Chapter 7
MAGDM Problems with Correlation Coefficient of Triangular Fuzzy IFS

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ABSTRACT

Correlation coefficient of Intuitionistic Fuzzy Set (IFS), Interval valued IFS, Triangular IFS and Trapezoidal IFS are already present in the literature. This paper proposes the correlation coefficient for Triangular Fuzzy Intuitionistic Fuzzy set (TrFIFS). The method on uncertain Multiple Attribute Group Decision Making (MAGDM) problems based on aggregating intuitionistic fuzzy information is investigated for TrFIFSs. The Triangular Fuzzy Intuitionistic Fuzzy Ordered Weighted Averaging (TrFIFOWA) operator is proposed for TrFIFSs and the Triangular Fuzzy Intuitionistic Fuzzy Ordered Weighted Geometric (TrFIFOWG) operator is utilized for decision making models where expert weights are completely unknown. Based on these operators and the correlation coefficient defined for the TrFIFSs, new decision making models are proposed with numerical illustrations. Some comparisons are also made with existing ranking methods for validity.

INTRODUCTION

Decision making is the study of identifying and choosing alternatives based on the values and preferences of the decision maker. Making a decision implies that there are alternative choices to be considered, and in such cases many of these alternatives as possible should be identified and the one that best fits with our goals, objectives, desires, values, should be chosen (Kahraman, 2008). Decision making should start with the identification of the decision maker(s) and stakeholder(s) in the decision, reducing possible disagreement about problem definition, requirements, goals and criteria. It is very important to make a distinction between the cases where we have a single or multiple criteria. When a decision

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problem has a single criterion or a single aggregate measure, then the decision can be made implicitly by determining the alternative with the best value of the single criterion or aggregate measure. When a decision problem has a finite number of criteria or multiple criteria, and the number of the feasible alternatives (the ones meeting requirements) is infinite, and then the decision problem belongs to the field of multiple criteria optimization. Also, techniques of multiple criteria optimization can be used when there are a finite number of feasible alternatives, but are given only in implicit form. This research work focuses on decision making problems when the number of the criteria (attribute) and alternatives is finite, and the alternatives are explicitly given. Problems of this type are called Multi Attribute Decision Making (MADM) problems.

Consider a MADM problem with m criteria and n alternatives. Let $\boldsymbol{C}_1,...,\boldsymbol{C}_m$ and $\boldsymbol{A}_1,...,\boldsymbol{A}_n$ denote the criteria and alternatives, respectively. A standard feature of MADM methodology is the decision table as shown in the following (See Figure 1). In this table each row belongs to a criterion and each column describes the performance of an alternative. The score a_{ij} describes the performance of the alternative $\boldsymbol{A}_j$ against the criterion $\boldsymbol{C}_i$. For the sake of simplicity it is assumed that a higher score value means a better performance, as any goal of minimization can easily be transformed into a goal of maximization. Here the weights w_i reflects the relative importance of criteria $\boldsymbol{C}_i$ to the decision, and is assumed to be positive. These weights are usually determined on subjective basis and they represent the opinion of a single decision maker or synthesize the opinions of a group of experts using a group decision technique. The values x_1, ..., x_n are associated with the alternatives in the decision table, and are the final ranking values of the alternatives $\boldsymbol{A}_j$. Usually, a higher ranking value means a better performance of the alternative; hence the alternative with the highest ranking value is the best of the alternatives. Group decision is usually understood as aggregating different individual preferences on a given set of alternatives to a single collective preference. It is assumed that the individuals participating in making a group decision face the same common problem and are all interested in finding a solution. A group decision situation

Figure 1. A simple Decision Table