

Thus,
 $P_3 = 6 (MTTR/MTBF)^3 P_0$
 $P_2 = 6 (MTTR/MTBF)^2 P_0$
 $P_1 = 3 (MTTR/MTBF) P_0$, and

$$P_0 = \frac{1}{1 + 3 (MTTR/MTBF) + 6(MTTR/MTBF)^2 + 6(MTTR/MTBF)^3}$$

noting that the last formula, for P_0 , gives the probability that all three CPU's are correctly working.

References

- PAGE, E. (1972). *Queuing Theory in OR*, Butterworths, London.
 REIFER, D. J. (1975). Goal-Directed Synthesis of Correct Software, White Paper. The Aerospace Corporation, El Segundo, California.
 WATERS, S. J. (1972). A Survey of CAM and its Publications, *Proceedings of NCC Conference on Approaches to Systems Design*.
 WATERS, S. J. (1974). *Introduction to Computer Systems Design*, National Computing Centre, Manchester.

Book reviews

Language Hierarchies and Interfaces, edited by F. L. Bauer and K. Samelson, 1976; 428 pages. (Springer-Verlag, Lecture Notes in Computer Science, No. 46, US\$15.20)

This book contains the lectures given at a NATO summer school organised by the Technical University of Munich in 1975. The contributors include some of the leading thinkers in programming, and the book is a superb record of the state of the subject in 1975.

The book begins with a short, thought-provoking introduction by Dijkstra. In this essay, he discusses the importance of 'pondering' as an indispensable companion to logical reasoning in solving problems, and considers whether the art of pondering can be taught in any valid sense.

The bulk of the book is divided into four 'chapters'. Chapter 1 deals with concurrency. Hoare contributes a lecture on 'Parallel programming—an axiomatic approach', and Brinch Hansen introduces concurrent PASCAL. Dijkstra and Gries both consider concurrent garbage collection. Dijkstra gives a suitable algorithm for which Gries then offers a proof of correctness. The second chapter is entitled 'Program development'. It begins with an introduction, by Dijkstra, to his 'guarded commands'. Other contributions include Griffiths on 'Program production by successive transformation', Bauer on 'Programming as an evolutionary process', Hoare on 'Proof of correctness of data representation' and—as an appendix—Bauer on 'A philosophy of programming'. The whole chapter gives a valuable insight to modern ideas in programming, even though Euclid's algorithm in its many forms is somewhat overworked.

Chapter 3 is on operating systems structure. Again Hoare (The structure of an operating system) and Dijkstra (A time-wise hierarchy imposed upon the use of a two-level store) offer sound original contributions. Wulf's lecture, on the other hand (Structured programming in the basic layers of an operating system) serves largely as an illustration of techniques as applied to a real problem. Seegmuller's paper (Language aspects in operating systems) does not reach the standard set by the other contributions. It contains lists of types of languages and desirable features, but says little about why the features are desirable or how they can be achieved.

The last chapter is contributed entirely by Ershov. It contains an

interesting and detailed description of the BETA project—a unified system which will provide compilers for several languages by using a universal intermediate language called INTEL.

As a whole, the book contained enough new ideas to affect the reviewer's thinking considerably. It should be read and used by all researchers and teachers in the area of programming.

A. J. T. COLIN (Glasgow)

National Planning for Informatics in Developing Countries, edited by G. R. Pipe and A. A. M. Veenhuis, 1976; 531 pages. (North Holland, US\$45.00)

This book contains the proceedings of the Intergovernmental Bureau for Informatics conference on National Planning for Informatics in Developing Countries, held in November 1975. The aims of the conference were to provide an exchange of experience and demonstrate the importance of informatics in the economic and social advancement of developing countries.

Fifty-six papers were presented, covering the following topics: Planning and implementation of national policies; Procurement of hardware, software, services and maintenance; Social, human technical and financial resources; Education and training; Telecommunications; The use of the arabic language; Applications systems.

These papers relate experiences in particular applications areas, and developments in computing and communication technology, in both developing and developed countries. The contents of these papers vary enormously in subject matter and treatment; from the standardisation of arabic characters for computer systems and programming, thus assisting further computer developments in the Arab speaking world, to a review of programs developed by the US Census Bureau for the handling of geographically based information and their availability to developing countries.

This book would be of interest to anyone who wishes to obtain a general appreciation of how developing countries are making use of computing and communications technology to advance industrialisation.

PAT CROCKER (Purley)

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