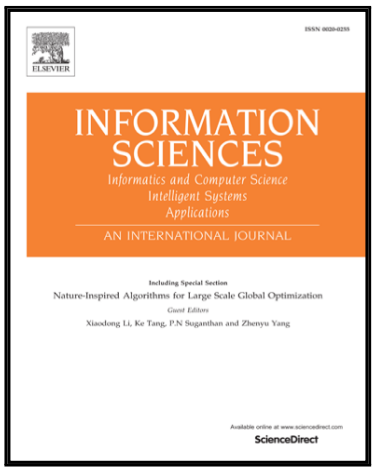

Three-way decisions based on semi-three-way decision spaces

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Three-way decisions based on semi-three-way decision spaces

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Abstract

Decision evaluation functions in three-way decision spaces must meet three axioms, the minimum element axiom, the monotonicity axiom and the complement axiom. Maintaining the complement axiom of decision evaluation functions is crucial to three-way decisions to simplify the decision rules based only on the conditional probability and the loss functions. However, some handy functions do not satisfy the complement axiom. This paper introduces the notion of semi-decision evaluation functions not necessarily satisfying the complement axiom but the minimum element axiom and the monotonicity axiom, and presents some transformation methods from semi-decision evaluation functions to decision evaluation functions. Through numerous examples this paper demonstrates the existence of semi-decision evaluation functions and significance of the transformation methods.

Keywords: Partially ordered sets; Fuzzy sets; Rough sets; Three-way decision spaces; Three-way decisions.

1. Introduction

After three-way decisions (3WD) were proposed by Yao [36-38], the theory of three-way decisions obtained the rapid development both in theory and applications [45]. The researches on three-way decisions mainly focus on three aspects, background researches, theoretical framework researches and application researches.

(1) Background researches

The background researches on 3WD are extension researches of rough set which is the root of theory on three-way decisions, such as decision-theoretic rough sets [6, 43-44],