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Einstein Fuzzy Graphs

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Abstract. Fuzzy graphs are used to represent relationships between objects/things using the concept of fuzzy sets. In this paper, we introduce the novel concept of Einstein fuzzy graphs and study fuzzy analogs of graph theoretical concepts using Einstein t-norm and Einstein t-conorm. Further more we highlighted that any product of strong Einstein fuzzy edge graphs is again a strong Einstein fuzzy edge graph. This case may not be true in the case of Einstein fuzzy graphs. Under the Einstein fuzzy environment tensor product, cartesian product, semi-strong product, symmetric composition and composition of two graphs are defined with suitable examples. Relevant propositions and theorems are also discussed.

Keywords - Fuzzy sets, Einstein t-norm, Einstein t-conorm, Einstein Fuzzy Graphs

INTRODUCTION

A graph is an easy way of representing information involving relationships between objects. Objects are represented by vertices and relations by edges. When the description of objects or relationships consists of vagueness, then such a graph model is Fuzzy Graph. Application of fuzzy relations is wide and important in many fields, especially in the field of neural networks, clustering analysis, computer networks, pattern recognition, decision making and expert systems. In each case the fundamental mathematical structure is fuzzy graph. The modern theory of uncertainty origin in the paper of Zadeh which appeared in 1965 [1]. Fuzzy graph and several fuzzy analogs of graph theoretic concepts were introduced by Rosenfeld [2]in 1975. Fuzzy graph theory has number of applications in several fields.

Fuzzy sets and fuzzy graphs are interest of researches for the last few decades. Now a days the research on applications of fuzzy sets especially fuzzy graphs are going on. But the concept of Einstein fuzzy graphs is still not introduced

Menger [3] discused t-norms and t-conorms in the background of probabilitic metric spaces. Many researchers presented different types of T-operators (t-norm and t-conorm) for intersecting and unifying fuzzy sets. The conventional t-operators,min and max contributed by Zadeh, have been used in various applications of fuzzy logic especially in decision making and theory of fuzzy graphs. It is a notable fact that from experimental and theoretical aspects, the t-operators other than min and max perform better in certain situations particularly in decision making processes. For the choice of suitable t-operators for a specified situations or application, one has to consider and examine the property they occur, their simplicity, their suitability or fitness to the model, their hardware and software implementation,etc.The study on this type of operators has broaden, as a result various options are obtained for the selection of T-opertators that may be better suited for the given research.

Sunitha and Kumar defined several new operations on fuzzy graphs and they also modified the definition of complement of a fuzzy graph so that to agree with the crisp case in graph. Mordeson and Peng [4]defined and introduced the concept of strong fuzzy graphs and some operations on fuzzy graphs. For a complete background on the previous notions and the following ones, the reader is referred to [[5], [6], [7], [4], [8], [9] [10], [11], [12] [4], [13], [9] , [14]].

The main purpose of this research paper is that the max, min and domby operations are not the only possibility for the generalization of the classical graph to fuzzy graph. we prefer to include the advancement suggest by Alsina, Klement, Ashraf and other researchers in the field of fuzzy logic in the field of fuzzy graph theory. This paper reveal the use of particular T-operator, namely the Einstein operator in the area of fuzzy graph theory. We start by recalling some necessary definitions and results.

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