

**Priti Srinivas Sajja
Rajendra Akerker (Eds.)**

Advanced Knowledge-Based Systems:
Advanced Knowledge-Based Systems:

Models, Applications and Research



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Preamble

This edited e-book, *Advanced Knowledge Based Systems*, aims to present a broad picture of the state-of-the-art research and development of knowledge based systems in real world.

Knowledge Based Systems (KBS) are Artificial Intelligence based tools that work on knowledge base for effective decision making in more human oriented way using the expert knowledge stored in it. The rapid development of technology in both hardware and software lead towards high degree of expectations from the computing support provided through information and communication technology. In this situation only the data and information processing is not sufficient to quench the thirst of users. KBS use has already been started and researchers are traversing the field of advanced computing models, techniques and research trends of the KBS.

The intended audience of this e-book will basically consist of researchers, research students and practitioners in knowledge based systems.

We are happy to include work of eminent researchers in the area of knowledge-based systems and artificial intelligence. The seven chapters contained in this edited volume summarize the latest research on knowledge based systems. In addition, Chapter 1 gives overview of the field and its application areas.

Mahalakshmi G.S. and Geetha T.V have proposed a novel method of representing knowledge using Indian logic in their chapter “Representing Knowledge Effectively Using Indian logic”. This chapter discusses an aspect of knowledge representation adapted from Indian philosophy along with a short comparison with other knowledge representation techniques. According to the authors, such human like knowledge representation increases quality of inferences and offers more human oriented decision making.

Manish Joshi, Virendrakumar C. Bhavsar, and Harold Boley have analyzed role of KRM in matchmaking systems in chapter entitled “Knowledge Representation in Matchmaking Applications”. The chapter begins with reviewing seven different KRMs and listing features offered by matchmaking systems that use these KRMs. They have proposed propose a new KRM that represent various types of constraints. The chapter describes development of a matchmaking system that implements the proposed KRM, exemplifying its features and evaluating its performance.

An expert system for diagnostic job is presented in the chapter entitled “Diagnostic Expert Systems-From expert’s knowledge to real-time systems” by C. Angeli presents the evolution of the expert systems paradigm for fault diagnosis in technical systems and processes. The knowledge-based diagnostic techniques are presented in this Chapter along with the technical details of the system implementation. The advantages and drawbacks of various techniques presented in the chapter are outlined, examples from recent research work of expert diagnostic practice in industry are presented and current research trends are underlined to help the reader to delve into the matter.

Sunandan Chakraborty, Devshri Roy, and Anupam Basu have proposed two major data structures (a tree and a directed graph) to represent the domain knowledge within the domain model of an intelligent tutoring system in the chapter entitled “Development of Knowledge-based Intelligent Tutoring System”. The intelligent tutoring system developed by them uses the proposed data structures. A fuzzy

state based student model is used to represent a student's cognitive ability and learning behavior. The ITS is evaluated and results are discussed at end.

In the chapter "Spatial Navigation in Virtual World" by Kanubhai K. Patel and Sanjay Kumar Vij, the navigation process in a virtual world is elaborated. This chapter presents the possibilities of using neural networks as a tool for studying spatial navigation within virtual worlds. The benefits of this approach and the possibility of extending the methodology to the study of navigation in Human Computer Interaction (HCI) and other applications are described in brief. The study of computation models of navigation and the potential of using cognitive maps in the modeling of navigational processes are also described. Non-visual spatial learning model is presented for the spatial learning through virtual world exploration. Different types of locomotion in virtual world with their constraints and benefits are discussed.

The chapter "Bio-Inspired Algorithms for Fuzzy Rule-Based Systems" by Bahareh Atoufi and Hamed Shah-Hosseini presents three bio-inspired algorithms and their combinations with Fuzzy Rule-Based Systems with an objective to represent the application of these algorithms in improving the learning process of Knowledge-Based Systems. After presenting outline of the Evolutionary Computation and Swarm Intelligence topics as a subfield of Computational Intelligence, the three bio-inspired algorithms, namely Genetic Algorithms, Ant Colony Optimization, and Particle Swarm Optimization are explained and their applications in improving the knowledge-Based Systems are presented.

In the chapter, "Structure-Specified Real Coded Genetic Algorithms with Applications", Chun-Liang Lin, Ching-Huei Huang and Chih-Wei Tsai have discussed genetic search algorithms and introduced a new type of genetic algorithms (GAs) called the real coded structural genetic algorithm (RSGA) for function optimization. According to them, the new genetic model combines the advantages of traditional real genetic algorithm (RGA) with structured genetic algorithm (SGA) efficiently. The chapter includes introduction, brief review of the genetic search algorithms, fundamental genetic operation of the RSGA and major applications of the RSGA. The proposed model is applied for optimal digital filter designs and extensive numerical studies have been represented to justify the claims.

We would like to convey our appreciation to all contributors including the accepted chapters' authors, and many other researchers who submitted their chapters that cannot be included in the book. In addition, we also appreciate all reviewers who contributed to the improvement of this e-Book. Finally we would like to express our appreciations to TMRF team's assistance in designing the e-Book volume and e-Book website.

January 25, 2010

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