Relative Similarity Programming Model for Uncertain Multiple Attribute Decision-Making Objects and Its Application

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二. 成果简介：

This paper is concerned with the uncertain multiattribute decision-making (UMADM) of which the attribute value is triangular fuzzy number. Firstly, the max-relative similarity degree and min-relative similarity degree of alternative decision-making objects are given based on the relative similarity degree of triangular fuzzy number, the advantage relation theories to comparative relative similarity degree of triangular fuzzy number are proposed, and some good properties, relations, and conclusions are derived. Secondly, in order to determine the attribute weight vector, a triangular fuzzy number-based decision-making object relative similarity programming model is established with the help of maximizing possibility degree algorithm rules in the cooperative game theory. Subsequently, by aggregating the comparison overall relative similarity degree values of all decision-making objects, we could pick over and sort the set of alternative objects and gather a new model algorithm for the relative similarity programming of triangular fuzzy number-based multiple attribute decision-making alternatives. Finally, an example is given to illustrate the feasibility and practicability of the model algorithm presented in this paper.

三. 主要研究内容及创新点：

(1) From the perspective of similarity degree measurement of triangular fuzzy number, some new definition formulas of max-relative similarity and min-relative similarity of normalized triangular fuzzy number and max-relative similarity degree and min-relative similarity degree of alternative decision-making objects have been given. (2) Some results of the advantage relation theories to comparative relative similarity degree of triangular fuzzy number have been given. (3) The similarity degree model and algorithm in have been improved.

The triangular fuzzy number-based decision making object relative similarity programming model of UMADM (TFN-DMORSPM) :

$$\max \varphi(\boldsymbol{W}) = \sum_{j=1}^{m} \frac{1}{rs(u_j)} \cdot w_j = \sum_{j=1}^{m} \frac{1}{\sum_{i=1}^{n} \sum_{k=1,k\neq i}^{n} rs_{TFN}(\tilde{r}_{ij}, \tilde{r}_{kj})} \cdot w_j,$$

$$s.t. \ \sum_{j=1}^{m} w_j^2 = 1, w_j \geq 0, \quad i,k \in N, j \in M.$$

The optimal solution is

$$w_j^* = \frac{1}{\sum_{i=1}^{n} \sum_{k=1,k\neq i}^{n} rs_{TFN}(\tilde{r}_{ij}, \tilde{r}_{kj})} \Bigg/ \sqrt{\sum_{j=1}^{m} \frac{1}{\left[\sum_{i=1}^{n} \sum_{k=1,k\neq i}^{n} rs_{TFN}(\tilde{r}_{ij}, \tilde{r}_{kj})\right]^2}}, \ i,k \in N, j \in M .$$

四. 主要研究成果及应用情况

在 Mathematical Problems in Engineering（SCI）发表论文 1 篇。

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