International Business Machines Corporation.—A Seminar on Scientific Computation was held at Endicott, New York, Nov. 16–18, 1949 by the International Business Machines Corporation. The program for the seminar was as follows:

Wednesday Morning, November 16, LEON BRILLOUIN, IBM, Chairman

"The dynamics of nuclear fission" by DAVID L. HILL, Vanderbilt University.

"Monte Carlo calculations" by WILLIAM WOODBURY, Northrop Aviation Co.

"Modifications of the Monte Carlo Method" by HERMAN KAHN, The RAND Corporation.

Wednesday Afternoon, November 16, FRANK HOYT, Argonne National Laboratory, Chairman

"Analyzing exponential decay curves" by ALSTON HOUSEHOLDER, Oak Ridge National Laboratory.

"Eigenvalue problems related to the diffusion equation" by DONALD A. FLANDERS, Argonne National Laboratory and GEORGE SHORTLEY, Operations Research Office, Department of the Army, Johns Hopkins University.

Demonstration of the IBM Card-Programmed Electronic Calculator.

Thursday Morning, November 17, VERNER SCHOMAKER, California Institute of Technology, Chairman.

"Stochastic methods in statistical and quantum mechanics" by GILBERT KING, A. D. Little Company.

"Calculations of resonance energies" by GEORGE KIMBALL, Columbia University.

"Cam design calculations on the card-programmed electronic calculator" by E. A. BARBER, IBM.

Thursday Afternoon, November 17, ARTHUR ROSE, Pennsylvania State College, Chairman

"Distillation theory" by JOHN BOWMAN, Mellon Institute for Industrial Research.

"Calculation of multiple component systems" by STUART R. BRINKLEY, U. S. Bureau of Mines.

Friday Morning, November 18, A. H. TAUB, University of Illinois, Chairman

"The parabolic equation" by L. H. THOMAS, Watson Laboratory.

"Solutions of the wave equation" by PAUL HERGET, Director, Cincinnati Observatory.

"Sampling methods applied to differential equations" by JOHN CURTISS, National Applied Mathematics Laboratories, National Bureau of Standards.

Friday Afternoon, November 18, W. J. ECKERT, Watson Laboratory, Chairman

"On the distribution of KOLMOGOROV's statistic for finite sample size" by Z. W. BIRNBAUM, University of Washington.

"Specialized matrix calculations on the card-programmed electronic calculator" by H. R. J. GROSCH, Watson Laboratory.

Swedish State Board of Computing Machinery. BARK, the Swedish relay machine [*MTAC*, v. 4, p. 52–53] built in Stockholm by C. C. R. A. PALM and collaborators under the Swedish State Board of Computing Machinery is now completed and under trial running. A description of the machine will be given in a future issue of *MTAC*. The mechanical differential analyzer, built in Gothenburg by S. EKELÖF [*MTAC*, v. 3, p. 328] and collaborators has also been completed. Preliminary planning for an electronic computing device is going on under the direction of Ekelöf and Palm.

OTHER AIDS TO COMPUTATION

BIBLIOGRAPHY Z–XI

17. A. E. CARTER & D. H. SADLER, "The application of the National Accounting Machine to the solution of first-order differential equations," *Quart. Jn. Mech. Appl. Math.*, v. 1, 1948, p. 433–441. [*MTAC*, v. 3, p. 548.]

Details are given of the solution on the National machine of the first-order differential equation $y' = f(x, y)$ by the MILNE-STEFFENSEN method.

The formula used is $y_n - y_{n-4} = (3g + 2\delta^2 g + \frac{7}{30}\delta^4 g)_{n-2}$, where $g(x, y) = \frac{4}{3}hf(x, y)$.

The machine is used to build up $(3g + 2\delta^2 g)_{n-2}$ from initial values and $\delta^4 g$ up to $\delta^4 g_{n-3}$, to build up an approximate y_n from y_{n-4}, $(3g + 2\delta^2 g)_{n-2}$, and and extrapolated $\frac{7}{30}\delta^4 g_{n-2}$, and to difference the approximate g_n to $\delta^4 g_{n-2}$. The operator has to provide the extrapolated $\frac{7}{30}\delta^4 g_{n-2}$, to obtain the approximate g_n, and to correct y_n and $\delta^4 g_{n-2}$ by successive approximation. He must further enter these values in the machine at the appropriate times.

