

Book REVIEWS

Progress in Artificial Intelligence
Editors: Luc Steels and J. A. Campbell
Ellis Horwood Publishers, 1985
£28.05, 318 pp, ISBN 0 853 12830 8

This book contains 21 selected papers given originally at the 1982 European Conference on Artificial Intelligence in Orsay, France. The book succeeds in its aim, as expressed by the editors, to provide an "accessible channel of distribution for a selection of AI papers in areas where recent achievements in the subject have been significant."

The papers are divided into 5 chapters: Problem Solving and Learning, Knowledge Representation, Reasoning and Control, Extending the Scope of Knowledge Representation and Reasoning, Artificial Intelligence and External Relations and Areas of Application. The papers taken together provide a good overview of progress and efforts in the field, an many of the papers provide ideas helpful to researchers in AI, particularly applications of AI. About half the papers give results of work in the U.S. and half from Europe, and many of the authors are leading figures. The compilation, hence, gives a good general picture, not a narrower European view.

There has in the last few years been a rapid increase in the number of people working on research and development in AI applications. A common problem of many groups and researchers is to be able to assess well which problems are worth attacking, and how to attack them; which problem and which approach is old hat; which is new; which will turn out to be intractable or inefficient. This book will be very useful for that audience. Most of the papers provide good information, both in general and in detail, and will not rapidly become out of date.

A common failing of papers at many AI conferences has been that researchers rush to publish about what they intend to do, before actually doing it, and there is a mass of papers in the general literature which discuss pseudo solutions to problems divorced from the difficulties of real implementation. In this book 14 of the papers (3) discuss work implemented and done, which is a welcome high proportion.

For those interested in the continuing debate about whether machines can be called intelligent, this book provides interesting background information. The papers on learning problems, reasoning, knowledge representation, analogy and modelling of emotion show clearly that, although there was a time when much AI work was devoted to technical details of heuristics, research today regards heuristic search as a tool and explores questions beyond heuristic details.

This is a volume worth acquiring for an academic or industrial AI research group.

*Prof. K. Preiss,
 Ben Gurion Univ. of the Negev,
 Beer Sheva, Israel*

A Guide to Expert Systems
Donald A. Waterman
Addison-Wesley Publishing Company,
1985
Price: \$27.95

Expert Systems (ES) are going to be an important addition to the engineer's tool kit. These systems have been successfully applied to a number of problems in the industry. The book by Waterman provides a wealth of information about this new technology. Waterman's book is divided into six sections, consisting of 30 chapters. These sections are reviewed below.

Section 1 (Chapters 1-6) introduces the subject of expert systems. A few definitions of expert systems are provided in Chapter 1. The author stresses the importance of knowledge in expert systems with the following statement: "The accumulation and codification is one of the most important aspects of an expert system". Chapter 2 provides a case for the use of ES. The organization of ES is the subject of Chapter 3. A typical ES consists of a *knowledge-base*, an *inference engine*, and a *context*, with optional modules, such as the *knowledge-acquisition* and the *explanation modules*. However, the author introduces the ES as consisting of only the inference engine and the knowledge-base; perhaps the author did not want to confuse the readers with too many details. A number of differences between conventional programs and ES is pointed out in Chapter 4. A few issues could have been discussed in more detail. The nature of problems that ES are useful for is addressed in Chapter 5. I liked the Figures illustrating ES in various domains. However, some of the systems included under one domain could easily be categorized under a different domain. For example, the DART system helps in the diagnosis of computer hardware faults. Computer hardware diagnosis, frequently, is performed by electronic engineers. Hence, the system should have been categorized under Computer and Electrical Engineering. Also, one wonders why the author chose to separate Electronics from Engineering. It is a difficult task, but on the whole the author did a good job of classifying various domains. The rules on page 36 for monitoring looks like a diagnosis rule to me. In monitoring, alarms are set when faults are found. This is not very clear from the given rule. The final chapter in this section 6 discusses PROSPECTOR, an ES developed to aid the geologist in mineral exploration.

