MULTI-CRITERIA DECISION MAKING PROCESS USING CUBIC SOFT MATRICES

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Abstract. A cubic soft set (CSS) is a combination of an interval-valued fuzzy set (IVFS) and a fuzzy set (FS). Cubic soft matrix (CSM) plays a significant role in analyzing modern uncertainty. In this manuscript, we discuss two novel approaches using a real-life scenario. One being, to use the combination of IVFS and FS and the other, to find a unique ranking using parameters. First, we introduce some basic operations of 'OR', 'AND', and complement of CSM. Second, we propose the concept of a weighted fuzzy vector (WFV), weighted interval-valued fuzzy vector (WIVFV), weighted cubic vector (WCV) and construction of cubic matrices to solve multi-criteria decision making (MCDM) problems. Third, we discuss the concept of the value and the score function to rank the alternatives and choose the best one. Finally, we present an MCDM problem to deal with the selection of a suitable candidate for a specific job in an organization with two case studies to illustrate the working and reliability of the proposed model.

1. Introduction

In 1965, Zadeh [24] introduced FS which formed the foundation for fuzzy mathematics. FS theory has attained great success in handling uncertainty and vagueness through numerous applications. In FS theory, the membership value of an element is a real number from the closed interval of $[0, 1]$. The concept of IVFS was later introduced by Zadeh [25] which is an extension of FS. In IVFS, the membership value of an uncertain element is specified by a closed subinterval of $[0, 1]$ instead of a real number. Later, Atanassov [5] introduced the intuitionistic fuzzy set (IFS), a concept involving the degree of membership and non-membership for each element, together with the condition that their sum does not exceed unity.

Jun et al. [22] introduced a cubic set (CS) and developed the notions of internal and external cubic sets using IVFS and FS. Molodtsov [13] proposed the concept of soft set