

X. ANALOG COMPUTER RESEARCH

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A. THE OPERATION OF PRESENT COMPUTERS

1. The Macnee Differential Analyzer

The machine has been exhibited to a number of visitors, and a manual of operating and calibrating procedures is under preparation. In order to handle the problem of a blocking oscillator four new feedback amplifiers with a fixed gain of minus one have been built for use as sign changers.

R. Woods, A. MacMullen

2. The Scott Impedance Function Analyzer

The graphical procedures of P. Profos (A New Method for the Treatment of Regulation Problems, Sulzer Technical Review, No. 2, 1945) are being extended to the approximation problem of network synthesis. These procedures are based on the potential analog method, and the results will be checked on the impedance function analyzer.

R. Mathews

B. THE DESIGN OF NEW COMPUTING ELEMENTS

1. Integral Equation Computer

The electrical and mechanical construction of the machine described in the Quarterly Progress Reports of January 15 and April 15, 1951 is progressing favorably. The completed equipment will consist of one 62-inch \times 20-inch rack of computing components, a portable keyboard tape punch and one 42-inch \times 20-inch rack of power supplies which are equipped with a standard cell-chopper calibrator.

It is anticipated that test results from the equipment will be available at the end of the forthcoming quarterly period.

J. M. Ham, S. Fine

2. The Square-Law Multiplier

An investigation has been conducted on the possibility of using Raytheon mask-type square-law tubes (QK256) in an analog multiplier. The completed multiplier consists of two balanced modulators feeding a single QK256 tube. With suitable filters a product term is obtained in the output. Because of the interest in high-speed analog multipliers a complete account of this investigation will be given in a technical report.

G. Fedde

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3. Function Generator

The frequency response of the mosaic of the RCA 5527 image orthicon tube has been measured for a variety of conditions of mosaic illumination and electron beam modulation. The design and construction of an optical system for projecting function masks from 35 mm film onto the mosaic has been completed. The evaluation of the design of the amplifier, compensating network and rectifier system forming the feedback loop from the mosaic to the vertical deflection plates is being pursued.

O. Becker

4. Analog-Digital Conversion Device

The preliminary design and construction of a double-comparison conversion device using modified Multiar comparators has been completed. Test results on the unit and circuit details will be available at the end of the forthcoming quarterly period.

C. O'Donnell

5. High-Speed Commutator

The counter-string has been completed and work on the gated oscillators is being carried on.

P. Cooper

6. An Analog Computer for Solving Linear Simultaneous Equations

A breadboard model of an analog computer for solving a 5×5 set of linear simultaneous equations was constructed. The equations were solved by setting up five simultaneous first-order differential equations which had a steady-state solution equal to the required algebraic solution. Direct current integrators were used and the coefficients were introduced by means of calibrated plug-in resistors. For most equations the accuracy of the results is limited only by the number of times the operator is willing to recycle. For matrices of the order of 100×100 the cost of hand computation is so high that a computer of this type could pay for itself by solving two or three problems, and at the same time the accuracy would be infinitely superior to that attainable on the best desk calculators.

G. Collins