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book reviews

DIRECT ANALOG COMPUTERS, by Victor Paschkis and Frederick L. Ryder, Interscience/John Wiley, 1968, 400 pp.

REVIEWED BY F. T. BROWN[1]

DIRECT analog computers, as opposed to the more familiar indirect analog computers, simulate passive energetic phenomena using passive energetic elements. The elements discussed in the book are lumped and distributed electrical resistors and lumped capacitors and inductors. Active elements also are used in subordinate roles.

Paschkis and Ryder have made modeling thermal and mechanical systems on such computers a fine art. Employing mostly a case-study approach they explore a wide variety of problems in the limited areas chosen. The switching of capacitors represents mass transport; diode circuits represent the fourth power law of radiation; voltage and current-dependent voltage sources couple fields and act as inputs to "property changers" which serve to modulate the parameters of nonlinear fields; electrical transformers accomplish the geometrical constraints in static and dynamic structures; holes punched in conducting resistance paper represent three-dimensional effects, and on and on. Practical details are presented in some depth, including discussions of system and experimental errors, and typified by the six pages on d-c power supplies.

No other book, apparently, collects more than a small fraction of the information in this one. At this point in history, however, I predict (at some risk) no other book ever will. The reason, of course, is the digital computer. By comparison, direct analogs are sharply limited in scope and flexibility, require a long set-up time, are high in cost if the active components are employed and experimental errors are closely controlled, and in most cases provide no mechanism for inexpensive program storage. Further, I doubt if in the modern world an engineer can justify the commitment involved to learn the necessary intracacies when a similar commitment to the digital computer produces more varied rewards. It must be recognized, however, that classes of field problems exist in which use of the direct analog computer is cheaper than digital computation. Although this observation applies mainly to the simpler problems, the direct analog-digital hybrid computer proposed in the last chapter (based on magnetic latching relays) potentially extends it for those faced with repetitive nonlinear field problems of particular types.

Despite their practical problems the *concept* of direct analog computers has powerful pedagogical value. It seems to me this nation needs more nonspecialists who grasp the significance of whole systems, and who consequently are intimately aware of energetic as well as functional analogies; the direct analog computer is a useful tool and example in teaching the modeling of systems. This suggests a text centered on the natures of the analogies themselves, expressing these analogies in a common language (such as bond graphs). The case-study approach of the present book virtually disqualifies it for this purpose, however. Further, the scope of the analogs presented is too narrow. The slim chapter on fluid flow (written by a third author) is trivial; nowhere in the book is it observed, for example, that potential flow problems can be solved by the same physical analogs as heat conduction and diffusion problems.

For those bent on applying direct analog simulation to thermal and mechanical problems, or interested in the practical problems of most direct analog simulators, this book is obligatory. As a reference book or a nonspecialist text it has its shortcomings, however.

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NUMERICAL CONTROL FOR MACHINE TOOLS, by Charles H. Barron, McGraw-Hill Book Company, 1971, pp. 239.

REVIEWED BY SHIRO KOBAYASHI[2]

THIS book is intended for beginners as a single source of information on numerical control of machine tools. The book aims at readers such as tool designers, technical students, machinists, process planners, etc., and is, therefore, introductory in nature with emphasis on programming. The book begins with an interesting section—the evolution of computing machines and numerical controls. After a brief description of how numerical controls operate, the author touches on the subjects of point-to-point systems, tape format specifications, and functions other than machine table or spindle movements. Then, programming in contouring controls is illustrated at some length. The book concludes with numerical control with computers. Examples are given in using Autospot II and APT III programs.

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