The machine prints on a line, n, y_n(approx.), g_{n-1}, g_n(approx.), $\delta^4 g_{n-2}$ (approx.), $\delta^4 g_{n-2}$, $\delta^3 g_{n-3/2}$, $\delta^2 g_{n-1}$, $\delta g_{n-1/2}$, y_{n-3}, and $\frac{7}{30}\delta^4 g_{n-1}$(extrapolated). The second and last of these are corrected by hand.

The next correction term of the series, $-\frac{2}{315}\delta^6 g$, can be applied to y by hand if necessary.

Anyone who wishes to use the Milne-Steffensen method should be warned that it introduces logarithmic rates of increase of error in the series of y_n additional to that, $h\, \partial f/\partial y$, inherent in the differential equation. In this case, the additional logarithmic rates are $\pm \frac{\pi}{2} i + \frac{h}{45}\frac{\partial f}{\partial y}$ and $\pi i - \frac{19}{45} h \frac{\partial f}{\partial y}$. Thus, it may be unwise to use the method to integrate in the direction for which $\partial f/\partial y$ is negative.

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18. A. C. COOK & F. J. MAGINNISS, "More differential analyzer applications," *Gen. Elec. Rev.*, v. 52, no. 8, 1949, p. 14–20.

This article lists a variety of engineering applications of the G.E. differential analyzer, which has been described in articles by PETERSON & KUEHNI[1] and by PETERSON & CONCORDIA.[2] The applications include electron ballistics, long distance power transmission, bearing design, frequency changers, guided missiles, and control problems. These applications extend those given in a previous paper by MAGINNISS.[3]

F. J. M.

[1] H. A. PETERSON & H. P. KUEHNI, "A new differential analyzer," A.I.E.E. *Trans.*, v. 63, 1944, p. 221–228. [*MTAC*, v. 1, p. 430–431.]
[2] H. A. PETERSON & C. CONCORDIA, "Analyzers for use in engineering and scientific problems," *Gen. Elec. Rev.*, v. 48, no. 9, 1945, p. 29–37. [*MTAC*, v. 2, p. 55.]
[3] F. J. MAGINNISS, "Differential analyzer applications," *Gen. Elec. Rev.*, v. 48, no. 5, 1945, p. 54–59. [*MTAC*, v. 1, p. 452–454.]

19. A. B. MACNEE, "A High Speed Electronic Differential Analyzer, I.R.E. *Proc.*, v. 37, 1948, p. 1315–1324.

A differential analyzer is described which reproduces its solutions sixty times a second, thus permitting the results to be exhibited on a cathode ray tube. Resetting is accomplished by clamping circuits. Addition and integration are performed in the usual fashion (involving feedback amplifiers). The multiplier uses a cathode ray tube. An electron beam is bent by electrostatic and magnetic methods to yield an effect proportional to the product of two quantities. The resultant deflection is cancelled by a feedback controlled electrostatic deflection, which measures the product. When the feedback is applied to a factor, division is obtained. An arbitrary function is introduced into the machine by a mask on the face of a cathode ray tube. A feedback arrangement causes the beam to follow the edge of the mask.

An error analysis for differential equations with constant coefficients is also given. The results of applying this differential analyzer to a variety of problems are given including end point boundary problems and the equations of MATHIEU, HILL and VAN DER POL.

F. J. M.

20. J. C. JAEGER & J. D. CLARKE, "A Product Integraph," *Jn. Sci. Instr.*, v. 26, 1949, p. 155–156.

By using mechanical components obtained from surplus anti-aircraft predictors, the authors have built an instrument intermediate in accuracy and cost between Meccano constructions and the well-known large differential analyzers. Two ball-and-disk integrators permit the evaluation of the indefinite integral,

$$\int_0^x f(x)g(x)dx.$$

The input curves $f(x)$ and $g(x)$ are followed manually; the machine is motor-driven in the x direction.

