$(n - r)$, which would be zero if no rounding errors were made, introduces the possibility of significant errors. However, the maximum perturbation of the original matrix corresponding to these errors can be obtained in the process, and in practical cases is generally insignificant.

A program has been written for the Pegasus computer corresponding to the method proposed for the general matrices, and one will be written for the KDF9. The scheme given in Section 4 was not adopted on Pegasus because of the small high-speed store. On Pegasus I, the program can deal with a matrix of order up to 60. With $n = 60$ and $r = 20$, the time taken is about 45 minutes, made up of about 10 minutes input, 20 minutes calculation, and 15 minutes output.

7. Acknowledgements

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Correspondence

To the Editor,
The Computer Journal,

Sir,

Straight Lines and Graph Plotters

The use of graph-plotting devices in computing laboratories is becoming increasingly widespread.

In the application of these devices there arises the fundamental problem of drawing the "best possible straight line" between two points with integer co-ordinates, given that elemental pen movements can be made in only a finite number of directions (usually eight), and this problem is readily reduced to that of making m movements of type A and n movements of type B with the two kinds of movement intermingled "as much as possible."

The solution—not your correspondent's—to this problem is a simple one; though it appears from some of the advertising and other material that has been received at this establishment that not everyone is aware of it, for many diagrams have come to your correspondent's notice in which the straight lines are more crooked than need be the case. It is necessary only to construct a sequence of m n's and n-m's (let these $m + n$ quantities be $a_1, a_2, \ldots a_{m+n}$ in some order) so that the absolute value $|S_k|$ of the sum $a_1 + a_2 + \ldots + a_k$ is least possible for every $1 \leqslant k \leqslant m + n$, and this is achieved recursively by the choice a_k equals n or $-m$ according as $|S_{k-1} + n|$ is less than or not less than $|S_{k-1} - m|$. The kth pen movement will be type A or type B correspondingly, and when $m + n$ movements have been chosen the required blend will have been achieved.

The solution is, of course, dependent on the definition of "best possible": the definition implicit in the above scheme seems to be no worse than any other, and the method is very easily programmed.

Yours faithfully,
J. R. Thompson.

Department of Mathematics,
The University,
Leicester.
27 August 1964.

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