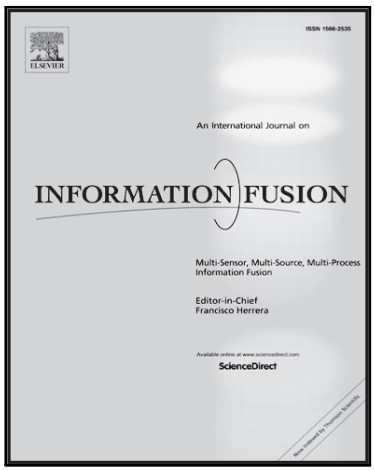

A consensus model for large-scale group decision making with hesitant fuzzy information and changeable clusters

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A consensus model for large-scale group decision making with hesitant fuzzy information and changeable clusters

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Abstract

In the large-scale group decision making (LGDM) consensus process, it is usually assumed that the obtained clusters do not change. However, as the individual preferences change as part of the decision process, this is generally not the case. The aim of this paper, therefore, is to propose a LGDM consensus model in which the clusters are allowed to change and the decision makers provide preferences using fuzzy preference relations. The most commonly used clustering method, k-means, is introduced to identify the subgroups and a possibility distribution based hesitant fuzzy element (PDHFE) is employed to represent each cluster preference. A novel distance measure over the PDHFEs is given to compute the various consensus measures, after which a local feedback strategy with four identification rules and two direction rules is designed to guide the consensus reaching process. The proposed model is distinguished from previous studies where the changes occur on the obtained clusters that the feedback mechanism is directly based on the decision makers in the identified clusters. Further, as the clusters change in every interactive consensus round, the consensus process evolution can be captured. Finally, an emergency decision to choose a rescue plan is illustrated to validate the proposed method and demonstrate distinctive characteristics compared with the existing approaches.

Keywords:
Large-scale group decision making (LGDM), Hesitant fuzzy element, Possibility distribution, Consensus, Local feedback strategy

1. Introduction

Consensus is an essential part of group decision making (GDM) problems. However, a rational consensus procedure is not just a pooling or aggregation of opinions, but a process in which rationally motivated changes are made based on individual preferences [1]. In general, consensus is defined as a dynamic and interactive group decision process coordinated by a moderator. The moderator, who plays a central role in the decision making, provides feedback, advice, and suggestions to assist the decision makers move towards a predefined consensus level. In this paper, the individuals in a group are called participators, which could refer to agents, decision makers, experts, or just people who provide online comments. The moderator determines which consensus model is most suitable and then decides on the parameters for the selected model. Cabrerizo et al. [2] provided an overview of fuzzy consensus models. Recently, a lot of new models have been presented; for iteration-based approaches, the reader can refer to [3, 4, 5, 6, 7, 8, 9], and for optimization-based approaches, the reader can refer to [10, 11, 12, 13].

Previous consensus models have generally only considered a small number of decision makers. However, the rapid development of the economy and technology has increased the demand

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