significant terms or the finding of no suitable row at a certain elimination step (as well as increased execution time for swapping and increased fill-in).

The second option (ICOND = 1) is the same as the first except that each row will be scaled so that:

$$.1 < \max_{1 \leq j \leq n} |g_{ij}| \leq 1 \text{ (for each } i\text{)}$$

Thus, each row of $\bar{G}$ will be of nearly equal length in the sense of $\|g_i\|$. This will usually reduce round off over option one. The effect of changes in EPS will be the same as option one. The third option also includes scaling except that only very small elements (less than EPS/100), to the left of diagonal are ignored. Another approach is to reject rows based upon a comparison of the pivot value with other elements on the row (Curtis, 1971). This will produce a more accurate solution but at the expense of many logical operations. It may be economically preferable to switch to a double precision version than to use this approach.

As an example consider one of the previous problems: A random set of 250 equations, five elements per equation, and a bandwidth for generation of 30. When this was solved previously, a single precision version of *IMP* was used on a computer with a 60 bit word. EPS was 1·0 E-10. Round off error was less than 1·0 E-6. The problem was re-run using different values of EPS and ICOND with a single precision version of *IMP* on a computer with 32 bit words. The condition number of this matrix is very high.

Table 6 shows the effect of 'EPS' and ICOND on round off error. For many ill-conditioned problems, round off error may be reduced to a tolerable level without using a double precision version of *IMP*. In addition to matrix scaling, *IMP* provides an option to scale the state vector so that each internal value of a state variable will be closer to unity while external values remain user oriented.

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Book review

Principles of Digital Computer Operation, by M. D. Freedman, 1972; 223 pages. (*John Wiley and Sons, Inc.*, £3·75)

It is stated in the author's preface that the book is written 'so that no previous knowledge of computers is required'. It is therefore no mean achievement that he has managed to begin by defining the meaning of 'digital' and progress, within two hundred pages, to brief discussions of such subjects as pipeline processors and fault-tolerant machines.

The first half of the book is concerned with the basic concepts of digital computers, namely, their fundamental block structure, language, arithmetic facilities and number representations. The various subsystems described in the first chapter on block structure are later covered in a more detailed way. A wide variety of input/output devices are described. The final quarter of the book deals with a mixed bag of topics, including chapters on Software, Applications, Interrupt and Time-Sharing.

The author's style is clear and concise and this, coupled with good diagrams and illustrative examples, contributes much to the book's undoubted value. The difficulty of writing a book which attempts, as this one does, both to introduce to the subject a reader with no background experience and also to serve as an overview of principles to a professional, is that it may fall between the two aims. One cannot help feeling that the plain number of ideas presented may be slightly overwhelming to a first-year undergraduate and yet leave a second-year student with a rather superficial view of any given topic, particularly those touched on in the last part of the book. One might also be forgiven for supposing that computers are calculators rather than data processors, such is the weight placed on arithmetic operations.

These are minor points, however, to set against the good features of a book which fills a rather noticeable gap in the existing literature. Its appearance is to be welcomed.

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