Introduction to the Special Issue on Rough Sets and Soft Computing

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The notion of rough sets was introduced by Zdzislaw Pawlak in his seminal paper of 1982 (Pawlak 1982). It is a formal theory derived from fundamental research on logical properties of information systems. From the outset, rough set theory has been a methodology of database mining or knowledge discovery in relational databases. In its abstract form, it is a new area of uncertainty mathematics closely related to fuzzy theory. Rough sets and fuzzy sets are complementary generalizations of classical sets. The approximation spaces of rough set theory are sets with multiple memberships, while fuzzy sets are concerned with partial memberships. The rapid development of these two approaches form the beginning of a "soft mathematics" and provide a basis for "soft computing," initiated by Lotfi A. Zadeh, which includes, among rough sets, at least fuzzy logic, neural networks, probabilistic reasoning, belief networks, machine learning, evolutionary computing, and chaos theory. A forum, the Third International Workshop on Rough Sets and Soft Computing (RSSC’94), was held in San Jose, California from November 10 through 12, 1994 to assess the progress of these areas. Lotfi A. Zadeh and Zdzislaw Pawlak, the two creators of the respective theory served as honorary chairs to guide the workshop. Almost of the all articles in this issue are extended versions of papers presented at RSSC’94. This workshop provides a forum for theoreticians and industry practitioners to discuss both their results and work in progress as well as to identify “grand challenges” in advancing the field of rough sets and soft computing. Eighty papers were presented at RSSC’94. The extended abstracts are available in book form published by Computer Simulation Society (Lin and Wildberger 1995). This special issue is the first collection of the final versions of some of these presentations.

The first paper by Pawlak presents the current state of rough set theory and points out the further directions. Y. Y. Yao and T. Y. Lin’s paper extends rough set theory into the territory of modal logic. This paper can be viewed geometrically, in that it is a special form of neighborhood systems studied by T. Y. Lin (1988, 1989). L. Polkowski and A. Skowron’s paper discusses their new approach on distributed artificial intelligence based on their new theory of rough mereology. A. Czyżewski’s and B. Kostek’s two papers present applications to the science and technology of sound using rough sets and soft computing. J. Grzymała-Busse and S. Than’s, and M. Chmielewski and J. Grzymała-Busse’s papers discuss issues in machine learning. The paper by S. Tsumoto and H. Tanaka reports their findings on a significant real world application of rough set theory. W. Ziarko and N. Shan’s paper discusses some deep issues in database mining. Zbigniew Ras reports his rough set approach on knowledge based systems. P. Lingras’ paper relates belief networks with rough set theory. B. Sy’s paper discusses abstract belief network. Finally, T. Y. Lin formalized the theory of fuzzy controller based on rough logic and the theory of differentiable manifolds; this should be useful in large scale control systems. All papers are reviewed blindfolded. T. Y. Lin’s paper is handled by the Editor-in-Chief.

This editor hopes that this special issue will give readers some feel for the diverse interests of rough set researchers. In this issue, we see papers related to belief networks, control, database mining, fuzzy logic, knowledge based systems, machine learning, mereology, modal logic, neighborhood systems, neural network, and soft computing. In real world applications, we see papers in biology and engineering. In the past few years rough set theory has developed very rapidly. The Rough Control Group was formed at ACM
23rd Annual Computer Science Conference (CSC’95). The group is headed by Professor Toshinori Munakata of Cleverland State University. The International Rough Set Society, chaired by this editor T. Y. Lin, was born at Wrightsvill Beach, North Carolina, during the Second Joint Conferences on Information Sciences, September 28-October 1, 1995. We welcome you to join us.

Date, C. J. 1995. Introduction to Database Management Systems. Addison-Wesley, Menlok Park, California.