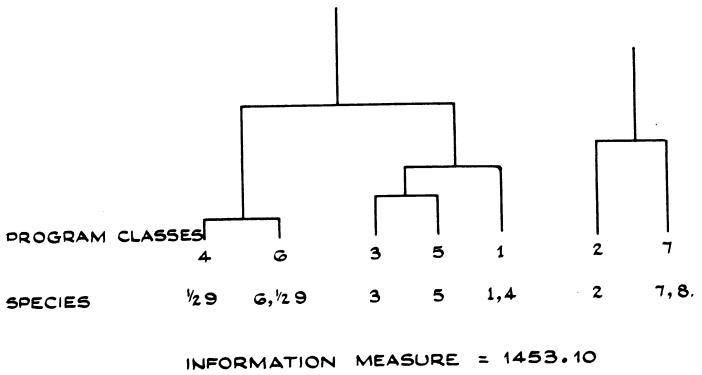

Fig. 1 Dendrogram for best classification.

The best solution obtained by the program comprised seven terminal classes. These are compared with the classification into nine species in **Table 2,** The best dendrogram is shown in **Fig. 1.**

This example has actually yielded two unlinked dendrograms. The two classes (4, 6) and (1, 2, 3, 5, 7) are so different that their parameters are more economically specified as two independent classes rather than by an hierarchical specification of the parameters of their union. An inspection of their properties verifies a marked difference between them.

We have also classified this data using our non-hierarchical program (Boulton and Wallace, 1970). The best classification it found contained six classes, five of them being identical to hierarchical terminal classes 1, 2, 3, 5 and 7, and the other identical with the union of terminal classes 4 and 6. When the non-hierarchical program was forced to limit the number of classes to three the best solution corresponded to the union of hierarchical terminal classes (4 and 6), (2 and 7) and (1, 3 and 5) as occurs in the dendrogram. Thus the hierarchical information measure appears consistent with the non-hierarchical measure.

The hierarchic analysis of the above data was performed by an ALGOL program running on a B5500 computer. It required nine iterations and took $3\frac{1}{2}$ minutes.

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Book reviews

Computer Applications of Numerical Methods, by Shan S. Kuo, 1972; xii + 415 pages. (*Addison-Wesley*, £5·75)

This is a revised version of a book first published in 1965. It gives an introduction to FORTRAN programming and numerical methods, with numerous examples. The first five chapters are devoted to computers, flowcharts, floating-point arithmetic, and programming. Some of the information is specific to IBM machines, and much of it is IBM-oriented, so that the reader would feel most at home if he worked in a System 370 installation. The description of the FORTRAN language is informal and is given mainly through examples; the majority of users would need a reference manual as well if they were actually writing programs.

The numerical methods section, which occupies about two-thirds of the book, discusses non-linear equations, initial-value problems in ordinary differential equations, linear equations and eigenvalues, interpolation, curve-fitting and quadrature, the Monte Carlo method, and linear programming. Some of the sections probably date from the first edition, and should have been revised, e.g. the Runge-Kutta-Gill method (page 142), Jacobi's method for eigenvalues (page 217), an interpolation method for Chebyshev curve-fitting (page 267). The presentation is rather uneven; some sections give a good background to the method described, leading up to a useful example, while others are rather sketchy, and plunge the reader into a long and complicated program. It seems to me that much of the space used for programs would have been better given to more practical discussion of the methods, including reasons for choosing one method rather than another, and common pitfalls.

The unevenness of the book makes it rather unsuitable for a class text, and a number of better books are available in this field for reference.

JOAN WALSH (Manchester)

Introduction to Computational Methods for Students of Calculus, by S. S. McNeary, 1972; 196 pages. (*Prentice-Hall International*, £4·25)

The preface to this book tells one that it is neither intended as a text in programming (yet the first sixth is a résumé of FORTRAN), nor as a text in numerical analysis. As an introduction to other books it is far too expensive, so I was left wondering just what this book is to do and for whom.

The material covered, besides FORTRAN, are formula evaluation, convergent sequences, errors, solution of equations, linear equations, polynomial approximation and numerical integration. The treatment throughout is elementary, assuming rather less than 'A-level' mathematics and, indeed, not going beyond a modern mathematics 'A-level' syllabus.

The references are entirely to American text books and among the list of 'Periodicals oriented toward computation' there are none published outside the USA.

P. A. SAMET (London)