

enced object in another **area** that is co-resident is decremented. However, the reference counts of absent objects cannot be decremented. In time **areas** will come to contain inaccessible objects that have not been collected. Should this be a problem in some application then the solution is a utility program that simultaneously garbage-collects all the **areas** on file that cross-reference each other. Such a program is feasible but the parameters it would require are complex.

10. Extension

If this scheme is embodied within a language that already provides a **heap** and an orthogonal system of references, as does ALGOL 68, then the mode **heap area** can be accommodated. The extension is obvious. So is the accommodation of orthogonal references from program variables to **area** object fields. What could not be permitted is that any field of a structure that is an **area** object should be an orthogonal

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Book review

Signals, Systems and Controls, by B. P. Lathi, 1974; 524 pages. (Intertext, £8.50.)

In this book Professor Lathi attempts to bring together all the basic ideas of network theory, signal analysis and processing, and control systems. The main approach is with control problems. It is an ideal text for those who wish to learn the elements of modern control theory but as such has little to do with digital computing systems directly (excepting of course those applications of control which contain some element of digital working). The principal use of this book and indeed the one for which it is written is as a text accompanying a lecture course.

The first third of the book presents time domain and frequency domain analysis. As is now customary Professor Lathi presents a unified view in that essentially they are the same apart from using different methods of representing the input signal. Some considerable effort is justifiably expended in showing that the Fourier and Laplace transforms are tools for representing a signal in the complex frequency domain and are not mere mechanical aids to solving integral and differential equations. After treating feed back and control, a chapter is devoted to the increasingly important method of state space analysis. This chapter, which is really introductory to the space state method of representation and analysis, is very clear in its exposition and should help dispel any difficulties in the concept of state of system. For this purpose the author uses the simple

reference, rather than one bound to an **area**. Thus would orthogonality be violated.

11. Conclusion

The desiderata outlined are achievable within an algorithmic language. APL has not been considered and would prove a difficult case.

The run-time overhead of the proposed solution would be high but would be no higher than a user's attempts to provide these facilities without the proposed language extensions, and the overhead is proportional to the use made of the proposed extensions.

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device of identifying the initial conditions with the initial state. A seemingly obvious but often omitted step. The final chapter of the book begins to treat discrete time systems. It introduces the transform and relates it to the Laplace transform for continuous systems and treats transform and state space analysis methods for both discrete data and sampled time systems.

Specialised appendices on differential operators, partial fraction expansion, Bode plots, vectors and matrices and the Nyquist stability criterion are included. The text is extensively sprinkled with mathematics. These are not used to illustrate the virtuosity of the author but to assist the physical understanding. In most cases these mathematical results are interpreted heuristically and further illustrated by simple yet sufficient examples. Professor Lathi has an engaging style which gives the impression that he is communicating personally.

For instance (page 367) 'Anyone who tries to solve a problem this way is bound to say . . . "There must be a better way!"'. A better way there is.' 'Some readers might find this slightly annoying but for myself it enhances the text.' Indeed Professor Lathi's style leads the reader along at a very fast pace. It is possible to read through quite long sections to obtain an overview of the development and then to return for more detailed study of the mathematics and its full implications.

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