Book Review

The Handbook on Reasoning-based Intelligent Systems, Kazumi Nakamatsu and Lakhmi C. Jain (Eds.), World Scientific, 2013, 658p p., ISBN: 978-981-4329-47-7 (hardcover), GBP 123,-.

The term 'Reasoning-based Intelligent Systems' appeared in the last decade to provide scientific direction to design practical intelligent systems. Of course, we can consider that reasoning-based paradigms are the basis of any well-designed intelligent engineering system. However, in this book the message is about forming a theoretical basis from classical and non-classical (e.g., paraconsistent) logic rules, which help to design such intelligent systems. They are functioning as classical control systems under the usual conditions and finding the appropriate decisions under the unusual conditions.

This handbook is the first book exclusively on reasoning-based intelligent systems. The chapters involve innovative and unique investigations from researchers all over the world. One of the main theoretical and practical developers of reasoning-based intelligent systems in the world, Professor Nakamatsu, invited more than 45 scientific researchers from various continents. The editorial team of Professor Nakamatsu and the well-known Professor Lakhmi C. Jain, distributed the chapters so that the chapters with academic content are located first, and the chapters with practical applications are situated second. This makes the handbook very useful for applied mathematicians and practitioners interested in the reasoning-based intelligent systems. The excellent work of the editorial team permitted this book to be published as a classical handbook, which will be read, flipped through, and learned from again and again.

The first 10 Chapters include the theoretical framework, both theoretical and practical frameworks are represented in Chapters 11–13, and Chapters 14–23 are devoted to practical frameworks in design of reasoning-based intelligent systems in online learning,. Additionally, these chapters cover communication patterns, finger print image processing, adaptive economic agents, medical databases, and some others.

Each chapter presents a high professional investigation and the recent advances of the authors in the development of reasoning-based intelligent systems.

Chapter 1: *Advances in Intelligent Systems* gives a brief description of all chapters, included in the book. Chapter 2: *Stability, Chaos and Limit Cycles in Recent Cognitive Reasoning Systems* provides the recurrent models, which are often used to represent the dynamics of short term memory in the human brain. The cognitive structure of an emotional system is considered as an example. Some dimensional reduction techniques are proposed in Chapter 3: *Some Studies on Data Mining*. Chapter 4: *Rough Non-deterministic Information Analysis and Uncertain Information* introduces in details a novel framework for handling the incompleteness of information in tables. In Chapter 5: *Meta-mathematical limits to computation*, the axiomatization of computer science within theorems including Zermelo-Fraenkel's set theory is discussed. The problem with building adequate individual agent hypothesis, when data are distributed with application of communication protocol, is discussed in Chapter 6: *Hypothesis Refinement: Building Hypotheses in an Intelligent Agent System* and Chapter 7: *A Heuristic Algorithmic Procedure to Solve Allocation Problems with Fuzzy Evaluations* represent the main concepts and examples of the proposed heuristic algorithmic procedure. A very interesting development of non-classical logics for reasoning-based intelligent systems is found in Chapter 8: *Non-classical Logics and Intelligent Systems*. Chapter 9: *A Paraconsistent Annotated Logic Program Before-After EVALPSN and Its Applications* provides the detailed theory of intelligent control and safety verification, and some real-time control applications. The formal theory of abductive logic models and their extensions using the model choice situations are represented in Chapter 10: *Inspecting and Preferring Abductive Models*.

The intermediate chapters, according to theoretical and practical domains, are in approximately equal parts each containing three Chapters. In Chapter 11: *Supervised Neural Network Learning: from Vectors to Graphs*, an unfired framework for learning in su-

pervised multi-layered neural network based on back propagation algorithm, is considered including logo recognition, internet surfing with recommended systems, image analysis, etc. The original class of artificial neural network – paraconsistent artificial neural network based on paraconsistent annotated evidential logic is represented in Chapter 12: *Paraconsistent Artificial Neural Networks and Applications*. Chapter 13: *Paraconsistent Annotated Evidential Logic Eτ and Applications in Automation and Robotics* provides more flexible logical systems for robots, when the classical approach cannot perform well.

The practical framework involves Chapters 14–23. Chapter 14: *Adaptive Intelligent Learning System for Online Learning Environments* provides the learning model the system components, agent behavior, ontologies, and adaptive strategies to perform such operations as login, search keywords, and view lecture notes. The improved methodologies based on biological evolution paradigms are proposed to automatically generate test programs for critical components of microprocessors and are presented in Chapter 15: *Automatic Test Program Generation: How Artificial Evolution May Outperform Experience* in detail. An agent-based model of communication traffic generated within a social network and the received results of modeling by software tool NetShow 2.0 are discussed in Chapter 16: *Discovery of Communications Patterns by the Use of Intelligent Reasoning*. Chapter 17: *Adaptive Approach to Quality Enhancement and Storage of Signatures and Fingerprint Images* provides a new approach for processing the images of fingerprints, signatures, and handwritten text based on a histogram modification with five types of additional ranges. The issues of logic programming and its application to knowledge representation of electronic circuits with extended semantic terms into the grammar rules are situated in Chapter 18: *Knowledge Representation for Electronic Circuits in Logic Programming*. Chapter 19: *An Intelligent CBR Model for Predicting Changes in Tropical Cyclones Intensities* involves the model forecasting the tropical cyclones by using Case-Based Reasoning. Chapter 20: *Analysis of Sequential Data in Tool Manufacturing of Volkswagen AG* demonstrates the decision of the standardization task by using data mining techniques for extraction of data from archived text files in conjunction with CAM-information. The development of agent-based computational economic models can be found in Chapter 21: *Reasoning-based Artificial Agents in Agent-based Computational Economics*. Chapter 22: *Reasoning and Knowledge Acquisition from Medical Database using Lattice SOM and Tree Structure SOM* represents a new variant for structure growing of Self Organizing Map with experimental results by using the Coronary heart disease Database. The model of a medical diagnosis framework with the main phases and the correlating activities based on fuzzy techniques and the agent-based paradigm is descried in Chapter 23: *Approximate Processing in Medical Diagnosis by Means of Deductive Agents*.

At the end, we can wish the respected authors and editors to continue their research investigations in this very interesting and useful area and prepare an excellent follow-up publication in the future.

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