building up a network by a series of steps can record his current state, or return to a previous state. The information saved in this way can also be filed, and used to produce microfilm copies of the screen image.

3. *Applications*

The work described in this paper can be considered in two ways. A piece of self-contained software has been produced, intended for use by researchers in any discipline who have networks which they wish to display and explore. It has been used, for instance, to represent patterns of co-occurrence between words in natural language texts (Jones, 1976) and, by contrast, to illustrate social interactions within a small group of people. Whatever the application, the user has the task of identifying the individual elements to be associated and what the connections between them represent. The programs can provide useful manipulations of this data.

However, from the point of view of the LEGOL project, the software is just an aid to the process of examining legal rules in terms of networks. Section 1 discussed the problems of analysing an Act of Parliament into textual elements and connections but such an analysis is only a first step. The textual units must be translated into automatically interpretable rules and the precedence relationships between them converted into instructions about the order in which such rules ought to be applied. The application of rules by the LEGOL 'interpreter' should cause operations to be performed on stored data representing typical cases, e.g. persons and their relationships in order to generate results, e.g. details of families satisfying the conditions specified in the Act and the amount of allowance to which they would be entitled. The relationships of dependency between the different data elements used and created by LEGOL rules may also usefully be represented as a precedence network.

In the context of the LEGOL project then, software to handle networks is intended to assist the difficult process of moving from the textual to the operational level of specification, of producing an automatically interpretable set of rules which retain the essential structure of the legislation from which they were derived. As such it is a very small part of a system which may eventually prove useful to lawyers or parliamentary draftsmen.

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References

BUSACKER and SAATY (1965). *Finite Graphs and Networks*, McGraw-Hill.

JONES, S. (1976). Word Collocation as a Principle of Classification, *LSE Papers in Informatics* (T21). Paper given at meeting of Classification Society at the Cambridge Language Research Unit, April 1976.

STAMPER, R. K. (1976). *The LEGOL Project: A Survey*, IBM UK Scientific Centre Report No. UKSC 0081, Peterlee, 1976.

STAMPER, R. K. (1977). The LEGOL 1 Prototype System and Language, *The Computer Journal*, Vol. 20 No. 2, pp. 102-108.

THORNTON (1970). *Legislative Drafting*, Butterworths.

WATERS, S. J. (1976). CAM01: A Precedence Analyser, *The Computer Journal*, Vol. 19 No. 2, pp. 122-126.

Book reviews

An Introduction to Mathematical Modelling, by Edward A. Bender, April 1978; 256 pages. (*John Wiley*, £11·95)

This is an interesting book, one can learn from it how to formulate and tackle a variety of problems in environmental, biological and social sciences using elementary mathematics and statistics. These fields are different from the traditional physical sciences, where mathematics has been most successfully applied in the past; a different outlook is needed, the problems are not well structured, the solutions are often qualitative rather than quantitative, the problems are practical and do not fit the conventional standard methods. The book deals with these problems by identifying the more important features while ensuring that the ignored details do not invalidate the broad results obtained. Computer methods do not feature prominently but they are used where appropriate.

The first chapter illustrates the main features of model building by considering the problems of population growth and the number of salesmen a firm should employ. Chapter 2 uses arguments based on proportionality, scale and dimensional analysis to solve problems on cost of packaging, shape of racing boats, size of animals and pendulum period. Chapter 3 applies graphical methods to problems on the missile arms race, the number of species on an island, the theory of the firm, stability in economics and group dynamics. Chapter 4 uses optimisation methods in problems concerned with inventory control, geometry of blood vessels, fighting forest fires, bartering economics and caste formation in ants. Chapter 5 applies probability to problems in population studies, sex distribution, the psychology of choice and learning, simulation of a doctor's waiting room, sediments and river networks. Chapter 6, titled Potpourri, studies temperature control in the body of the desert lizard, election procedures, respiration and carbon dioxide elimination. Chapters 7, 8 and 9 introduce differential equations and apply them to problems in the pollution of lakes, driving hazards on road curbs, polymer chains, towing a water skier, stability problems, species interaction and population size, Keynsian economics and the dynamics of car following in heavy traffic. The last chapter studies stochastic models in radioactive decay, facility location and particle size in sediments.

The mathematics used is first year college level, each chapter is supplemented by further exercises, problems and references. There is an appendix on probability and a classification by subjects of the 90-odd problems considered in the book. It would be a pity if, as I suspect, this book does not fit easily the teaching program of mathematical specialists, but it should prove a useful source of material for teaching mathematics to non specialists.

I. M. KHABAZA (London)

Discrete Mathematics in Computer Science, by D. F. Stanat and D. F. McAllister, 1977; 401 pages. (*Prentice-Hall*, £12·80)

This book is an attempt to gather together the parts of mathematics that are used in the various branches of computer science. It contains chapters on mathematical models, mathematical reasoning, sets, binary relations, functions, counting and algorithm analysis, infinite sets and algebras. Each chapter introduces the definitions and theorems necessary for discussing the particular topic and where possible attempts have been made to provide solutions to related computing problems using an ALGOL-like programming language. There are a large number of mathematical problems set throughout the text as well as some problems that require the reader to produce solutions to programming problems.

Many students of computer science who are required to do courses on pure mathematics may well find this book will give them some indication of which parts of mathematics are useful tools in their computing studies.

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