References

BATHER, J. A. (1962). "Bayes Procedures for Deciding the Sign of a Normal Mean", *Proc. Camb. Phil. Soc.*, Vol. 58, p. 599.

CRANK, J. (1957). "Two Methods for the Numerical Solution of Moving-Boundary Problems in Diffusion and Heat Flow", *Quart. Journal Mech. App. Math.*, Vol. 10, p. 220.

CRANK, J., and NICOLSON, P. (1947). "A Practical Method for Numerical Evaluation of Solutions of Partial Differential Equations of the Heat-conduction Type", *Proc. Camb. Phil. Soc.*, Vol. 43, p. 50.

DOUGLAS, J. (1961). *Advances in Computers* (Vol. 2, edited by F. L. Alt), New York and London: Academic Press.

DOUGLAS, J., and GALLIE, T. M. (1955). "On the Numerical Integration of a Parabolic Differential Equation Subject to a Moving Boundary Condition", *Duke Math. Journal*, Vol. 22, p. 557.

EHRLICH, L. W. (1958). "A Numerical Method of Solving a Heat Flow Problem with Moving Boundary", *Journal Assoc. Comp. Mach.*, Vol. 5, p. 161.

EVANS, G. W., ISAACSON, E., and MACDONALD, J. K. L. (1950). "Stefan-like Problems", *Quarterly of Applied Mathematics*, Vol. 8, p. 312.

LANCZOS, C. (1957). *Applied Analysis*, London: Pitman.

SACK, R. A. (1965). (Private communication.)

TRENCH, W. (1959). "On an Explicit Method for the Solution of a Stefan Problem", *Journal Soc. Ind. Appl. Math.*, Vol. 7, p. 184.

WRAGG, A. (1966). "The use of Lanczos τ-methods in the numerical solution of a Stefan problem", *The Computer Journal*, Vol. 9, p. 106.

Book Review

Pattern Recognition, by Leonard Uhr, 1966; 393 pages. (London and New York: *John Wiley and Sons Ltd.*, 68s. cloth, 45s. paper.)

This is a most stimulating book. Leonard Uhr, who is well known for his work on computer programmed models of visual perception and cognition, has collected together from a range of disciplines important papers relevant to pattern recognition in all its aspects. He attempts "to focus on the problem of pattern recognition as it would be posed by someone interested in the psychological functions of perception and cognition". The result is a gold-mine of information and ideas.

There are five sections each of which contains approximately five papers drawn usually from the last fifteen years, but occasionally from considerably earlier. The first section is particularly pleasing for it introduces us to the subject by way of the thinking of such men as Peirce, Cassirer and Wittgenstein. Thus we are able to decide for ourselves the value of the more philosophical and theoretical approaches to the subject.

The second section is devoted to some of the experimental evidence on visual perception. Here are an important survey and discussion by Vernon of the nature of perception, and an early attempt by Attneave and Arnoult to study quantitatively the concept of shape—work which pioneered the computer scientist's now established approaches. Section 3 deals with attempts to interpret the experimental evidence. Deutsch's model of shape recognition in terms of a two-dimensional network of cells is accompanied by a paper by Dodwell discussing theories of discrimination learning with special reference to shape discrimination. Here also is a paper by Reichardt who is remarkably successful in modelling aspects of visual perception in the beetle Chlorophanus.

Section 4 brings us to neurophysiological results which are directly relevant to models of perception and their computer implementation. Experiments to investigate the organization and behaviour of retinal cells in the frog are described in a paper by Barlow, and important results revealing how the excitation of a specific visual cortex cell in the cat may be determined by a complex but precise stimulus are described in a paper by Hubel and Wiesel. A paper by Young presents a neurophysiological model of shape perception in the octopus and discusses the mechanics of motivation and reward.

Finally we reach the editor's own field, that of attempts to create digital computer systems of perception and cognition comparable with those we observe in nature. The approach by way of adaptive networks is represented by Roberts' extension of Rosenblatt's "Perceptron". More structured models described include Selfridge's "Pandemonium", and Uhr and Vossler's program that decides for itself what features to look for in the unknown pattern. The section, and the book, ends with a recent paper by Uhr himself in which he surveys the present and future of pattern recognition programs.

Uhr has made a rather personal selection of papers, but I do not at all regret this. His own views are sufficiently ordered to bind together material from many sources, and, even where he is perhaps being unorthodox, as in his willingness to accept introspection as a valid source of information, he is almost always convincing. Thus I find this book an excellent introduction to, and brief survey of, the work of the psychologist of perception and the computer scientist trying to program feature extraction and pattern recognition. Although the latest work in the computer area, for example that of Kamentsky and Liu, and Marrill's Cyclops project, is not included, Uhr in his preface makes clear to where the reader should next turn.

The book is equipped with subject and name indexes, and the bibliographies are often very extensive. It is a pity that so desirable a work is marred, in the reviewer's copy at least, by printing which has occasionally produced faded or blurred pages. But this is a small matter.

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