KOSARAJU, S. R. (1974). Analysis of Structured Programs, *Journal of Computer and System Sciences*, Vol. 9, p. 232-255

LEAVENWORTH, B. M. ed. (1972). Special Issue on Control Structures in Programming Languages, *ACM Sigplan notices*, Vol. 7, No. 11

LEVY, L. S. (1976). Automata on Trees: A Tutorial Survey, *Egyptian Computer Journal* (forthcoming).

MILLS, H. D. (1972). Mathematical Foundations for Structured Programming, FSC 72-6012, Federal Systems Division, IBM Corporation, Gaithersburg, Md.

NILSSON, N. J. (1971). *Problem-Solving Methods in Artificial Intelligence*, McGraw-Hill, New York, NY

PREPARATA, F. P. and YEH, R. T. (1973). *Introduction to Discrete Structures*, Addison-Wesley, Reading, Mass.

YELOWITZ, L. (1973). A Symmetric, Top-Down Structured Approach to Computer Program/Proof Development, IBM Report FSC 73-5001, IBM Federal Systems Division, Gaithersburg, Md.

Book reviews

Informal Introduction to Algol 68, by C. H. Lindsey and S. G. van der Meulen, 1977; 361 pages. (*North Holland*, for IFIP, US$14.50)

ALGOL 60 appeared in 1960; the report was quite difficult reading to a generation not brought up on Backus Naur Form, but it became the users' bible. A few errors were detected and a revised report appeared in 1962. ALGOL 68 appeared in 1968, by which time the whole scale of everything had increased. The difficulty of mastering the extended grammatical techniques used in defining it meant that few but specialists gave the report more than a single shuddering glance, and so in 1971 an official informal introduction appeared. As a result of the 'field trials' stage, a revised report appeared in 1974. This revision went further than the ALGOL 60 revision did; it made significant improvements in the language (as well as extensive additions to the descriptive techniques). The 1971 introduction was no longer an accurate one, and the work here under review is its consequential revision.

Every serious computer science undergraduate who uses ALGOL 60 has his own (often Xeroxed) copy of the ALGOL 60 report. Because it carries the guarantee not only of the authors but also of the whole of IFIP WG 2.1, this work is nearly as authoritative as the Report itself, and might fulfil the same function for ALGOL 68 were it not far too big to do so. It starts with a sixty page 'Very informal introduction'; one wonders whether authors and publishers have considered making this available by itself to penurious students. As a substitute for the report in this context its only defect, which it shares with the main work, is that it dispenses entirely with any formal grammar. I found it very clearly written. Apart from an unintended and distracting mnemonic in using **fun** rather than **fn** or **func** for **function**, and an unidiomatic usage of **constantly** (using **constantly yielded** for **yielded . . . in the form of a constant**), my only complaint is that I still, after considerable investigation of **scope**, **range** and **reach**, cannot see how a local generator in a for-loop can produce storage that outlives the control variable. (That the work goes too fast for anyone to absorb properly on a single reading is inevitable.) The main work is directed to the specialist student, whether advanced programmer or implementer; it covers the whole language by a profusion of program snippets illustrating each point as it arises. Like the 1971 version, it is organised as a two-dimensional array of sections so that it may be read by rows (each introducing a new development of phrase structure) or by columns (each dealing with a new concept in data structure and its associated notation). The final row consists of more extended examples appropriate to each column. Appendices include a description of the sublanguage ALGOL 68S and of the recently approved stropping conventions.

ALGOL 68 on the defensive is its own worst enemy, and some of this survives in this book. Thus although it is to be commended for restoring to us such familiar terms as **expression** and **statement**, it does its subject no good by suggesting that coercion saves us from writing **widenedtoreal**(i) when everyone knows that all it saves us from is **float**(i). Nevertheless, these are minor criticisms. We have too often learned the hard way that, where the concealments and protections of high level languages are concerned, ignorance is not always bliss. ALGOL 68 has chosen to develop a machine independent way of describing some of what goes on behind the scenes; just enough to restore the bliss without incurring the folly. Consequently this is a work that should be in every computer library, and that will be invaluable to anyone involved with a real understanding of what computing involves.

B. HIGMAN (Lancaster)

Digital Picture Analysis, edited by A. Rosenfeld, 1976; 351 pages. (*Springer-Verlag*, Topics in Applied Physics, Vol. 11, US$29.60)

Visual inspection as a routine task in industry, medicine and commerce represents an enormous labour bill. This fact has fascinated computer scientists and engineers for several decades now and has spawned massive research efforts to automate these tasks with a consequent vast literature. This book is a valuable source of references to that literature except for the singular omission of the substantial body of work on computer interpretation of images of three dimensional scenes. The five substantive chapters are separately authored, and each treats a different topic area. There is an (obligatory) account of character recognition by Professor Ullmann which is poorly illustrated and fails to give a sense of the challenges remaining in that field, e.g. recognition of badly written material like signatures. A chapter by Haralick on the interpretation of images of the land surface, e.g. air photos, does little more than parade the mathematics of decision theory: it gives us no sense of how well that mathematics performs nor of what the state of the art is. Both authors remain remote from the giver of the task. McIlwain's account of work in high energy physics—basically of the automatic analysis of bubble chamber photographs—is at the other extreme. The physics underlying these images is well understood and the recognition techniques are carefully tuned to the explicit recovery of the three dimensional geometry of the particle track. We are presented with large amounts of high energy physics but no general principles of picture analysis emerge. Preston's account of work on the analysis of cell images including work on chromosomes done in the UK by Rutoviztz's MRC group is a massive piece of scholarship, with more than 400 situations.

The best chapter however is that written by Harlow and his colleagues, in which they describe their work in devising computational tools to accomplish automatic diagnosis of a variety of clinical abnormalities—bone malformations, heart disease, brain tumours, etc.—starting from conventional radiographs. The paper is full of interesting problem details, e.g. the ways in which congestion can occur in the heart—an important assessment in diagnosing congenital heart disease. Estimating this from a radiograph involves 'seeing' the heart boundary: a difficult problem made worse by the fact that 'there is some disagreement as to the location of the top of the heart, (so) we chose an arbitrary criterion suggested by radiologists'. The active collaboration between potential users—in this case radiologists—and computer scientist produces something in which we can see how the problem interacts with the hoped for means of its solution, namely the computing system. The collaboration also provides the opportunity to compare results: human v. computer interpretation—an evaluation all too often missing in the engineer's sorties into applications.

Perhaps the most interesting feature of their work however is the clear sense of the variety of processes that have to be programmed into an effect system. In his introduction the book's editor Professor Rosenfeld offers a unifying framework for the subject in terms of four goals that he believes characterise pictorial pattern recognition—matching, classifying, segmenting and recognising. If such a taxonomy is to be useful, then it should inform the designer; while Haralick and Ullmann would, I'm sure, be happy with it Harlow and his colleagues seem to me to have felicitously indulged in what Preston in his chapter disparagingly refers to as 'the adhockery' of shape analysis. But shape and the meanings of shape is what it's all about, isn't it Professor Rosenfeld?

MAX CLOWES (Brighton)