Fig. 8

ever, if the elements are to be entered in a more random fashion then it will be first necessary, by some means, to determine the positions of the first non-zero elements of all the rows before the matrix can be constructed.

Conclusion

A method of computer storage and method of solution has been developed for symmetric linear simultaneous equations which have zero elements away from the leading diagonal in the matrix of L.H.S. coefficients. The method is versatile and economical as regards use of storage space and computer time for solution, while at the same time not being unduly complex.

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Book Review

Approximation of Functions, edited by H. Garabedian, 1965; 215 pages. (Barking: *Elsevier Publishing Company Ltd.*, 70s.)

The literature on approximation, a subject which has always been of interest to mathematicians, has of recent years experienced an explosive increase. For example, it is noted by P. J. Davis in this volume, in a brief and very readable article, that he found in just two years of *Mathematical Reviews* over 120 papers and a dozen books on topics of approximation theory that seemed relevant to practical numerical analysis; these are listed in an appendix to his paper. Also in this volume, in an account of recent Russian literature on approximation, G. E. Lorentz lists over 150 publications since 1958, and notes that these are only the more important and original papers, some 45–50% of the total output. In the light of these figures, it is clear that the mathematician interested in approximation is now faced with a formidable task in merely attempting to keep abreast of new developments.

In such a situation, the value of a book of this kind is very great. Here we have thirteen papers which were presented at the *Symposium on the Approximation of Functions* held at the *General Motors Research Laboratories* in 1964, each by an expert of international reputation. The list of contibutors alone will arouse the interest of anyone acquainted with the subject: F. L. Bauer, G. Birkhoff and C. de Boor, R. C. Buck, E. W. Cheney, L. Collatz, P. J. Davis, A. A. Goldstein, M. Golomb, G. G. Lorentz, J. R. Rice, A. Sard, E. L. Stiefel, and J. L. Walsh. Although such a collection of papers cannot possess the coherence of a book by a single author, it can and

does present a general, if incomplete, picture of the frontiers of the subject in 1964.

Apart from the surveys by Davis and Lorentz already mentioned, the subject-matter of the papers ranges over those approximation topics which are of greatest interest to numerical analysts; there are papers on approximation by polynomials, by rational functions and by splines, approximation to continuous functions and approximation on finite point sets, as well as papers giving general theoretical background. There is still evidence of a difference of viewpoint between those who are interested in solving practical problems and those who are concerned with proving theorems in functional analysis (or, as Davis puts it, between the "Earth men" and the "Space men") but perhaps the distinction is less sharp than it was some four or five years earlier. Certainly there are theoretical papers here which are concerned with the development of algorithms, and this trend is surely to be welcomed.

It is difficult and perhaps unfair to pick out any one paper for special mention, but in the reviewer's opinion that by Birkhoff and de Boor on "Piecewise polynomial interpolation and approximation" should be particularly noted for its eminently readable presentation of a topic which is of considerable current interest. The interest here is heightened by expressions of the authors' opinions and recommendations; controversial though these may sometimes be, they are always stimulating and relevant.

The general standard of the papers is very high, and the book is well printed. No numerical analyst should be without it.

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