defined in the interface. Once again the authors back this up with a detailed case study, this time a material requirements planning system.

In Chapter 4 the ACt Environment is described. This helps provide a good feel of how one would use the actual system. Of particular note is a facility to generate visualisations of algebraic terms. I feel that this chapter is effective as it can be, however there is no real substitute for first hand experience of the system.

Appendix A gives a more detailed treatment of the formal theory underpinning ACT. Realistically, one needs a good grasp of category theory to understand this. Finally, Appendix B gives some brief user instructions for the ACT Environment.

I hearily recommend the book to all computer science students at Technical University of Berlin (the authors' institution)! It should also be very useful to others studying algebraic techniques in general, and industrialists wanting to gain an understanding of what is possible with algebraic specifications. The balance between theory and examples has been struck, with plenty of case studies to back up the concepts. To summarise, if the area interests you and you are prepared to grapple with a little discrete mathematics, then buy it.

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The uncertain reasoner's companion: a mathematical perspective by J. B. Paris, Cambridge Tracts in Theoretical Computer Science 39, Cambridge University Press, UK, 1994, pp 212, £25.00, ISBN 0 521 46089 1.

Uncertain reasoning is a very controversial field, where very different approaches are competing. After the era of Mycin-like "certainty factors", very popular in the 1970s, a lot of mathematical work was carried out in the 1980s to base the field on solid foundations. Dempster-Shafer Evidence theory, Fuzzy logic and related possibility theory, and many logics have been developed for addressing the uncertain reasoning problem. The old probability theory, a little bit rejected in the 1970s, is now becoming the most used formalism, in the modern form of belief networks. Some people, while convinced of the suitability of probabilities for representing uncertainty, find the constraints imposed by the belief network formalism too strong, or unrealistic, and thus have proposed methods for allowing inference from knowledge bases represented as a non-organized set of beliefs. Among these approaches, the ones based on Maximum Entropy are the most popular. The author of *The Uncertain Reasoner's Companion* is one of the most famous advocates of this last approach, and his book, while based on mathematical grounds, is clearly biased toward the author's preference.

The book can be seen to be constructed in four parts: the first part (Chapter 1) describes the motivation, and a mathematical formulation of the problem of uncertain reasoning. In the second part, three approaches are presented and discussed, namely: probabilities, which are briefly introduced in Chapter 2 and discussed in Chapter 3; the Dempster-Shafer theory, described in Chapter 4; and the so-called "truth functional theories", which contain fuzzy logic and possibility theory as special cases, are presented in Chapter 5. Chapters 2 to 5 contain detailed justifications and criticisms on each proposed approach, and they are thus controversial, even if the main content of these chapters, as is the case for the remaining of the book, is mainly a set of theorems and their demonstration. The third part is mainly devoted to probabilistic inference. Inference processes are defined in Chapter 6, and the usual inference processes are described for each approach. Chapter 7 is the most important of the book, since it contains 10 properties (principles) of common sense reasoning, according to the author's opinion. The extent to which these properties are met by the inference processes is discussed, and the main results, not demonstrated in the book but referenced, is that the maximum entropy approach is the only one consistent with all the principles.

Chapter 8 describes three methods for belief revision: Bayesian updating is the most usual one, and it is shown to be a special case of Jeffrey's updating, which in turn is a special case of Minimum

Cross Entropy updating. Chapter 9 deals with independence and conditional independence assumptions. Two examples of formalisms based on independence assumptions are briefly discussed: the Prospector inference algorithm (Prospector was among the first expert systems), and the belief networks formalism. The part devoted to belief networks, however, cannot be considered as an introduction to this field; the interested reader must consult other books. The third part of the book ends with a summary of the main results about the computational complexity of uncertain inference. All the methods of uncertain inference are infeasible in the general case, as is well known.

The fourth part of the book presents an attempt to generalise the uncertain reasoning problem to predicate calculus. Chapter 11 deals with representation, and chapter 12 with inference. This last part is very speculative, and, as the last sentence of the book says, "this is an area where much still needs to be understood".

The aim of the author was, as the title of the book suggests, to give the reader the main mathematical results of the field of uncertain reasoning in a compact and unified presentation. The book does not (and is not intended to) give a complete view of the field: many approaches are not discussed, as for instance most of the modern logics, and important authors are not referenced. So the central focus of the book is probability (and more precisely subjective probability), with a large place let to the Dempster-Shafer approach, and a small one to possibility theory. One could regret, as already stated, that the demonstration of one of the most important theorems of the book, that is theorem 7.9, which state that maximum entropy approach is the only one satisfying basic common sense principles, is only referenced. Its demonstration could at least have been presented in an appendix, if it was considered too long for being included in the main text.

Nevertheless, the book is very interesting, as it provides, as its title suggests, many theorems and demonstrations which are very useful for the scientist interested in uncertain reasoning. Its style, although very technical, is clear, once the reader has entered into the mathematical notations, which are nearer the propositional calculus ones than the probability theory ones. The book is most suited, as the author said, for mathematicians, people interested in the mathematical foundations of uncertain reasoning, or students familiar with propositional calculus.

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