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"A Procedural Study of symmetrical and Asymmetrical Neutrosophic Graphs with Factual Lifecycle Applications"

Ms.Pooja V

Assistant Professor

Department of Mathematics

T. John College, Bengaluru,Karnataka,India

Email: pooja61213@gmail.com

ABSTRACT

Fuzzy graph idea is a beneficial and famous device to version and remedy many real-life optimization problems. it describes the application of the everyday neutrosophic graph and bipartite neutrosophic graph to model a challenging problem, a road shipping network, and a social network. For this purpose, we introduce the definitions of the everyday neutrosophic graph, star neutrosophic graph, everyday entire neutrosophic graph, entire bipartiteneutrosophic graph, and everyday sturdy neutrosophic graph.

Keywords: *Fuzzy Graph, Neutrosophic Graph, bipartite ineutrosophic graph*

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1. INTRODUCTION

Graph idea has many real-lifestyles packages for issues in laptop packages, systems analysis, pc networks, transportation, operations research, and economics. A graph is basically a version of relations, and it's far used to symbolize the real-lifestyles trouble which includes courting classical graph idea makes use of the primary idea of a classical set idea, which turned into offered by Cantor. In a classical graph, for any vertex or edge, there are possibilities: it's miles both withinside the graph or it is not withinside the graph. Therefore, classical graphs can't version unsure optimization issues. Real-lifestyles issues are frequently unsure, which can be tough to version the usage of classical graphs.

2. LITERATURE BACKGROUND

- **Zadeh, L.A.** has expounded that, the fuzzy set is an extended version of the classical set, where the objects have varying membership degrees. A fuzzy set gives its objects different membership degrees between zero and one. The membership degree is not the same as probability; rather, it describes membership in vaguely-defined set.
- **Shannon, A.; Atanassov, K.** has investigated that, Shannon and Atanassov presented the idea of the IFS relation and the intuitionistic fuzzy graph (IFG) and discussed many theorems, proofs, and proprieties.
- **Rashmanlou, H.; Samanta, S.; Pal, M.; Borzooei, R.A.** presented some products such as strong, direct, and lexicographic products for two IFGs.
- **Smarandache** has introduced the idea of the neutrosophic set, by modifying the concept of the fuzzy set. The neutrosophic set can work with uncertain, indeterminate, vague, and inconsistent information of any uncertain real-life problem. It is basically a modified version of the crisp set, Type 1 fuzzy set, and IFS. It is described by the truth, indeterminate, and false membership degrees of any object. These three membership degrees are independent and always lie within 0, 1+ [, i.e., a nonstandard unit interval.
- **Gani and Lathi** proposed the concept of irregularity, total irregularity, and total degree in a fuzzy graph.
- **Maheswari and Sekar** proposed the notation of the d2-vertex in a fuzzy graph and also described several properties on the d2-vertex degree of a fuzzy graph.
- **Darabian et al.** Presented the idea of the dm-regular vague graph, tdm-regular vague graph, m-highly irregular vague graph, and m-highly total irregular vague graph, and they discussed some properties of those graphs. They described some real-life applications (e.g., fullerene molecules, wireless networks, and road networks) of regular vague graphs. Neutrosophic graphs

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are more effective, precise, flexible, and compatible when modeling uncertain real-life problems compared to fuzzy graphs or vague graphs.

Summary: The concept of the regularity and degree of nodes has a significant role in both theories and applications (e.g., social network analysis, road transportation network, wireless multihop network, and the assignment problem) in neutrosophic graph theory. Some different types of neutrosophic graphs such as the regular, regular strong, d_m-regular, tdm-regular, and complete bipartite neutrosophic graph were introduced here. It provided some sufficient criteria for which the tdm-regular neutrosophic graph and d_m-regular neutrosophic graph are equivalent. We have introduced the definition of the m-complement and h-morphism of a neutrosophic graph. Some properties of the complement and isomorphic regular neutrosophic graph were also presented here. Finally, some real-life applications of the regular neutrosophic graph and complete bipartite neutrosophic graph were described for the assignment problem, road transportation network, and social networks.

3. METHODS

The single-valued neutrosophic graph (SVNG), adjacent node path, isolated node, strength ofa path, strong SVNG, complement SVNG, and complete SVNG, which are efficient for the present work. In this slice, the single-valued neutrosophic graph (SVNG), adjacent node, path, isolated node, strength of a path, strong SVNG, complement SVNG, and complete SVNG, which are efficient for the present work.

Considered an example of an SVNG G, presented in Figure 1.1

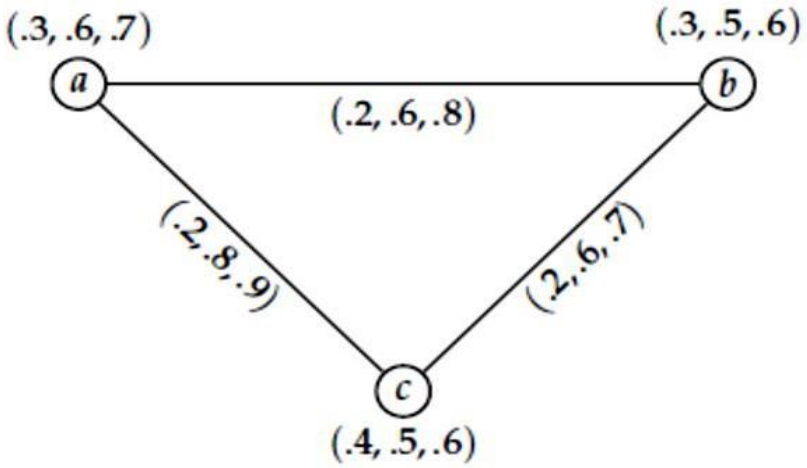

Fig.1.1: Single-Valued Neutrosophic Graph

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Then, the d_2-degree of the nodes in G is computed as follows.

$$d_2(a) = (0.2+0.2, 0.6+0.8, 0.8+0.9) = (0.4, 1.4, 1.7)$$
$$d_2(b) = (0.2+0.2, 0.8+0.8, 0.9+0.9) = (0.4, 1.6, 1.8)$$
$$d_2(c) = (0.2+0.2, 0.6+0.8, 0.8+0.9) = (0.4, 1.6, 1.8)$$

4. RESULTS AND DISCUSSIONS

There are many networks that are used in real-life scenarios. Graph theory plays a vital rolein the application parts of these networks. Some networks are designed for distributing commodities or services. The power grid, Internet-related issues, and road transportation networks are some examples of technological networks. There has been a phenomenal change in network research in recent years from a small graphical structure to a widestatistical analysis of large-scale networks. Most of the real-life networks/structures are ambiguous and vague in nature and not well defined. Indeterministic information exists in almost every real-life scenario.

CONCLUSION

The neutrosophic graph is more flexible and compatible to model the indeterministic information in a network when compared to the fuzzy graph or vague graph. A graph is a classical way of modeling real-life networks, which consist of relationships between entities. In a graph, the entities are expressed by nodes and relationships by arcs. Transforming all those data-carrying networks to a neutrosophic graph using various types of information from all the possible existing levels, it is a proper multilevel method where all possible levels and ties among them are represented and analyzed mathematically at the same time. Neutrosophic graphs have more applications related to information technology and computer science such that these graphs are used to illustrate networks of communication, data optimization, machine learning, chip design, and much more.

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