agreement with the author's warning that ". . . the computer is an important adjunct to analysis and experiments, not a substitute for it."

The transformation from theory to practice is done in Chapter 15, where practical circuit-parameter values are used to solve transient problems. Chapters 16 and 17 deal with equipment and techniques that are used to measure transients.

This book is well suited as a textbook and is an asset to the practicing engineer.

Introduction to Mathematical Techniques in Pattern Recognition—Harry C. Andrews (New York: Interscience, 1972, 255 pp.). *Reviewed by Earl E. Swartzlander, Jr., Hughes Aircraft Company, Culver City, Calif. 90230.*

This book introduces the basic concepts of pattern recognition and provides a consistent notation which is especially useful to students and others who wish an introductory guide to the pattern recognition literature.

The first chapter is an introduction to the notation and the concepts of pattern space, feature space, and classification space.

Feature selection is surveyed in Chapter 2. First, various linear transformations (i.e., simple diagonal transformations, Karhunen–Loève rotational expansions, and generalized linear transformations) are described; then transformations based on minimization of the divergence of a Gaussian pattern distribution are presented; and finally nonlinear transformations are introduced. This chapter also describes a method for adaptive feature selection. The author is careful to emphasize the problem sensitivity of feature selection (i.e., most feature selection techniques are well suited to certain problems with which they produce considerably better results than they do in general).

Chapter 3 introduces distribution-free classification where discriminants are developed on the basis of known prototypes. Linear and Φ discriminants are described, as is a one-at-a-time training algorithm (and its convergence theorem). A brief survey of other classification techniques (i.e., piecewise linear discriminants, nearest neighbor rules, and the method of potential functions) conludes the chapter.

While the methods of Chapter 3 do not require knowledge of pattern statistics, the methods of the fourth chapter require statistical data. The Bayes classifier (i.e., maximum likelihood ratio) is derived and various parametric and nonparametric classifiers are developed. Some of the nonparametric classifiers described include probabilistic-descent method, potential functions with varied kernels, and an adaptive histogram method which is suitable for approximating nonstationary densities.

Nonsupervised learning (or clustering) is introduced in the penultimate chapter. Various heuristic methods, a vector field approach (similar to potential function methods), mode estimating procedures, and minimum spanning tree concepts which are useful for clustering are described. The author then explains the notion of intrinsic dimensionality. This chapter is concluded with a brief description of statistical methods for nonsupervised learning.

The final chapter is concerned with sequential learning schemes. Wald's sequential probability ratio test and Fu's modified sequential probability ratio test are described and illustrated with a Gaussian example. Other concepts treated in this chapter include dynamic programming, use of the Lehmann alternative, and supervised and nonsupervised sequential Bayesian learning methods.

Appendixes on the use of multidimensional rotations for feature selection and a rate distortion criterion for feature selection conclude the book. Of specific interest is a feature selection experiment performed on handwritten numerals which dramatically illustrates the dimensionality reduction–correct classification tradeoff which is implicit in feature selection.

This book is well suited as a text for senior or graduate level courses in pattern recognition; nearly 20 percent of the text is devoted to problems and references. There is sufficient material for a one-year sequence of courses. It is a pleasure to report that this book attains the author's goal of providing a pleasantly readable introduction to the pattern recognition literature.

Asynchronous Sequential Switching Circuits—S. H. Unger (New York: Wiley, 1969, 290 pp.). *Reviewed by Stephen Y. H. Su, Department of Computing and Information Sciences, Case Western Reserve University, Cleveland, Ohio 44106.*

Switching systems include digital computers, telephone switching systems, and many types of control systems. A switching system is often made up of many switching circuits. There are two types of switching circuits: combinational and sequential. A combinational circuit has no memory. In a sequential circuit, the present outputs depend upon the present inputs as well as the previous history of the circuits, i.e., it has memory. There are two types of sequential circuits: synchronous and asynchronous. In a synchronous circuit, clock pulses are used to synchronize the circuit operations. No matter how soon the current operation is finished, no action will take place before the next clock pulse comes along. In an asynchronous circuit, as soon as the present circuit operation is finished, a signal indicating the completion is sent out which starts the next operation immediately. Asynchronous circuits are of interest for at least two reasons: 1) theoretically, they are faster than the synchronous circuits; and 2) frequently, it is important to have a circuit which can operate asynchronously, such as the interface circuit controlling the interactions between high-speed digital computers or other switching systems and low-speed peripheral devices such as card readers, printers, etc.

The approach of this book is different from most other books since instead of starting with some definitions and theorems, the author starts with a practical interesting problem of designing a switching circuit for the control of highway traffic. He goes through the whole design process step by step, until the logic circuit is obtained. Then he points out the undesirable operations, such as hazards and critical races, which can occur in asynchronous circuits and presents methods of eliminating them. The rest of the chapters of the book treat various steps of synthesizing asynchronous circuits in detail.

This book is different from most of the other books in the switching theory area in that instead of covering many different topics, it covers the topic of asynchronous sequential switching circuits thoroughly and informally. The thorough treatment provides the reader with a clear deep understanding of the subject. The informal treatment along with many examples, makes the book easier to read without requiring special mathematical background. With some general knowledge of combinational circuits and the Kanaugh map, a reader who is not in the switching theory area can understand most of the material. The book contains updated material and the presentation is clear. It contains solutions to about one-third of the problems and a large number of references. The book is suitable for self-study. It is a good reference book for people in the control area who are interested in the application of switching theory to control circuits. It can also be used as a text for a second course in switching theory.