only upon termination). The relationships between the placement problems and several mathematical problems (the assignment problem, the traveling salesman problem, and the quadratic assignment problem) are first discussed. Much of the attention is then focused on the initial placement method (sequentially select and adjoin modules to a subset of already placed modules) with detailed discussion of the work by Kurtzberg concerning the use of the pair-linking method and the cluster-development method as selection rules. Many of the iterative placement techniques are also described, which include the Steinberg assignment method, the pairwise interchange techniques, and the stochastic methods. The chapter is concluded with an excellent comparison of the various methods and recommendations for handling practical situations.

Chapter 6 deals with routing which is the process of laying out necessary conductor paths to achieve the indicated connections among the elements which have been placed. The four basic steps in a routing process are: wire-list determination; layering; ordering; and wire layout. These steps and their associated mathematical problems are described in a very easy to follow fashion. In the discussion of wire-list determination, the minimum tree algorithm, the traveling salesman problem, and the Steiner’s problem are mentioned. The discussion of ordering (i.e., the process of assigning each wire to one of the multilayer boards to minimize wiring difficulties) is mostly heuristic. The description of ordering process (the sequential steps in which the wires on each layer be processed) is brief but complete. A considerable amount of discussion is focused on the wire layout problem. This includes the well-known Lee’s algorithm, along with its many variations for speedup purposes. Other approaches, such as the use of incremental weights to give certain paths priority over other less desirable ones, are also described. Finally, a very brief discussion of discrete wiring is presented.

Chapter 7 is concerned with the techniques of automatically deriving test sequence(s) for detecting faults of logic circuits. The author provides an excellent account of the evolution of test-generated techniques developed at IBM. Most of the methods on test generation for combinational logic, such as those by Forbes, Stiegitz, and Muller, and by Maling and Evans had been used in practical applications. The discussion on test-generation methods for sequential logic is relatively brief. It primarily covers the work by Sehus-Freeman and the unpublished work by Auch-Cheng-Preiss. Those who have been exposed to only the theoretical treatment of fault-test generation will probably find this chapter interesting as it touches upon several practical aspects of the problem.

Overall, this is a good introductory book for those who are entering the design automation field. This reviewer also recommends that this book be included in the must-read list for those who are interested in computer engineering techniques.

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B74-4 Minicomputers in Data Processing and Simulation—B. Souček.
(New York: Wiley, 1972, 467 pp., $19.95.)

The stated purpose of Branko Souček’s book Minicomputers in Data Processing and Simulation is to present the theory and application of digital simulation and measurement of data with emphasis on the use of minicomputers. The title is somewhat misleading, however, because the book is of interest to an even wider audience, including those interested in data acquisition, monitoring, industrial process and manufacturing control, and others. In particular, the section concerned with minicomputer hardware organization and interfacing collects information of great interest in a very readable fashion and fills a long existing void.

Content-wise, the book is divided into three parts. The first part, Chapters 1-4 (150 pages), is an elementary introduction to computer hardware and software. The level of this section of the book is quite beneath that of the remainder, and the section contains material that is readily available in almost any introductory textbook on computers. Chapter 1 reviews binary and decimal number systems, as well as various codes for the representation of numbers and characters. Chapter 2 is an elementary discussion of digital logic including gates, flip-flops, digital system design using Boolean equations, nomenclature for integrated circuit elements, and it ends in a discussion of digital computer organization. The chapter is very superficial in its treatment, and consequently not useful to anyone wishing to design interfaces for minicomputers. It is probably of limited use to one interested in logic only so that he can understand the detailed discussion of minicomputer hardware in later chapters. In any future edition, this chapter could be significantly improved by directing it toward the latter purpose, namely, presenting a number of examples of logic circuits of the type used in minicomputer interfaces and quantitatively tracing through the sequential events. This would prepare the reader for an in-depth understanding of the latter parts of the book.

Chapter 3 continues with the discussion of basic computer instructions, and ends with the discussion of addressing in a minicomputer. The chapter is somewhat misleading in that the only memory organization discussed is a paged addressing scheme where the instructions can reference either the current page or page zero. This chapter could well have addressed itself to the problem of addressing a large memory in a short computer word, which helps explain the variety of minicomputer organizations discussed later. The fourth chapter is concerned with software, with emphasis on the organization of a program at the Fortran level. The discussion of software is not detailed enough to teach someone to write programs in Fortran or any other language, and it does not present the software problems peculiar to minicomputers.

The first part of the book discussed above is clearly directed toward the novice user of minicomputers. As an introduction to the second and third sections of the book, other elementary textbooks may be necessary to the reader in order to fully comprehend the material.

The second part of the book, Chapters 5-6 (143 pages), is a discussion of interfacing, input-output, and the overall minicomputer hardware organization. These chapters are very well written, and serve to lead the reader through a detailed discussion from the logic level through the overall machine organization; they result in a rather complete picture of the state of minicomputer hardware today. In my opinion, these two chapters justify the cost of the book.

