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硕士学位论文

不完全信息下的区间直觉模糊多属性决策方法研究

Study on Approaches to Interval-Valued Intuitionistic Fuzzy Multiple Attribute Decision Making with Incomplete Information

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摘　要

多属性决策可以描述为从有限个方案集中选择足够好的方案以获得最优目标的决策过程。可是，注意到大多数决策问题具有不确定性，并且对于不同的问题传统的决策方法通常是代价昂贵的和依赖数学上的近似方法(如非线性问题的线性化)，这样可能导致决策问题在性能方面的缺乏。因此，实用的有助决策的重要方面是提供处理不精确和模糊信息的能力。在这种情况下，模糊多属性决策方法通常比传统的多属性决策方法做得好，模糊多属性决策被Bellman和Zadeh视为目标或约束条件本质上是模糊的决策过程。从模糊数的结构来看，区间直觉模糊集作为模糊集的扩展来描述决策信息是一种非常有用的方式，因为区间直觉模糊集的隶属函数和非隶属函数是区间型的，这样能够更加合理地描述现实社会、经济、管理中的决策信息。

本文对不完全信息下的区间直觉模糊多属性决策问题进行了深入研究：决策者提供的决策信息是区间直觉模糊决策矩阵，其元素都是区间直觉模糊数；属性权重信息是部分已知或者完全未知的。（1）把区间直觉模糊数视为取区间值的区间数，建立了几个线性规划模型以获得属性优先权重，并得到了相应的区间直觉多属性决策途径；最后，通过解决具体的投资决策问题，验证了决策途径的可行性和有效性。（2）由区间直觉模糊数的得分函数计算出属性值的得分值，并构造为区间直觉模糊决策矩阵的得分矩阵；为了产生属性优先权重，基于得分矩阵和给定的不完全权重信息建立了一些优化模型，得到相应的多属性决策途径；最后，用一选择全球供应商的实例演示了决策途径的实施步骤。（3）属性权重为区间型的，且属性权重信息以区间直觉模糊偏好关系的形式给出，决策者提供的决策信息是区间直觉模糊决策矩阵。首先定义了一致性区间直觉偏好关系的概念，接着提出了一种获得属性优先权重的方法，结合线性规划模型提出一种区间直觉模糊多属性决策途径；最后，针对一致性区间直觉偏好关系和非一致性区间直觉偏好关系，分别用具体实例验证了决策途径的可行性。（4）应用四种不同的决策方法（文中提出的两种决策方法和已有的两种决策方法）对同一个具体的决策问题进行分析对比，阐述了实验结果出现异同的原因，最后演示性地说明了方案排序的集结方法。

关键词：区间直觉模糊集；多属性决策；优化模型

Abstract

Multiple attribute decision making (MADM) may be characterised as a process of choosing or selecting 'sufficiently good' alternative(s) or course(s) of action, from a set of alternatives, to attain a goal. It should be noted, however, that much decision making involves uncertainty, and for difficult problems, conventional (nonfuzzy) methods are usually expensive and depend on mathematical approximations (e.g. linearization of nonlinear problems), which may lead to poor performance. Hence, one of the most important aspects for a useful decision aid is to provide the ability to handle imprecise and vague information. Under such circumstances, fuzzy sets often outperform conventional MADM methods. Fuzzy multiple attribute decision making (FMADM) is defined by Bellman and Zadeh as a decision process in which the goals and/or the constraints are fuzzy in nature. From the data structure, Interval-valued intuitionistic fuzzy numbers, each of which is characterized by the interval degree of membership and the interval degree of non-membership of an element, are very useful means to depict the decision information in the process of decision making.

The aim of the paper is to investigate the multiple attribute decision making problems with interval-valued intuitionistic fuzzy information, in which the information about attribute weights is partially known or completely unknown, and the attribute values provided by the decision makers is expressed as interval-valued intuitionistic fuzzy decision matrices where each of the elements is characterized by interval-valued intuitionistic fuzzy number. (1) Several optimization models are presented to generate optimal weights for attributes, and the corresponding decision-making methods have also been developed. Feasibility and effectiveness of the proposed methods are illustrated with an example of investment decision problem. (2) The score matrix of the interval-valued intuitionistic fuzzy decision matrix is constructed by the score function.

Several optimization models are established to generate optimal weights for attributes. A procedure based on the interval-valued intuitionistic fuzzy weighted arithmetic averaging (IIFWAA) operator is developed to solve the multi-attribute interval-valued intuitionistic fuzzy decision making problems. Finally, a global supplier selection example is used to illustrate the developed procedure. (3) Interval-valued intuitionistic preference relations are a powerful means to expressing a decision maker's uncertainty and hesitation about its preference over weights in the process of generating the weights for attributes. First define the notion of consistent interval-valued intuitionistic preference relations. Goal programming models are established for generating priority interval weights based on interval-valued intuitionistic preference relations, and the corresponding decision-making methods have also been proposed. Two illustrative numerical examples are furnished to demonstrate how to apply the approach.4Based on the two proposted methods in text and the other two methods which had been in existence, Analysis and solve the same interval-valued intuitionistic fuzzy decisoin making question, and explain the similarities and differences of the results. Finaly, demonstrate there practicality methods about aggregating the order of the projects.

Keywords: Interval-valued intuitionistic fuzzy sets;Multi-attribute decision making;Optimization models

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