Book review

Book Title: Knowledge-based systems. Applications. (In Romanian. Sisteme bazate pe cunoştinţe. Aplicaţii)
Authors: Horia-Nicolai Teodorescu, Marius Zbancioc, Oana Voroneanu
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The book consists of seven chapters, the last one comprising general recapitulative problems. Dedicated to the knowledge based systems, the book includes basic knowledge in the domain, with a detailed overview, and practical applications in economy, medicine and engineering. The Clips and FuzzyClips programming languages are presented as a basis for the applications.

The first chapter (Fundamentals of the Knowledge Based Systems) sets up the stage for the central topics in this monograph. In a top-down manner the knowledge based systems, the intelligent systems and the notions of „data", „information" and „knowledge" are presented. The delimitations among these three notions are clearly set. A brief introduction to expert systems is accompanied by examples of the way the user interface of an expert system can interact with the user. Different logics (binary, probabilistic and fuzzy) are presented, in order to remind the reader that for a given problem there are many possibilities to solve it by using these logics or combinations of them. The chapter ends with an overview of fundamental notions needed throughout the book: graphs, trees, algorithms, and inference methods.

The second chapter (Fuzzy sets and systems) gives the reader a more extensive presentation of the fuzzy sets, operations with them and their properties, and it covers mathematical concepts such as partial ordered sets, lattices, t-norm and t-conorm. Fuzzy implications (including Mamdani, Boolean, Zadeh, Larsen) are clearly defined and exemplified. Using criteria for defining connectives, the more used interpretations of the "same-as" connective are enumerated and exemplified. The in-out functions and interpolation properties are described for Mamdani and Sugeno fuzzy systems.

The third chapter, titled CLIPS programming language, covers almost exhaustively all the elements of the language. After a general presentation of the components of an expert system and a comparison of Clips with other programming languages suitable for knowledge based systems, the chapter introduces the reader to the way of interaction with Clips. The next three sections detail the knowledge base: its syntax, the possibilities to watch, and many examples of facts and rules. The inference engine of the Clips shell and the pattern-matching process are then described. Having the basics of Clips, the authors introduce in sections 7 and 8 the conditional elements and fields and the procedural

and user-defined functions. The chapter ends with a section dedicated to the warning- and error-messages and recommendations for optimization of the Clips programs, based mainly on the decision with respect to the search strategy.

Chapter 4 is central to the book since it presents the FuzzyClips language. Using the notions already introduced in the previous chapter, the first sections deals with defining fuzzy facts and rules and with the possibilities to manipulate them. The basic operations with fuzzy sets (reunion, intersection and negation) and their graphical representation in FuzzyClips are detailed. The authors bring to attention the linguistic modifiers, both the pre-defined ones and the user-defined ones. The predefined defuzzification operators are presented together with user-defined functions that implement the COG and MOM methods. In section 9 an entire fuzzy system is exemplified. The chapter ends with a detailed overview of the way the certainty factors are used, giving clear modalities for the calculus of the CF of various types of rules.

The chapter 5 is dedicated to the applications of the knowledge based systems in medicine. First the reader is introduced to a system intended to diagnose and recommend the treatments to be followed in cardiovascular diseases. A model for the diagnosis of the trembling disease in the neurological pathology is presented, with a special emphasis on the Parkinson disease. This chapter needs some more clear explanations and more detailed examples of implementation if the book were to see a second edition.

Chapter 6, Applications of the knowledge based systems in economy and engineering, starts with a clearly defined and implemented example of an automated guided vehicle system. The implementation and the functionality of a fuzzy-controlled phase-locked loop system are detailed. For the economical model, the classical one is presented and evaluated comparatively to other implemented models of fuzzy decision loops systems in economy.

The book ends with a revision chapter intended to help the reader to fix his knowledge in the domain by solving problems of various levels of difficulty.

All subjects are enough rigorously treated, based on many examples and exercises – some of them solved, some with hints and some left to be solved by the eager reader. The detailed explanations, figures, tables, and more than 80 references along the book are helpful.

The volume is a useful contribution to the area of Knowledge Based Systems in several respects. Taken as a manual, the book covers the domain of fuzzy logic and rule-based programming, through its chapters dedicated to fuzzy sets, Clips, and FuzzyClips, in the context of the KBS. As a monograph, the book is helps the reader understand and use fuzzy systems in economy, medicine and engineering.

Some typo errors have been corrected by the authors in the errata added to the volume and also available on web. The authors are recommended to eliminate these errors in the next edition, if any, and to improve the content of chapter 5. Extension in a further edition of the theoretical chapters (1 and 2) may be beneficial for the PhD students. More examples and exercises in the last chapter should also be considered. As the book title is Knowledge-Based Systems, the authors should consider including in a new version of the volume at least one

example of expert system, possibly worked out on a graph. An example of interpolation with fuzzy logic systems could also be beneficial to the reader.

All in all, a clear presentation of the subjects, mainly in the chapters 1-4 and 6 is helpful to the target readers, comprising undergraduate, MS, and PhD students in Informatics, Electronics, Biomedical Engineering, or researchers and specialists willing to use knowledge based systems in their domain of expertise.

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