

cepts necessary to understand operating systems—for example, hesitations, interrupts, various addressing techniques (such as relative, indirect and two-component addressing—with page and word registers), storage protection techniques such as base-limit or protect key systems, privileged and unprivileged

modes, program status word, interrupt priorities, handling of multiple interrupts, stack machines, etc. In general, we have found it an extremely useful aid to teaching these aspects of computer science.

References

- BELL, C. G., and NEWELL, A. (1971). *Computer Structures Readings and Examples*, McGraw-Hill.
LEE, J. A. N. (1972). *Computer Semantics*, New York: Van Nostrand Reinhold Co.

Book reviews

Computer Aided Control System Design, 1973; 244 pages. (IEE Conference Publication No. 96, £8.30)

This publication consists of a set of papers presented at an IEE Conference on Computer Control System Design, 2-4 April 1973, and represents the state of work in this field in the UK at that time. The papers can be split into roughly three sections: (i) identification and modelling, (ii) design, and (iii) simulation, which correspond to the three main activities of the design engineer. The number of papers which fall into each of these categories are, respectively, eight, nineteen and three.

The papers on identification and modelling include descriptions of three comprehensive packages of interactive programs for identification (Clarke, Shellswell and Young, Goodwin *et al*), the latter incorporating an optimal test signal design method. The remaining papers in this area are concerned with various techniques for the reduction of high order system models, a survey of the field being given by Towill. An interesting discussion of some practical modelling problems in relation to steel rolling mills is given by McClure.

Several papers describe comprehensive interactive design program packages and CAD techniques for: (i) linear single input, single output (siso) systems (Allen and Atkinson, Shearer *et al*, Webb, Woodward and Daly), (ii) nonlinear siso systems (Gray and Savvides), (iii) linear multivariable systems (Belletrutti, Fallside *et al*, MacFarlane, Mayne and Chuang, Munro and Ibrahim, Seraji, Young *et al*), and (iv) optimal control (Brown, Burt, Elkin and Daly, Healey and Jones, Mayne, Mobley and Paddison, Weislander). Clearly these areas could be further subdivided to display their specialisations. Two noticeable unifying features are the extensive use of interactive programming techniques, and the importance of graphical presentation of results, features which will undoubtedly form the basis of all control systems CAD programs in the future.

Simulation methods in design are described by Harris and Miles, and Revett. A survey of continuous system simulation languages, with particular emphasis on their industrial usage, is given by Gulland.

As a whole this set of papers describes, or makes reference to, most of the work done in CAD in this field in the 1970-73 period. There is a nice balance between papers which describe successfully implemented packages, and those concerned with future projects. Implicit in their descriptions are the essential features of CAD programs in this area: interactive, command driven, graphical. The only notice-

able shortcoming is the absence of any papers which describe real problems which have been approached and solved making use of CAD programs. This can be taken as an indication of the state of acceptance of these design tools by industry, a situation which one would hope will be improved in the future. Another important feature which is absent from many papers is a deep appreciation of the numerical problems implicit in many of the proposed algorithms, especially in relation to implementation on machines with short word length.

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Human Congenital Malformations, the Design of a Computer-aided Study by E. Gal and I. Gal. 1975; 194 pages. (*The Butterworth Group*, £7)

This is an excellent book in almost all respects except its unfortunate title, in which the emphasis is quite misleading. The object is to explain how to design and carry out computer-aided studies and surveys. Since the authors took part in one such study on human congenital malformations, it is used partly as an example to illustrate the points: but other examples are used too.

The central theme is how to make sure that data obtained for future analysis, is useful, relevant and above all completely reliable. Thus the forms or questionnaires on which the information is recorded should be both as acceptable as possible to the specialist in the field and easy for the card-punch operator to use. It is essential to have advice from experts to know what information is useful and relevant. It is equally important to have the questions vetted by laymen and others to make sure that they are easy to understand, unambiguous, and likely to result in truthful answers. Methods of checking the accuracy of the information in various stages (when it is obtained and recorded, when it is punched, and when it is processed) are outlined. The emphasis is on seemingly simple and commonsense precautions which can be easily and disastrously overlooked. For technical details, such as programming or statistical methods, the advice is to consult professional programmers and statisticians.

Anyone but the most seasoned expert considering a survey type of investigation in any field (medical, psychological, social) would be well-advised to read this book first.

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