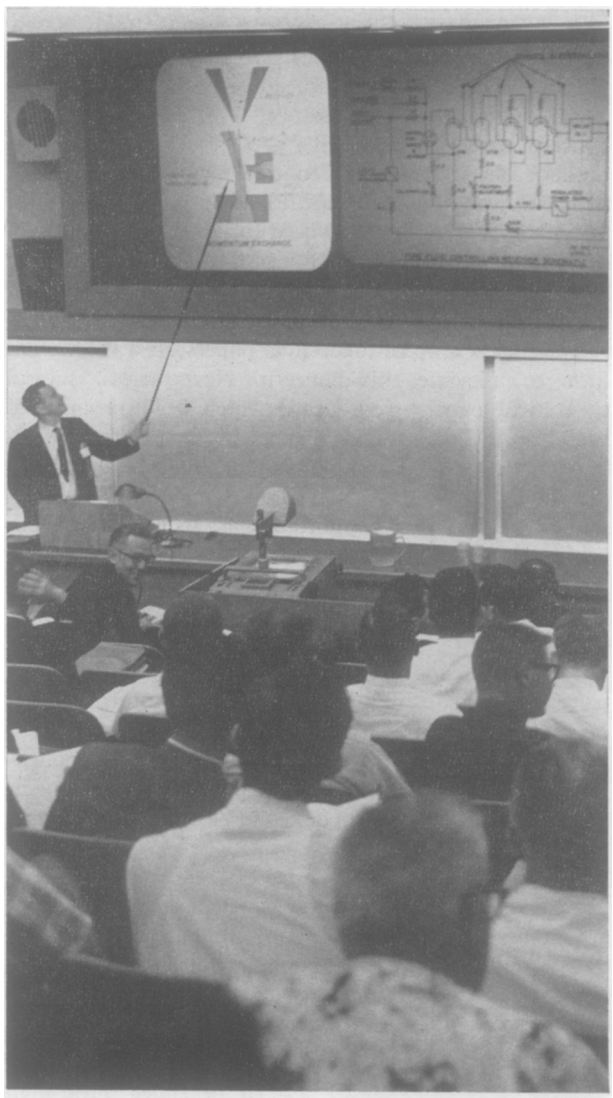
Diversity in the technical program characterized the sixth annual Joint Automatic Control Conference, held in June of this year on the campus of the Rensselaer Polytechnic Institute. This conference is jointly sponsored by the American Institute of Aeronautics and Astronautics, the American Institute of Chemical Engineers, the Instrument Society of America, the American Society of Mechanical Engineers, and the IEEE. It was founded to bring together, once each year, reports on the latest developments in automatic control theory, applications, and components. This year's conference, conducted by ASME, attracted some 700 attendees from the five sponsoring societies.

In past years, the technical program for the Joint Automatic Control Conference has been composed largely of contributed papers, and a disproportionate share of these contributed papers have been theoretical. A large part of these theoretical papers came from the universities. This year the conference steering committee, under its chairman, Prof. Sidney Lees of Dartmouth, achieved a wider coverage of the more practical aspects of control engineering by inviting specific authors to present papers on applications and components. About a fourth of the total 120 papers heard at the conference were so invited. Approximately half of this year's papers were from universities and about half from industrial firms. Only a few came from private or government research establishments.

At the plenary session the conference attendees were treated to an unusual duo of speakers: Leonard Woodcock, vice president of the United Automobile Workers, and J. Herbert Hollomon, Assistant Secretary of Commerce for Science and Technology, presented complementary viewpoints on the sociological



View of one session of the 1965 JACC. The speaker is B. G. Bjornsen of the Johnson Service Company, Milwaukee, Wis.

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impact of automatic control. The conferees were urged to become more aware of the potential social effects of their technological creations and to start to use the techniques of modern "systems engineering" on some of the great social problems of our time. The audience responded vigorously to these challenges, showing that some engineers present had already given considerable thought to the social and economic effects of automation along the lines suggested by the speakers. It was clear from this session that a great opportunity exists for the control engineer to become involved in such problems, provided he can initiate proposals for specific work to the appropriate agency.

