program P23 of Fig. 3 has been greatly expanded. The network diagram has proved admirably suitable as a means of bridging the gap between intentions and specification. Thus its first advantage lies in its inherently simple yet precise manner of specifying a real-time computer problem. In the very short time it has been in use, the rate of completion of programs has been very high so that its second advantage lies in the breaking down of a complex system into smaller units, thereby enabling a group of programmers to work in parallel on relatively simple programs. Its third advantage is its flexibility as shown by the ease with which additions and modifications have been made. It is thus particularly suited to experimental programming and to those systems which may require development. The fourth and overriding advantage is its ability to facilitate the running together of separate programs. Here we have found that a partially completed network can be used as a vehicle for testing a new program.

Although the main spur for the work was the need to find a manageable method for the real-time on-line programming of an automatic surveillance radar, it is clear that the method could be applied in many other fields. Although the present work is being carried out in machine code a further improvement could be obtained if the detailed programming were to make use of a high level language, such as JOVIAL or CORAL. The language must, of course, be suitable for on-line work, i.e. it must be able to handle interrupts and preferably have other special features as well, but these requirements do not in any way arise from the use of a network. One can imagine in the future the combination of a network and a high-level language so that quite complex control systems could be planned and developed with comparative ease. As far as future ground surveillance radars are concerned, this may lead to a general-purpose method of data handling and control, for radars with different, and variable, physical characteristics.

Reference

PHILLIPS, C. S. E. (1964). "An Automatic F.M.C.W. Surveillance Radar", *Proc.* Eighth AGARD Avionics Panel Symposium on Radar Techniques for Detection, Tracking and Navigation (September 1964). Also R.R.E. Memorandum No. 2324.

Book Review

Numerical Processes in Differential Equations, by Ivo Babuska, Milan Práger and Emil Vitásek, 1966; 351 pages. (London and New York: *John Wiley and Sons Ltd.*, 63s.)

This is a translation of a book published in Prague in 1964. A short introductory chapter is followed by one on the stability of numerical processes in general. This starts with examples of simple calculations performed on different computers; the diversity of the results for the same calculations is illuminating. The authors then introduce their concepts of local and global stability, which are illustrated by examples drawn from recurrence relations and matrix processes.

Chapter III, on initial-value problems for ordinary differential equations, concentrates chiefly on classical recurrence methods and Runge-Kutta methods. The problem of deriving satisfactory error estimates is also discussed. There follows a chapter of 150 pages on boundary-value problems for ordinary linear equations; an interesting range of topics is treated, including factorization and variational methods.

The fifth chapter, on elliptic partial differential equations, is devoted to the derivation of the relevant finite-difference equations, and the solution of the resulting linear systems by direct or iterative methods. The book concludes with a short chapter on parabolic equations.

There are two disturbing features which recur throughout the many numerical results displayed. First, the graphs of errors, in various processes, due to round-off, against the reciprocal of the step length, indicate that progressive reduction of the interval eventually gives rise to larger errors. The implications of this phenomenon are disturbing, since it appears to rule out the possibility of ever ensuring that the numerical results are independent of the interval used. In fact, however, it is possible to prepare programs based on Runge-Kutta formulae, for example, which do not possess this defect. Secondly, the numerical results presented seldom agree with the exact results to more than a few of the figures quoted, and the uninitiated reader may falsely conclude that higher accuracy is unattainable for problems of the type considered. Again one may cite the example of Runge-Kutta methods which may be programmed to yield an accuracy comparable with the working accuracy.

The reviewer is also not entirely happy about the definitions of global and local stability of numerical processes. Each of the recurrence relations used for illustration (on pages 28 and 29) arose "from the solution of a simple system of differential equations". Failing an exact solution of the recurrence relation, values of the solution to the differential equation would have made the results more revealing.

The book is generally well produced, although the reviewer found a few misprints. Two coefficients are wrong in the formula of Huta on page 88. Incidentally, this is a thoroughly bad formula in practice in view of the size of some of the coefficients, and has been completely superseded by the formulae of J. C. Butcher (*Journal of the Australian Mathematical Society*, 1964). The last term in the second equation of (2.4.1) has an index missing. There is an error in the scale for the abscissa of the graph of Figure 3.4, and the coefficient of y_k in Example 4.14 should read $-2{\cdot}0225$. None the less this book can be commended to research workers in the field as it contains many stimulating ideas and treats some topics not easily found in extant literature.

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