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A consensus model for group decision making under interval type-2 environment

Key words: Group decision making (GDM), Interval type-2 fuzzy sets (IT2 FSs), Feedback mechanism

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Introduction

- We propose a new consensus model for group decision making (GDM) problems, using an interval type-2 fuzzy environment;
- Consensus and proximity measures based on the arithmetic operations of IT2 FSs are used simultaneously to guide the decision-making process;
- We propose a new feedback mechanism that generates different advice strategies for experts according to their different levels of importance;
- We investigate a numerical example and execute comparable models to demonstrate the performance of our proposed model.

Consensus model under IT2 fuzzy environment

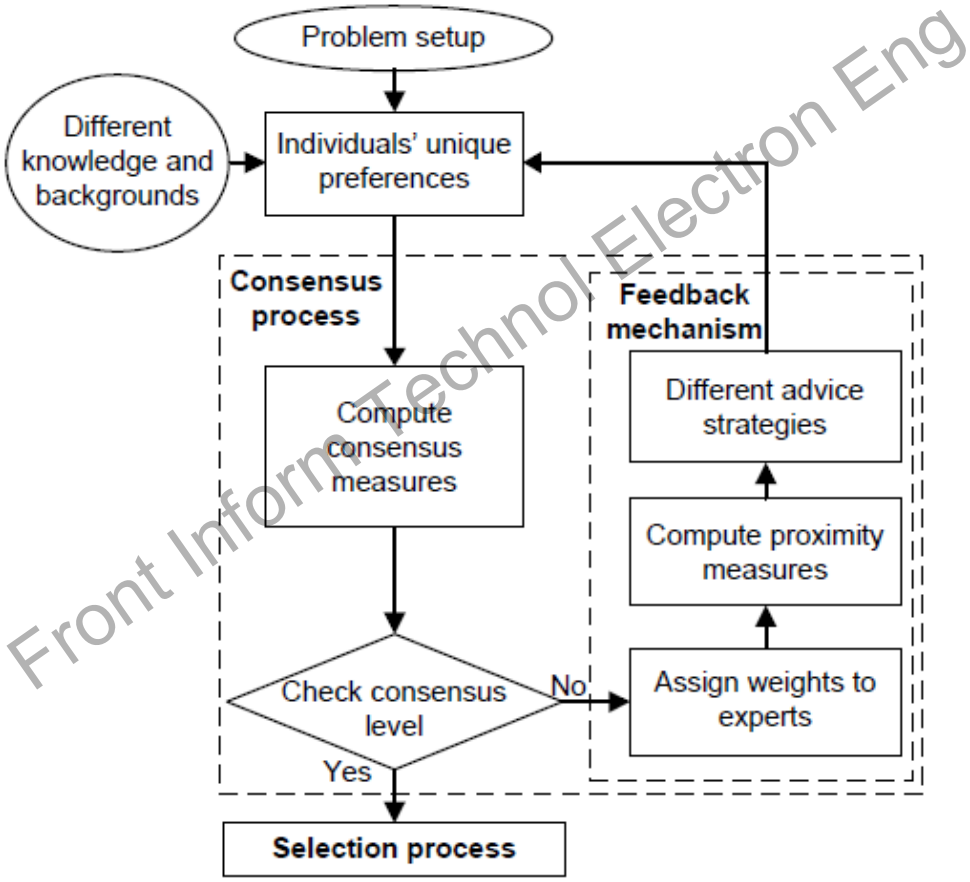

Fig. 2 New consensus model for group decision making (GDM) using an IT2 environment

Statistical study

- We propose a new consensus model for group decision making (GDM) problems, using an interval type-2 fuzzy environment;

Table 2 Consensus measures at the relation level using different distance functions

Distance function	CD	Distance function	CD
Manhattan	0.6458	Dice	0.6736
Euclidean	0.6408	Jaccard	0.6004
Cosine	0.9108		

CD: consensus measure on the relation

- Decision makers can use a specific distance function to reach a higher consensus level based on these comparative results, which can lead to a faster convergence.

Comparative study

- Three other consensus models were applied under the same assumptions:

(a) $x_4 < x_1 < x_3 < x_2$,
(b) $x_1 < x_4 < x_2 < x_3$,
(c) $x_4 < x_1 < x_2 < x_3$.

- The differences may occur because of the different methods used to compute the weights.
- Moreover, variations in the determination of the corresponding parameters in the different models can affect the results.

Conclusions

- The IT2 FSs used in this paper can depict information with more vagueness and uncertainty, which can provide decision makers with more flexibility;
- The automatic feedback mechanism, which is designed to generate specific advice in order to aid the consensus process, overcomes the problem of a traditional moderator;
- The concept of the importance of the experts is considered throughout the decision-making process, which is one of the main novelties in this study. It can lead to a faster convergence.