Theory

Approximately half of the 25 technical sessions consisted of papers dealing with theory. Optimal control seemed to be the most frequently treated theoretical subject; this was also true at the 1964 JACC. The identification and estimation problem also received substantial coverage. Papers on nonlinear controls, stability, sampled data systems, and time variable systems, in about equal proportion, rounded out the theoretical portion of the conference.

One significant aspect of any given paper on control theory is its influence on the development of practical techniques of control system engineering. Only a few papers dealing with theory from past JACC meetings have proved to be of significance in this sense. Many JACC attendees during the past few years have voiced concern over the apparent "gap" that exists between modern developments in control theory and methods which engineers actually use to design control systems. There appears to be a real need for more work that will bolster the scientific reputation of modern control theory —that is, some demonstrations of correlations between hypothesis and experimental observation.

This year's crop of theoretical papers, as a whole, did little to alleviate this concern. Nevertheless, several theoretical papers were heard which hold promise of useful engineering results. Papers by Brockett and Willems, for example, presented readable interpretations and extensions of the celebrated "Popov method" for determining stability in an important class of nonlinear feedback systems. This information was presented in a form which engineers can readily apply to real problems.

Applications

The nine sessions on applications covered a wide spectrum of technical subjects. These included tutorial papers on reliability analysis and computer programming languages and a series of state-of-the-art papers on applications in the machine tool, chemical processing, biomedical, transportation, aerospace, and electric power industries.

Perhaps the liveliest exchange of ideas in the application sessions occurred in the panel discussion on programming languages for control computers. From this discussion it appeared that communication between man and computer poses some problems which cannot be met by new technological advances in the computers themselves. For example, the turnover rate in programming personnel was cited as a contributing factor to the expense and delay encountered in getting a control computer installation into service. Another problem, in connection with the sharing of programs, arises because the program itself discloses proprietary information about the process controlled. However, the general impression was that computer control of manufacturing processes has already gained a permanent place in industry and that improvements in programming will promote a continued growth of such applications.

The papers dealing with applications of control theory in the manufacturing and utility industries showed the remarkable economic impact of automatic control upon those industries. In these reports the role of computers was prominent in both simulation studies of processes and in on-line control and optimization. It was also shown that the availability of automatic control techniques has changed many manufacturing processes to the extent that manual control of these processes is now impossible. Automatic control techniques for the integrated control of whole business systems, including inventory control, order processing, warehousing, and transportation, as well as the basic manufacturing functions, were brought to the attention of the conferees.

An informative paper by Coulter and Updike surveyed applications in the biomedical field and gave an extensive bibliography. The authors showed that control theory and data processing are being widely used in basic physiological studies and in medical treatment. Cited as an area of great theoretical need is improved methods of mathematical modeling for most biological processes.

Components

Three technical sessions were devoted to components. These sessions seemed to be intended as state-of-the-art reports rather than as forums for reporting new research results or product developments. As such they were very useful to nonspecialists or to theoreticians whose daily activities do not afford them an opportunity to keep abreast of emerging hardware developments.

The current state of solid-state devices used in control systems was surveyed. A brief paper by Thurston outlined the advantages that integrated circuits offer to control system designers, and also pointed out some of the technical problems involved in their manufacture. Other papers treated various solid-state power control circuits.

A session on fluid components and systems provided the conference with a status report on this newly developing field. The analysis and design of fluid components was shown to be more analogous to that of electronic devices than to conventional fluid power mechanisms. Several applications of signal processing devices and digital computer elements were described; these descriptions strengthened the impression that the new devices might be thought of as replacements for electronic circuits in some applications. However, the physical differences between fluid devices and their electronic counterparts are so pronounced that the potential competition between the two in applications is more apparent than real.

Preprint volume

A volume of preprints entitled "1965 Joint Automatic Control Conference Preprints of Papers," is available at $25.00. Direct your purchase order to: William H. Larkin, American Society of Mechanical Engineers, United Engineering Center, 345 E. 47 Street, New York, N. Y. 10017.