the tutorial examples. They needs must be drawn into the mainstream of scientific research and review, with the assumptions and methods of solution presented for peer review in the appropriate scientific domains. There is a fairly smooth progression of complexity (and real world applicability) from models of rabbits breeding in geometric ratios to global models of climate change. Exactly where on this scale lies the limit of applicability of Eco-Logic remains to be seen. Nevertheless, the motives behind the project are laudable, and maybe advances in logic programming technology will push the frontiers of applicability further.

In summary, a very nice book with much to commend it.

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From natural language processing to logic for expert systems edited by André Thayse, John Wiley & Sons, Chichester, 1991, pp 535, £29.95, ISBN 0 471 92431 8.

Two of the central issues in artificial intelligence research are knowledge representation and inference. Among the many formalisms and inference mechanisms researched and used, probably the first used formalism still occupies the central platform. That formalism is logic. The advantage of using logic is its clean semantics, well developed methodology and techniques of making inferences. Effective use of logic, as with any other discipline, requires considerable thought. Practical examples which bring together the theory and practice would be very beneficial for beginners as well as experts. The successful application of logic in different fields is the main theme for the trilogy *A Logic Based Approach to Artificial Intelligence*. The first two volumes are devoted to basic logic, concepts and various AI techniques. The volume under review is the last of the series, which emphasizes the use of the various logic languages and formal grammars described in the previous volumes for the most significant application areas of AI and computer science. The book consists of eight self-contained chapters, organized according to the general theme, as the editor states:

spoken natural language → *written natural language* → *logic languages* → *application-specific language* → *programming language*

The first chapter starts with speech recognition. It first discusses the general problems involved, and then moves on to hidden Markov models and the related problems in acoustic decoding. The major point of the chapter is how to use a language model based on a recursive transition network of a context-free grammar to improve the recognition algorithm. The strength of the proposed language model results from incorporating syntactic knowledge into the algorithm. Surprisingly, the very first chapter is not really about using logical formalism.

Chapter 2 continues the main theme. The first part overviews the general issues in natural language understanding and develops a logical language in an intermediate logic form. It is instructive to see that various results and tools of mathematical logic can be used to increase the competence of natural language processing systems. The rest of the chapter explains how to translate the form described in the first part into Prolog form, a chosen target application language for a particular realization of the proposed formalism.

Chapter 3 is on building knowledge bases for expert systems. It starts by illustrating the advantage of a logic-based approach for the construction of problem solvers for expert systems. Then the discussion focuses on a particular formalism and the different aspects in using it to represent various parts of a knowledge base. Much effort is devoted to plausible reasoning by an inheritance hierarchy in an object-oriented manner.

Chapter 4 introduces two classical realizations of truth maintenance systems. The two paradigms of Doyle's TMS and de Kleer's ATMS are explained superbly in a clear and concise way. This chapter also includes the discussions about why these two techniques can make knowledge based systems more efficient.

Chapter 5 is an introduction to the main approaches to machine learning, which is an excellent review of this particular field. It covers a wide range of issues and techniques from general architecture of learning systems, inference rules used, to different learning strategies. It is one of the few chapters in the book that just assume a general knowledge of AI to understand the contents.

Chapter 6 addresses the definition of a formal language for requirements engineering of software systems. After articulating the activity of requirements engineering and its role within the software development lifecycle, the author primarily systematically reconstructed a language which incorporates various logics such as temporal logic, multi-sorted logic, logic of partial functions, etc.

Chapter 7 deals with the extension of Montague's semantics. This chapter heavily depends on the material described in the first two volumes, although it includes a brief overview of the basic concepts and limitations of Montague's intensional logic. The purpose of this chapter is to show how these limitations can be overcome by the translation of the alternative formalisms such as the theory of discourse and boolean semantics, into the language of intensional logic. The power of this enriched logic is exhibited by its application to natural language representation. The chapter concludes with a discussion of the flexible Montague grammar and its extension.

Chapter 8 is devoted to proof verification in type-theoretic languages. It discusses type-theoretical logic of higher order, and shows how this powerful language can tackle the tasks which would be difficult to handle by directly using first order logic. A particular system called Automath for proof checking of constructive type theory is described in detail. Towards the end of the chapter, tactics are introduced as a way to enhance the performance of the systems.

In general, the book met its original motive and showed several uses of logic in different areas of artificial intelligence. Many concrete applications have been presented and analysed. The book is well edited, and forms an integral part to the previous two volumes. Each chapter contains a good bibliography. However, it is doubtful whether someone without familiarity with the application domains would be able to make sense of the details of the specialized discussions. Certainly, the book does not provide an easy way of becoming familiar with the issues in each of the fields convered. The editor and indeed the authors did make an effort to link the diverse applications together, and a foreword is included to summarize each chapter and the possible links between them. However, the connection between them is weak, which I think is due to the nature of such a book.

All in all the book would seem to be of interest to those with a particular involvement in one of the areas covered, rather than a way to learn from practical applications in these fields. It is doubtful that any reader could find that all the material in the book is useful.

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Artificial intelligence from A to Z by Jenny Raggett and William Bains, Chapman & Hall, UK, 1992, pp 246, £11.95, ISBN 0-412-37950-3.

This book must have seemed like a great idea when it was first proposed. I can just imagine a sharp-suited someone with an eye on their profit margin announcing "Let's provide a 'Bluff your way in AI' guide for all those harassed middle managers who've heard about the subject but are far too overworked to read a serious textbook, it'll be a bestseller", and then deciding upon a glossary of AI topics, each being explained in jargon-free terms. It sounds like a good idea, and in fact the book almost lives up to its back cover billing of *entries . . . which are extensive and discursive, . . . written in a clear, informal manner*. Except that many of the entries are riddled with errors, and not even the cute icons with which the book is littered, or the folksy hand-drawn diagrams, or even the large friendly letters with which the entries are titled, can make up for the inaccuracies.

These inaccuracies range from the complete fabrication of some terms to sloppy referencing in others. For example, the authors define something called "Bayesian Logic" (page 24), which just does not exist—what they describe is a confused version of Bayes theorem, which in reality has very