JERNEJ VIRANT

Design Considerations of Time in Fuzzy Systems

Kluwer Academic Publishers, Dordrecht – Boston – London 2000.
xxxv + 475 pages.
ISBN 0–7923–6100–8.

The fuzzy set theoretical and possibilistic approach to the modelling of vague or uncertain phenomena already became a standard field of applied mathematics offering more and more sophisticated tools for processing real knowledge and information. There already exist numerous theoretical concepts, applied methods and software packages which can be used for the description and analyses of vagueness, imprecision, uncertainty and further analogous phenomena. They do not pretend to substitute the probabilistic and statistical methods in the areas in which they have good support in the reality. But they have their own specific sort of questions and answers to which the fuzzy and possibilistic methods are adequate.

The referred book contributes to fuzzy set theory and, namely, to its applications by summarizing approaches and results which are connected with the time factor in the processes regarding the fuzzy set theoretical view on the reality. Its aim is to provide engineers and other experts with a knowledge of fuzzy and possibilistic logic required for fuzzy design, building and utilization of systems and processes. It is especially focused on uncertainty of temporal propositions with natural and measurable time.

The book is formally divided into four parts where the first one, entitled *The Fundamentals of Fuzzy and Possibilistic Logic*, brings a brief survey of introductory notions regarding fuzziness, fuzzy operations, relations and functions, fuzzy algorithms, as well as fundaments of fuzzy inference and fuzzy logic. The second part the title of which is *Fuzzy Temporal Logic* is the main part of the book. Its sections are devoted to detailed investigation of temporal propositions whose evaluation is not time-stationary but it is based on time. It serves for the definition and investigation of concepts like fuzzy data, duration, time distance, fuzzy temporal relation, and also dependence of fuzzy sets and fuzzy rules. This chapter continues by further study focused on fuzzy memorizing and the concept of fuzzy memory cell. This part, in general, shows how to present the function of time as a basis of fuzzy memory constructions analogous to cells. Part III entitled *Fuzzy Sets Computation, Representation and Simulation* is oriented to engineers and other users applying the previous concepts to the computational solution of practical problems. It regards the problems of calculation, errors and MATLAB simulation. The last part *Programs* brings a summary of software tools applicable to the fuzzy set theoretical and possibilistic problems. It has rather a character of an appendix to the previous sections. The book is completed by (not very rich) list of references, and its reading is simplified by the list of figures, the list of tables and the index.

The referred book offers an extensive survey of the topic mentioned in its title. It joins the existing knowledge, skills, technology and logic design which are used when fuzzy time is present in the investigated structures. It formalizes such concepts like fuzzy-dependent inference, temporary developing knowledge or fuzzy memorizing and combines this formalization with accessible technological and software tools. The text is clearly written and well organized. The book represent a useful support for those who are deeply interested in the wide scale of time-dependent fuzzy phenomena from formalized models to practical calculation methods.

Milan Mareš