CLENSHAW, C. W., and CURTIS, A. R. (1960). "A Method for Numerical Integration on an Automatic Computer," *Numerische Math.*, Vol. 2, p. 197.
CLENSHAW, C. W., and NORTON, H. J. (1963). "The solution of nonlinear ordinary differential equations in Chebyshev series," *The Computer Journal*, Vol. 6, p. 88.
ELLIOTT, D. (1960). "The Numerical Solution of Integral Equations using Chebyshev Polynomials," *J. Austral. Math. Soc.*, Vol. 1, p. 344.
ELLIOTT, D. (1961). "A Method for the Numerical Integration of the One-dimensional Heat Equation using Chebyshev Series," *Proc. Camb. Phil. Soc.*, Vol. 57, p. 823.
ELLIOTT, D. (1963). "A Chebyshev series method for the numerical solution of Fredholm integral equations," *The Computer Journal*, Vol. 6, p. 102.
INCE, E. L. (1956). *Ordinary Differential Equations*, London: Constable; New York: Dover.
KALABA, R. (1959). "On Nonlinear Differential Equations, the Maximum Operation, and Monotone Convergence," *J. Maths. Mechs.*, Vol. 8, p. 519.
LAGO, B. (1960). "Intégration des Équations Différentielles par la Méthode de Clenshaw," *Journées d'Études sur les Codes pour les Réacteurs Nucléaires*, Vienna, 25–29 April 1960, Agence Internationale de l'Énergie Atomique.
LANCZOS, C. (1938). "Trigonometric Interpolation of Empirical and Analytical Functions," *J. Maths. Phys.*, Vol. 17, p. 123.
LANCZOS, C. (1952). "Tables of Chebyshev Polynomials," National Bureau of Standards Applied Mathematics Series No. 9, Washington: Government Printing Office.
LANCZOS, C. (1957). *Applied Analysis*, London: Pitman.

Correspondence

To the Editor,
The Computer Journal,

Sir,

Hardware Representation of Algorithmic Languages

I write in support of those correspondents to *The Computer Journal* who have urged the need for the hardware used in tape preparation to be tailored to the needs of the user. This is in no way to deny that, so long as cost and availability of hardware impose limitations, it is useful to devise hardware representations which mitigate these limitations, as is done for example in the Royal Radar Establishment's 5-hole code for ALGOL 60 described by Mr. P. Taylor on page 335 of your January 1964 issue.

In the long run, however, these limitations must be overcome rather than circumvented. On the same page, Dr. D. Barron asks why current tape preparation equipment is not more suitable and economical. Particularly with regard to cost, part of the answer lies in commercial reasons which it might be invidious to debate but which we can influence as buyers. The unsuitability of present equipment arises basically from the fact that it was never intended for computer use, but has been adapted from other applications.

Teleprinters were devised for remote working by means of a single electrical circuit. In computer applications, the distance to be spanned is generally much less and multi-wire working is preferable. The serial coder and de-coder, which are central to the working of the machine in telegraphy, have therefore to be removed or nullified for computer use. This leads neither to convenience nor economy.

The teleprinter shares with electric typewriters, whether associated with punched paper tape or not, the defect of an insufficient character set. A character set which is adequate for its intended purpose of business communication is quite inadequate for mathematics, as anyone knows who has published a paper and has had to fill in much of the mathematics by hand on the typescript. While it is not impossible to represent almost any algorithmic language with any character set, reasonable transparency of interpretation and ease of punching need at least the 88 type slugs potentially available on current electrical typewriters, even when non-escaping keys or similar tricks are used in order to increase the effective number of available characters. A considerable loss in transparency or convenience results from providing a double-case full point or from wasting both cases of one key on an erase symbol.

The rotating-head typewriter gives some improvement, in as much as the character set can be altered by exchanging the type head. A fully available set of 128 or 256 characters would be very much better, however, and this probably implies a non-mechanical method of printing. It would require 7- or 8-hole tape, in conformity with Dr. Barron's remarks.

The scale of money and effort needed to develop tape preparation equipment that is really suited to the needs of the user is small in comparison with that required to design and construct a medium-sized computer. If a computer manufacturer were to undertake this task, it would be surprising if the resultant increase in computer usage failed to recompense him for the investment. While it is undesirable to impose conformity at too early a stage, the Computer Society could help catalysing co-operation in these developments.

In a forthcoming issue of the *Automatic Programming Information Bulletin*, I urge the need for compilers to give the user the option of declaring his input and output hardware representations (including composite symbols) during input. Any manufacturer who in this way makes his computer directly compatible with the hardware representations of *all* potential users will evidently place himself at an advantage.

Yours faithfully,

PETER FELLGETT.

Royal Observatory,
Edinburgh 9.
17 March 1964.

Downloaded from https://academic.oup.com/comjnl/article/7/1/85/558769 by guest on 19 April 2024