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Symposium on Modern Network Synthesis (Audio to Microwaves): held in New York City, April 16-18, 1952
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SYMPOSIUM OF
MODERN NETWORK SYNTHESIS
(AUDIO TO MICROWAVES)

HELD IN NEW YORK CITY, APRIL 16-18, 1952

S. G. JONES

ON LOAN
from
National Research Council
Radio & E.E. Division
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OTTAWA
MAY 1952

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SYMPOSIUM OF MODERN NETWORK SYNTHESIS

(Audio to Microwaves)

Introduction

Modern Network Synthesis (Audio to Microwaves) was the subject of a symposium held April 16-18, 1952, at the Engineering Societies Auditorium (33 West 39th Street) in New York City. This symposium, was jointly sponsored by the Polytechnic Institute of Brooklyn and the Office of Naval Research. Its object was to summarize progress to date in the various fields of network synthesis, and to highlight new developments of current interest. The writer was instructed to attend this symposium in company with Mr. C. W. McLeish, but Mr. McLeish was unable to make the trip.

Social Functions

A Cocktail Party and Buffet Dinner was held on the evening of April 17th, 1952, at the Hotel Governor Clinton. This pleasantly informal affair provided an excellent opportunity to meet many of the workers in the field, including several of the pioneers and leaders in the art, and to renew old acquaintances.

Lecture Program

The lectures were arranged by the program committee according to the following plan. Basic methodology and mathematical background were presented at the morning sessions, with design applications stressed in the afternoon. The first day was devoted to techniques for synthesizing physical networks from prescribed response functions. On the second day, methods for approximating a desired response by realizable network functions were presented. The third day's papers emphasized techniques used in dealing with distributed parameters and microwave networks. Each session saw a different prominent personality in the chair, and was completed with the smoothness that may be expected from a well organized program.

No attempt will be made in these notes to summarize the contents of the papers, since all the papers are to be published by September, 1952, in the Proceedings of the Symposium, (a copy of which has been ordered.) The manner in which the papers were presented made it virtually impossible to take detailed notes. In general, the lectures were given in a darkened auditorium with the aid of slides. It is thought, however, that a detailed tabulation of the program, together with comments, if any, which occur to the writer, may be useful, since anyone interested in the topics dealt with at the symposium could thus take note of the existence of these papers, and refer to them when the Proceedings are published.

P R O G R A M

Wednesday, April 16/52.

(a) Preliminaries

(b) Lectures:

1. Topological and Algebraic Considerations in Network Synthesis - R. M. Foster, Polytechnic Institute of Brooklyn.

A concise review of what has been done to date, using as tools topology and algebra, and statement of some of the problems still outstanding.

2. Application of Complex Function Theory to Network Synthesis - R. L. Dietzold, Bell Telephone Laboratories.

This review of the analytic approach to the synthesis problem, which has, in recent years, become a very useful tool, especially in the approximation phase, completes the picture of methods in use to date.

3. Synthesis of Driving Point Impedances - A. B. Giordano, Polytechnic Institute of Brooklyn.

An exposition of the methods of Brune, Gewertz and Bott and Duffin for the synthesis of driving point impedance functions.

4. Synthesis of Four Poles - A. van der Weg, Phillips (Eindhoven).

A report by Dr. van der Weg on the work of B. D. H. Tellegen of Eindhoven on the synthesis of passive resistanceless four-poles incorporating the "ideal Gyrator" as an element.

5. R-C Network Synthesis - A. D. Fialkow, Polytechnic Institute of Brooklyn.

A very well presented paper on the synthesis of two terminal-pair networks composed of resistances and capacitors, only, as elements. The necessary and sufficient conditions for realization are given, together with criteria for maximum gain networks.

6. Synthesis of N-Terminal Pair Networks - M. Bayard, Ministère des postes Telegraphes et Telephones, Paris, France.

Thursday, April 17, 1952.

7. Rational Fraction Approximations for Network Functions -
E. A. Guillemin, M. I. T.

This paper dealt with approximations in rational fractions for functions arrived at by Laplace transform analysis, and in particular, the selection of the best approximation in both frequency and time domains.

8. Application of Tchebycheff Polynomials to Network Synthesis -
S. Darlington, Bell Telephone Laboratories.

This paper deals with the use of conformal transformation, and expansions in series of Tchebycheff polynomials in the synthesis of filter networks.

9. Application of Electrolytic Tank Techniques to Network Synthesis
E. C. Cherry, London University, England.

Professor Cherry gave an interesting historical background to the use of the electrolytic tank, and described some of the tanks which have been used, methods of increasing accuracy, and ways in which they have been used to obtain amplitude and phase response for a given pole and zero configuration, to obtain the roots of polynomials, and other applications to network synthesis.

10. Broadband Reflectionless Matching with Minimum Insertion Loss
H. J. Carlin, Microwave Research Institute, Polytechnic
Institute of Brooklyn.

A method is described for matching a prescribed impedance load to a generator over a wide frequency range with maximum power transfer. Lossy structures are used in the matching network.

11. Application of Conformal Mapping to the Synthesis of Bandpass Networks - D. L. Trautman, Jr., UCLA.

A brief review of the Potential Analogy method, was given, followed by a description of how bandpass networks may be synthesized by setting up the corresponding low-pass p-plane configuration, and transforming by use of conformal transformations and mapping to give the bandpass configuration desired.

12. Broadband Interstage Design - W. A. Lynch, Polytechnic Institute of Brooklyn.

The background of the "Maximally Flat" and the "Linear Phase" types of cascade amplifier response was set forth, leading to the general "derivative corrections" methods of interstage design.

13. Distributed Amplifier Theory - J. M. Petit and D. O. Pederson, Stanford University.

This paper traced the development of Distributed Amplifiers to date, and outlined some of the problems which still remain to be solved, and how they are being attacked at Stanford.

Friday, April 18, 1952

14. Network Formulation of Field Problems - N. Marcuvitz, Polytechnic Institute of Brooklyn.

An outline of what has been accomplished to date, and some of the problems to be faced.

15. Equivalent circuit representation of Microwave structures - A. A. Oliner, Microwave Research Institute, Polytechnic Institute of Brooklyn.

This paper showed that a multiplicity of equivalent circuits for a given microwave structure exist, but a few are preferred because of frequency insensitivity or other reasons. Examples were given for the Thick Iris, and Thick E-plane Radiating Slot.

16. Scattering Matrix Formulation of Microwave Networks - A.E. Laemmel, Microwave Research Institute, Polytechnic Institute of Brooklyn.

An outline of the scattering matrix methods was given, and a comparison with the impedance matrix was made.

17. Geometric Viewpoint in Scattering Representation of Microwave Structures - G. A. Deschamps, Federal Telecommunications Labs.

18. Design of Microwave Filters - J. R. Whinnery, Hughes Aircraft Co.

This paper was, in the main, a review of the various types of filters which have been developed to date. At present, most synthesis is done on the lumped-element basis, and approximated with microwave elements.

19. Bi-conjugate Transmission Line Networks - H. T. Budenbom,
Bell Telephone Laboratories.

This paper reviewed biconjugate networks, with special reference to the Hybrid Ring.

20. Microwave Broadbanding Principles - J. W. E. Griensmann,
Microwave Research Institute, Polytechnic Institute of Brooklyn.

Considerations in the design of co-axial connectors covering the entire band from radio frequencies to three centimeters.

The Polytechnic Institute of Brooklyn hopes to conduct annual symposiums in this and related fields. It was suggested that next year it might be worthwhile to consider the demands for networks in the light of advances which have been made in recent years in the field of Information Theory.