

Bibliography

- COTTON, I. W. and GREATOREX, F. S. (1968) Data structures and techniques for remote computer graphics, *Proc. FJCC*, 1968, pp. 533-544.
- COTTON, I. W. (1970). Languages for Graphic attention handling, *Computer Graphics 70*, Brunel University, April 1970.
- ELLIOT GREEN, R. (1970). Computer Graphics, *Computer Aided Design* supplement Spring 1970, pp. 29-48.
- ELLIOTT, W. S., JENKINS, A. P., and JONES, C. B. (1970). An Interactive Graphical System using computers linked by a voice grade line. *Computer Graphics 70*, Brunel University, April 1970.
- GRAY, J. C. (1967). Compound data structure for CAD. *Proc. ACM National Conference*, 1967, pp. 355-365.
- INGRAM, D. G. W. (1970). Man-Computer Interaction in the Design of Telecommunications Systems. IEE Conference on Man-Computer Interaction, September 1970.
- LEWIN, M. H. (1967). An introduction to Computer Graphic Terminals. *Proc. IEEE*, Vol. 55, No. 9, September 1967.
- MCKINLEY, J. T. (1970). Further Conversational Techniques developed for Remote Access Computer Aided Design. IEE Conference on Man-Computer Interaction, September 1970.
- NEWMAN, W. M. (1969). Interactive graphical response and its effect on display system performance. *International Symposium on Man-Machine systems*, Vol. 4, September 1969.
- NINKE, W. H. (1965). Graphic 1—A Remote Graphical display console system. *Proc. FJCC* 1965, pp. 839-846.
- STOTZ, R. H. and CHEEK, T. B. (1967). A low cost graphic display for a computer timesharing console. Project MAC ESL, MIT July 1967 (EL-TM-316).
- SUTHERLAND, I. E. (1963). Sketch pad—A man machine graphical communication system. *Proc. SJCC* 1963, 329-346.
- SUTHERLAND, I. E. (1966). Computer Graphics—10 unsolved problems. *Datamation*, May 1966.
- VAN DAM, A. (1970). Storage tube graphics: Comparison of terminals. *Computer Graphics 70*, Brunel University, April 1970.
- VAN DAM, A. Lecture Notes.
- WISEMAN, N. E. (1968). A Note on compiling display file from a data structure. *The Computer Journal*, Vol. 11, No. 2, August 1968, pp. 141-147.

Book review

Approximate Linear Algebraic Equations, by I. B. Kuperman, 1971; 225 pages. (Von Nostrand-Reinhold, £6.00)

The term 'Approximate linear algebraic equations' means that the values of the coefficients of the matrix of the equations and also the right hand sides are not known precisely, instead it is supposed that these quantities are contained in given small intervals. Moreover it is supposed that all arithmetic calculations are exact, so the subject of this volume is quite different from the usual error analysis of linear equations that occurs in most books on numerical analysis. Indeed the main problem that is considered is to estimate the range of each component of the solution of the equations that is consistent with the data.

This problem is not straightforward because the set of possible solution vectors that are admitted by the data need not be convex. However the intersection of this set with each orthant of solution space is convex, so it is possible to solve the problem by a finite number of linear programming calculations. This technique is described very well. However applying the technique can require much computation, so some simpler methods are presented for estimating the range of the solution vector.

No less than eight methods of estimation are described of various degrees of complexity and accuracy. Of course the methods that require less computation tend to be less accurate, but, with the exception of Method 1 that is derived from vector and matrix norms, all of the methods give realistic estimates when the data intervals are small. Moreover some of the methods provide actual bounds on the components of the solution of the linear equations.

The style of writing is rather unusual, for the main results are emphasised by repetition. Indeed the author has taken a great deal of trouble to communicate his ideas unambiguously. Most of these ideas are illustrated by numerical examples, but there are no exercises for the reader. The mathematical accuracy of the book is of a particularly high standard.

Except for an overlap with Dr. E. Hansen's work on interval arithmetic and a chapter on statistical methods, the subject matter is the research of the author. This subject is interesting from an academic point of view, and also it is relevant to practical computation. Therefore I recommend this book very warmly.

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