Section 2 (Chapters 7-10) provides a more technical presentation of ES concepts, presented in Section 1. The rule-based, semantic, and frame-based representations are discussed in detail with examples in Chapter 7. The discussion on frames is particularly good. The logic-based representation is not adequately discussed anywhere in the book. Since details of the inference structure are also provided in this chapter, it should have been titled "The Representation and Use of Knowledge" instead of "Knowledge Representation". Two problem solving strategies –

Forward chaining and Backward chaining – are lucidly discussed. The types of tools used in ES development are provided in this chapter. The author brings in the issue of explanation and debugging modules. The evolution of ES tools is discussed in Chapter 9; these ES tools evolved from university research to viable commercial tools. A table provides information about use, knowledge-representation, hardware and developer of various tools. Descriptions of OPS5, EXPERT, EMYCIN, and ROSIE, which are ES development tools, are provided in Chapter 10.

Section 3 (Chapters 11-15) addresses important issues in building expert systems in good detail. This section is specially useful for managers, and other groups, who plan to develop commercial expert systems. Before venturing into a major developmental effort, the feasibility and applicability of expert systems to a particular domain should be studied. Chapter 11 provides several guidelines for this purpose. The five stages – *identification*, *conceptualization*, *formalization*, *implementation*, and *testing* – involved in the development of ES are discussed in Chapter 12. The implementation stage requires the need for a developmental tool. Several criteria for the selection of such a tool are described in Chapter 13. Towards the end of this Chapter, the author discusses an important question "Is the best development tool the best production tool?". The knowledge acquisition process, which is a major bottleneck in ES development, is the subject of Chapter 14. A number of guidelines are suggested. However, I feel that the statement "Don't be your own expert" is too strong. Since the engineer would have acquired his knowledge after several years of experience on the job it is better for him to become conversant with the ES technology rather than a knowledge engineer trying to learn a new domain. An example, which involves the evaluation of personal injury claims related to product liability, illustrating the concepts presented in the previous chapters is provided in Chapter 15; this example is simple, yet it lucidly illustrates the ES development process. I feel that this section is well written and the issues presented are worth pondering over.

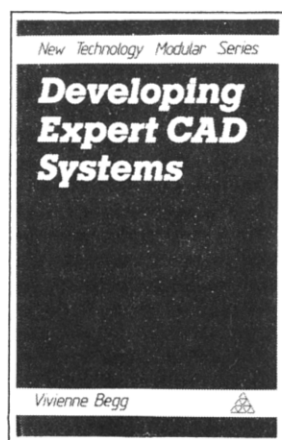
The common pitfalls encountered in developing ES are discussed in Section 5 (Chapters 16-19). Chapter 16 points out a number of limitations in trying to apply the ES technology. Common pitfalls and some solutions to avoid these pitfalls are discussed in Chapter 17. Problems in dealing with domain experts are described in Chapter 18. Several problems that are likely to be encountered during the developmental process and solutions about how to avoid them are addressed in Chapter 19. Section 5 (Chapters 20-23) discusses work being conducted in various organizations. Section 6 (Chapters 24-30) provides information about existing ES tools; existing ES in engineering, medicine information management, law; and a comprehensive bibliography. The above two sections span nearly 150 pages and contain descriptions of approximately 250 expert systems. It is an excellent collection of information in one place.

The volume will make a good addition, in

particular a good reference, to your book collection.

The subject of Artificial Intelligence (AI) is very wide and embracing. Available is a plethora of texts concerned with the field. The majority apply themselves to some particular sub-set of the subject. Most assume that the reader understands the rudiments of this vast subject. There are still, however, many people around that do not follow the jargon which accompanies AI and hence the basic concepts. It is refreshing then to come across a number of books which set out to breach this gap. The two descriptions that follow are of texts which are designed as overviews to AI, and attempt to bring meaning to the technical jargon that is so much in abundance within present day engineering.

