C.V. Negoiță, D.A. Ralescu

APPLICATIONS OF FUZZY SETS TO SYSTEMS ANALYSIS

Birkhäuser Verlag, Basel and Stuttgart, 1975

The book is translated into English from the Romanian version which was published in 1974.

Since Zadeh presented the concept of fuzzy sets in 1965, nearly 600 papers have been published on this topic, both theoretical and on applications in various fields.

Unfortunately these works have been scattered so far mainly because of the very wide scope for applying the theory.

This excellent book gives a systematic view to a theory of fuzziness and its applications. It collects various works in the field of fuzzy theory including the authors' recent works and systematically describes those from algebraic point of view.

Thus the reader, who is expected to have some basic knowledges on algebra such as sets, topology, lattice and category, will get to know not only the outline of the fuzzy theory but also the recent topics such as a categorical approach to fuzzy systems. Though the book is not introductory, it is also helpful for engineers who want to apply fuzzy mathematics in engineering.

The book consists of 7 chapters — Each chapter includes historical and bibliographical remarks.

Chapter 1 introduces the basic concepts such as fuzzy sets $\mathcal{L}$-fuzzy sets and flou sets. The concept of flou sets has been developed by the authors. It also gives the idea of a fuzzy probability field and introduces the concept of a category of fuzzy subsets.

Chapter 2 contains, on the basis of Chapter 1, fuzzy categories, fuzzy topological spaces and so on. Fuzzy categories, being studied by Goguen and the authors, provide us with a powerful means to approach fuzzy systems theory.

Chapter 3 describes the concept of fuzzy logic which should be distinguished more or less at its semantics from the ordinary logics,

e.g., multi-valued logic. Fuzzy logic gives a mathematical basis for *fuzzy reasoning.*

Chapter 4 discusses an algebraic approach to fuzzy systems. For example, it gives the concepts of reachability, observability, etc. in fuzzy systems. Here, fuzzy systems are also described in a categorical framework.

The reader may find this chapter interesting from general systems theoretical point of view. Indeed, category theory is playing an important role in general systems theory.

Chapter 5 contains some aspects of fuzzy automata, languages and algorithms.

Chapter 6 deals with fuzzy programming and fuzzy optimal control. The problem is how to formulate decision-making process in a fuzzy environment, which may lead us to a practical application.

Chapter 7 deals with fuzzy clustering problem based on similarity relations. The problems are of course related to pattern recognition.

Throughout the chapters, the authors have done an admirable job in blending and connecting the various and scattered works. The book would be a valuable text for working researches in the field of fuzzy theory.

Apart from an algebraic method discussed in the book to deal with fuzziness, it is also possible to find an analytical approach which may include the concepts of fuzzy measures and fuzzy integrals pursued by the reviewer.

It is desirable that both the method, algebraic and analytical, mutually help us to deal with a variety of problems in our fuzzy world.

M. Sugeno

Department of Control Engineering
Tokyo Institute of Technology