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21. L. PEREK, "Nomograms for computing galactic longitude and latitude, galactic rectangular coordinates and components of the space velocity," Brno, Masarykova Univ., Prirodovĕckâ Fakuta, *Spisy*, no. 299, 1947.

The first two nomograms constructed for finding the galactic longitude and latitude of a star are at present of little practical importance, since detailed tables for the conversion of right ascension and declination to galactic longitude and latitude have already been published.[1]

The second set of seven nomographic charts is designed for the calculation of the rectangular components x, y, z of space velocities. The coordinate system is so oriented that the z axis points to the galactic North Pole (RA 12^h40^m, decl. $+28°$), the x axis toward the center of the Galaxy (galact. long. 327°). The data from which the velocity components are derived are the proper motion components μ_α, μ_δ, the parallax π (or distance r), the radial velocity V, the right ascension α and declination δ of the star. The nomographic solution of this problem is quite accurate enough, as space velocities of stars can generally not be determined with an accuracy greater than 1%. The procedure, however, is by no means simple; it requires eleven nomogram readings of which seven are double constructions. So long as extensive tables are not available these nomograms may, nevertheless, serve a useful purpose.

Three of the charts made for the calculation of velocity components serve also to obtain the rectangular space coordinates of a star (in the same system) from the right ascension, declination, and distance.

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[1] J. OHLSSON, "Tables for the conversion of equatorial coordinates into galactic coordinates," Lund Observatory, *Annals*, v. 3, 1932.

22. ROBERT M. WALKER, "An analogue computer for the solution of linear simultaneous equations," I.R.E., *Proc.*, v. 37, 1949, p. 1467–1473, figs.

Linear simultaneous equations occur frequently in science and in engineering. Their solution by numerical methods is straightforward, but the amount of work required increases rapidly with the number of unknowns. A device is described for the solution of systems of linear simultaneous equations with not more than twelve unknowns. It is an electrical analogue computer which accepts the problem information in digital form from a set of punched cards. This facilitates the preparation, checking, and insertion of the input data and greatly reduces some of the usual liabilities of an analogue device. No special preparation of the problem is required, other than a simple one of scaling the coefficients. Solutions of well-determined problems are easily and rapidly attained and may be refined to any desired accuracy by a simple iteration procedure.

Author's summary

NOTES

112. A COMMITTEE ON FACTOR TABLES.—In September, 1946, the Association Française pour l'avancement des Sciences established a committee consisting of A. GÉRARDIN (France), who to our regret could not participate in the work because of ill health, L. POLETTI (Italy) and the author, for the purpose of extending the factor table. The committee was joined later by Dr. A. GLODEN (Luxemburg). We agreed that only a table practically free from error may have any significant value. Hence, the necessity to check the existing manuscript tables against one another. These tables are: KULIK'S famous manuscript,[1] Poletti's table of the 11-th million, GOLUBEV'S table of the 11-th and 12-th millions, R. J. PORTER'S two tables[2] of the 11-th million. The Carnegie Institution of Washington presented us with two microfilms of the 11-th and 12-th millions of Kulik's manuscript. Poletti's table is in our hands. A request of a photostat of Golubev's table in the Steklov Institute at Moscow finally was denied. Porter's tables are unfortunately in symbols quite different from Kulik's. The committee decided to extend the existing printed table to the 11-th and probably the 12-th million. The necessity of checking Kulik's table against Poletti's made it necessary to get large photos of the relevant part of the microfilm. The Lord Mayor of Luxemburg presented us with large photos of the second half of the 11-th million of the microfilm and the author ordered large photos of the other half. Since Kulik used letters instead of numbers, the author is to transcribe the photos in the interval from 10^7 up to $10^7 + 5\cdot 10^5$, Dr. Gloden in the interval $10^7 + 5\cdot 10^5$ up to $10^7 + 10^6$. Every page of the new manuscript will be checked against Poletti's table. The checking of the manuscript against a third table, which seems necessary is still a problem to the committee.

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[1] See *MTAC*, v. 2, p. 139–140, v. 3, p. 222.
[2] *MTAC*, v. 1, p. 451.