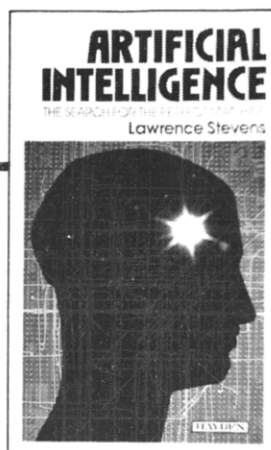
D. Sriram
MIT



Developing Expert CAD Systems
Vivienne Begg
Published by Kogan Page
ISBN 0-85038-818-X

Having said that this book is an overview of AI is not totally true. It does, in fact, concern itself with the application of CAD to electronics engineering. However, the book assumes little foreknowledge of the subject, and what jargon is used is explained fully. The book sets out to show the possible uses of CAD within electronic design, and goes on to explain how the use of these tools can be made easier to use and more powerful by the use of AI. The background of both CAD and AI within electronics design is laid out well. The book makes interesting reading. The book offers useful background to most people although it is dedicated to the field of electronic design.

Andy Mercy



Artificial Intelligence – The Search for the Perfect Machine
Lawrence Stevens
Published by Hayden Book Company
ISBN 0-8104-6327-X \$14.95

This book truly offers an overview to the complete subject of AI. A brief history of the field is followed by chapters describing the logic involved, expert systems, image-understanding systems, robotic systems and teaching systems. Each chapter sets out to explain in simple terms the rudiments of each of these areas.

After this sound basis, part 3 of the book describes the logic of AI in more detail. These concepts are illustrated with examples of AI programs already in existence.

To end with, the psychological and philosophical aspects of the subject are discussed. Is AI attainable? Even the assumptions made by present researchers are discussed.

The jargon is explained in simple words, the concepts are unravelled. If anyone is looking for a first text, an introduction to AI, then they could do little better than this one.

Andy Mercy
Computational Mechanics Institute, Ashurst,
Southampton, UK

A Practical Guide to Designing Expert Systems

Chapman & Hall, 174 pp., 0 412 264501,
1984, £15.00

Many books have been written about expert systems – defining and explaining the jargon which is used in connection with this subject. Few claim to describe how to build an expert system. 'A Practical Guide to Designing Expert Systems' by Sholom Weiss and Casimir Kulikowski gives a general introduction to some of the terms used in expert systems, discusses many of the points which should be considered in the design

of an expert system, and gives practical examples collected from their building. This book may be useful for computer scientists with some knowledge of Artificial Intelligence interested in building systems which can display a degree of expertise using simple and well tested methods. It is also suitable for those outside computer science who wish to learn about the ideas and techniques involved in basic expert systems.

The opening chapter provides a good introduction to the concept of expert systems but gives the impression that all the problems of building an expert system are easily overcome. The following chapters dispell this impression in various ways.

Reasoning methods used in expert systems are reviewed as are the other main elements of a production rule system. The overview of earlier systems did not provide any new material but put into context the introductory remarks about expert systems. These chapters provide a theoretical basis for those following, which describe how to design and build an expert system.

The expression of expert knowledge in rules is discussed and different types of reasoning rules which may be used are described (here as throughout the book, points are well illustrated by examples). Features which may be thought useful (some may say essential) for an expert system are also described, for example explanation facilities, allowing volunteered information, and tracing mechanisms.

The most pragmatic part in the book describes some of the problems which will become apparent as an expert system is being built, particularly in knowledge elicitation. It is now clear that the authors have had some practical experience in developing expert systems. A section on testing and evaluating an expert system describes tools which are available for checking consistency of the knowledge in the system. Aspects of comparing the performance of a human expert and system are also discussed.

The style is informal, making it easy to read although unsuitable as a reference text. The authors concentrate on systems which use a rule based representation of knowledge and do not attempt to tackle more complex representational issues. However readers should gain useful knowledge about building a system that works.

Sue Green,
CAD Centre,
University of Strathclyde,
Glasgow, UK