Chapter 5 begins with a discussion of registers and operations on registers, and proceeds through I/O state and timing signals, various signals needed to get data in and out of the computer, the organization of device controllers, interrupts, and the like. This chapter is presented in a general way without reference to a specific minicomputer. Chapter 6 then proceeds to make each topic very concrete by taking examples from a number of popular minicomputers. For example, the I/O discussion is illustrated by the PDP-8 computer. Discussion includes detailed organization of the computer, I/O BUS, as well as timing of input and output instructions. Party line I/O is discussed using the Hewlett-Packard minicomputer as an example. The discussion is kept within context by first reviewing the structure of the machine and the general instruction set before emphasizing the party line I/O operation. The need to understand basic logic is evident here, for the organization is illustrated profusely by logic diagrams which are then carefully explained in the text.

Further discussion of input-output structures is carried on using the Varian minicomputer as an example. The three examples illustrate most modes of minicomputer I/O and provide a very comprehensive overview of organizations, interface forms, timing problems, and the like.

Chapter 6 then considers the PDP-11 minicomputer in some detail. Registers, addressing modes, special instructions, and stack operations for this machine are illustrated. Twenty pages are then devoted to the discussion of the PDP-11 Unibus including interfacing requirements,
The third portion of the book is associated with the use of minicomputers for data acquisition purposes. Chapters 7-10 (139 pages) presume a more sophisticated reader than either of the first two parts of the book. The author uses the word "simulation" to mean the generation of data with prescribed statistical characteristics. This is justified on the grounds that experimental design usually cannot be carried out automatically, and consequently the data that would be generated by the experiment itself must be simulated at the design and checkout stage. To this end, Chapter 7 considers the generation of continuous and discrete data (both random and nonrandom). Monte Carlo techniques are explained, as well as techniques for generating random variables with prescribed distributions.

Chapter 8 is concerned with data sampling and quantizing. This chapter gives an elementary analysis of sampling problems, and follows it with some examples of analog-to-digital and digital-to-analog conversion schemes. This chapter is approximately the same level as those in the first third of the book. Chapter 9 is a much deeper chapter concerned with data collection. This includes buffering problems and the effective dead time in data acquisition systems, including detailed analysis of its effects. Storage of data in complex list structures is then described. The addressing of data is then discussed at a very high level without adequate background for an uninformed reader. In particular, the addressing problem is discussed from the point of view of coding theory. The reader is required to be knowledgeable about Galois fields, polynomials, Rose-Chaudauri codes, and the like. Compared to the rest of the book, these sections are a little out of place, but nonetheless may be of interest to some readers. Adequate references to the literature are given.

Chapter 10 is concerned with the measurement of data, and emphasizes various analyzers which automatically trace statistics of data associated with some parameter, such as pulse height and pulse width. The discussion in this chapter gets very detailed, but it is at a level that the normal reader of a book like this can handle. As such, it provides an excellent in-depth case study of a particular area of application of minicomputers because problems such as buffering of large volumes of data to bulk storage are discussed in sufficient detail that the problems become apparent to the reader.

Although portions of this third section of the book require a rather good background on the part of the reader, the section nonetheless provides a good introduction to the problem of data acquisition and data simulation.

Looking at the book as a whole, it provides a reader who wishes to apply minicomputers on-line with a source of information which is not available anywhere in a coordinated fashion. Unlike books of reprints of articles in this area, the chapters are well written and coordinated. Despite the unevenness in the level of presentation in the various sections, I highly recommend this book to serious users of minicomputers.

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B74-5 Computer-Oriented Approaches to Pattern Recognition—W. S. Meisel.1 (New York: Academic, 1972, 250 pp., $15.00.)

The book Computer-Oriented Approaches to Pattern Recognition by W. S. Meisel was recently reviewed very favorably by Prof. Breeding [1]. The review emphasized the wide range of numerical algorithms contained in the book, thus making it a desirable reference for anyone working in mathematical pattern recognition.

This author completely agrees with the reviewer that the book exposes the reader to a broad spectrum of different techniques. Some of the methods are only briefly mentioned, however, and the exposure is only sufficient to make the reader aware of the technique [2, p. 50]. However, adequate references are included for readers wishing to learn more about any of the methods.

What this author feels to be the outstanding contribution of the book is the excellent treatment in Chapter 6 of potential function methods [2, pp. 98-118] for estimating data class probability densities. The development in the book closely follows that of an excellent original work by Meisel [3] in which he generally discusses potential function methods and develops an improvement of the polynomial discriminant method (PDM) reported on by Specht [4], [5]. The outstanding success experienced by Specht in the classification of vectorcardiograms with the PDM is indicative of the possible power in these methods. This writer had much less success with the PDM [6], but this was attributed to small sample size, data sets which exhibited no outstanding separable properties, and limiting the separating surface to a quadratic surface.

Nagy [7] has also commented on the success Specht achieved and encouraged further investigation. Given Specht's success and Meisel's improvements, all pattern recognition researchers should be aware of the potential function method, and Meisel's book is an excellent place to retrieve this information. As stated by the reviewer, Chapter 6 "may be used as a primer on such methods," and as such it is certainly an outstanding book in the area of mathematical pattern recognition.

REFERENCES

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1 These comments were stimulated by an original review in this section and the reader is referred to that review for further details.