Kybernetika

Book reviews

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Fuzzy Set Engineering

CRC Press, Boca Raton 1995.
331 pages.

The burst of books on various aspects of fuzzy logic and fuzzy sets in the past few years is overwhelming. They witness the growing importance of this branch which thus tends to become a technology suitable in various problems not having been solvable by classical techniques before. Most of these books are edited volumes the character of which, though the editors struggle for the coherence, is still rather diverse. From this point of view, monographs, especially if well written, are more useful for the reader as they bring a unified explanation of the matter. And still better are monographs which are written by renowned authors active in the field who bring a specific and novel treatment of the topic. In my opinion, this is the case of this book. Unlike other books, this one is a conscious attempt to provide the reader with a pure engineering approach (in the best tradition) to the problem of soft computing which is a new paradigm raised from the cooperation among fuzzy logic, neural networks and genetic algorithms.

The book consists of 10 chapters and three appendices. The core of the book is represented by the chapters 1–3 and 5 which cover the basis of engineering in soft computing. As the purpose of the book is engineering, it does not go into great details and theoretical considerations, but provides the reader with the general overview that enables him/her to use the presented knowledge for the solution of his/her own problems. Some little theory is contained in the appendices which contain information about fuzzy sets and basic operations (Appendix A), fuzzy relations and fuzzy relational equations (Appendix B) and fuzzy sets and probability (Appendix C).

Except for the mentioned topics, the other chapters deal with fuzzy control, fuzzy flip-flops and fuzzy Petri nets. Let us now go through the book in more details.

Chapter 1 is a short informal introduction presenting some basic principles of system modelling together with justification of the use of fuzzy sets. It is perhaps too brief as it still requires effort to convince engineers about the usefulness of fuzzy technology.

Chapters 2 and 5 concentrate on the questions of the optimal design of input and output interfaces of fuzzy models. Both problems are close as the first task to be solved is to specify the optimal covering of the input and output spaces by fuzzy sets. Both these problems are solved purely in an engineering style which works with the membership functions no matter of their possible linguistic interpretation. Of course, this is a quite difficult problem requiring also classical linguistics and thus, being quite far to engineers. The author touches linguistics in connection with the interpretation of the output but not very deeply. However, I do not blame him for that as such questions are still waiting for the better elaboration in fuzzy logic and fuzzy modelling and as late as then, we may expect them to be discussed in the monograph like this one.

Chapters 3 and 4 deal with fuzzy neural networks and fuzzy neurocomputations which, together with genetic algorithms may serve well in the processing module between the input and output interfaces.

Chapters 6 and 8 are devoted to fuzzy controllers, i.e. to their optimal construction (Chapter 6) and their optimal use in cooperation with the classical controllers in control problems (Chapter 8). Chapter 7 has specific position, very reasonably following Chapter 6 (where the theory of fuzzy controllers is explained) which presents several chosen software development tools aiming at the design of fuzzy systems models and fuzzy controllers. I consider this chapter very useful for the engineering purpose of this book.

The last two chapters deal with other engineering problems and methods, namely fuzzy flip-flops and fuzzy Petri nets. A very interesting, for example, is the description of the use of fuzzy Petri nets for representation of fuzzy rule-based systems (fuzzy controllers).

Some parts of the book seem to me too brief and the interested reader must seek other literature (a list of some references is contained at the end of each chapter). On the other hand, this is also the advantage, especially for those who want to get only overall information.

Altogether, I consider this book a very interesting and useful for engineers who want to learn the principles of soft computing and fuzzy technology and are thinking about its implementation in their own problems. I would also recommend this book as a teaching book in special engineering courses focused on control and decision systems design. As the book contains also many author's original results, it is nice and coherent monograph worth of reading.

Vilém Novák