GENERATION AND APPLICATION OF DECISION RULES WITHIN DOMINANCE-BASED ROUGH SET APPROACH TO MULTICRITERIA SORTING

Liping An[1], Zengqiang Chen[2] and Lingyun Tong[3]

[1]Business School
[2]College of Information Technical Science
Nankai University
No. 92, Weijin Road, Tianjin 300071, P. R. China
{ anliping; chenzq }@nankai.edu.cn

[3]School of Management
Hebei University of Technology
No. 8, Guangrong Road, Hongqiao District, Tianjin 300130, P. R. China
tonglingyun2008@sina.com

ABSTRACT. *We are considering the problem of multicriteria sorting. In this problem, a set of "if . . . then . . . " decision rules is used as a preference model to sort objects evaluated by a set of criteria. The rules can be induced from dominance-based rough approximations of preference-ordered decision classes according to the Dominance-based Rough Set Approach (DRSA). In this paper, we present an approach to generating the minimal decision rules based on Boolean reasoning techniques. The concepts of decision matrices and decision functions of the lower approximations and the boundary regions are proposed to generate the certain rules and the approximate rules, respectively. Then, the decision rules can be applied to predict sorting of new objects. An example is used for illustration of the proposed method.*
Keywords: Multi-criteria sorting, Rough sets, Dominance relation, Decision rules

1. **Introduction.** Both multiattribute classification and multicriteria sorting refer to the assignment of a set of alternatives into predefined classes, they differ with respect to the way that the classes are defined. Classification refers to the case where the classes are defined in a nominal way. On the contrary, sorting refers to the case where the classes are defined in an ordinal way [1]. The set of alternatives is evaluated by a set of criteria and regular attributes. The difference between criteria and regular attributes is such that domains of criteria are preference ordered, while domains of regular attributes are not [2].

The wide range of real-world applications of the sorting problem has constituted a major motivation for researchers in developing methodologies for constructing sorting models. Recently, a complete and well-axiomatized methodology for constructing decision rule preference models from decision examples based on the rough sets theory [3] has been proposed. The decision rules are logic statements of the type "if . . . , then . . . ". The set of decision rules represents a preference model of the decision maker who made the classification decisions described by a data set. It is more general than the classical functional or relational model [4,5] and it is more understandable for the users because of its natural syntax.

The rough set approach and its extensions [6-8] provide useful tools for reasoning from data. They are applied to various fields such as medicine, engineering, management and economy, etc [9,10]. The original rough sets idea has proved to be particularly useful in