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Trends in Fuzzy Graphs

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Abstract: After introducing and developing fuzzy set theory, a lot of studies have been done in this field and then a result appeared as a Fuzzy Graph (Combination of graph theory and fuzzy set theory). This is now known as Fuzzy graph theory. In this article we review essential works on different types of fuzzy graph and fuzzy hyper graph.

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I. INTRODUCTION

In 1736, Euler first introduced the concept of graph theory. In the history of mathematics, the solution given by Euler of the well known Konigsberg bridge problem is considered to be the first theorem of graph theory. This has now become a subject generally regarded as a branch of combinatorics. The theory of graph is an extremely useful tool for solving combinatorial problems in different areas such as geometry, algebra, number theory, topology, operations research, and optimization and computer science.
In 1965, Zadeh published his seminal paper on "Fuzzy sets" which described fuzzy set theory and, consequently, fuzzy logic. The purpose of Zadeh's paper was to develop a theory which could deal with ambiguity and imprecision of certain classes of sets in human thinking, particularly in the domains of pattern recognition, communication of information, and abstraction.
Rosenfeld (1975) introduced the notion of fuzzy graph and several fuzzy analogs of graph theoretic concepts such as path, cycles, connectedness and etc. Zadeh (1987) introduced the concept of fuzzy relations. Bhattacharya (1987) and Bhutani(1989) investigated the concept of fuzzy automorphism graphs. McAlester (1988) presented a generalization of intersection graphs to fuzzy intersection graphs. Mordeson (1993) introduced the concept of fuzzy line graphs and developed its basic properties. The concept of complete fuzzy graph was investigated by Sunitha and Vijayakumar (2002). The concept of domination in fuzzy graphs was investigated by Somasundaram (1998). Ramaswamy and Poornima (2009) introduced the concept of product fuzzy graphs. The first definition of intuitionistic fuzzy relations and intuitionistic fuzzy graphs were introduced by Atanassov (1999), and further studied in [2009]. Parvathi and Thamizhendhi (2010) introduced the concept of domination number in intuitionistic fuzzy graphs. Mahioub Shubatah (2012) introduced the concept of domination in product fuzzy graphs. Vinoth Kumar and Geetha Ramani (2011)introduced the concept of product intuitionistic fuzzy graphs.
A graph is a symmetric binary relation on a nonempty set V. Similarly, a fuzzy graph is a symmetric binary fuzzy relation on a fuzzy subset. The first definition of a fuzzy graph was by Kaufmann[1] in 1973, based on Zadeh's fuzzy relations [2]. But it was Azriel Rosenfeld [3] who considered fuzzy relations on fuzzy sets and developed the theory of fuzzy graphs in 1975. During the same time R.T.Yeh and S.Y. Bang have also introduced various connectedness concepts in fuzzy graphs.
Zimmermann [4] has discussed some properties of fuzzy graphs. The book [5] by Mordeson and Nair entitled "Fuzzy graphs and Fuzzy hypergraphs " is an excellent source for research in fuzzy graphs and fuzzy hypergraphs.
In this paper we are giving an overview on the fuzzy graph and its various kinds. Here we will only focus on fuzzy graph and its types and not on operations and properties of Fuzzy Graph.

II. PRELIMINARIES

Graph

A graph G is defined as an ordered pair: $G=(V,E)$ where V : Set of Vertices. A vertex is also called a node or element and E :Set of edges. An edge is an unordered pair (x,y),of vertices in V.