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Critics View on UGC Funded Project from St Albert's College, Ernakulam, Kerala.

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Abstract— "Solution of the Traffic Jam Problem through Fuzzy Applications'' is developed by Dr. Shery Fernandez as a part of research project. In this article the method used to solve the traffic jam problem is criticized. It is observed that proper understanding and practical views are not applied in the project. In the first part of this paper Comparison method which is easy to layman is introduced and in the second part an introduction to mathematical model of vague network and literature review on that is explained.

Index Terms— Practical View, Fuzzy Mathematics, Research Project, Graphs, Fuzzy Graphs, Networks

1 Introduction

Solution of the Traffic Jam Problem through Fuzzy Applications is developed by Dr. Shery Fernandez from the research department of mathematics, St Alberts College Ernakulam as a part of research project. It is observed that proper understanding and practical views are not applied in the project. In this article the method used to solve the traffic jam problem is criticized. Comparison method which is easy to layman is introduced.

2. Criticism on Assumption and applicability:

As per the assumption the driver must know traffic intensity, width of the road, etc. which is not practically applicable. Already existing method fuzzy linear programming is considered as time consuming and so the suggested method is considered as a simple one that can be done by a layman. This logic is not acceptable because the author assumes that a layman has good background in mathematics to workout the suggested method.

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3. Suggested Comparison Method:

Without using the technique suggested by the author [1], a comparison method as shownbelow is enough to get the same solution. The following data.[1] shall be obtained using GPS navigation, google map and a study on traffic routes in the area.

Factors / Routes	Route 1	Route 2	Route 3
Distance	27 KM	20.5 KM	21 KM
Signals	3	5	13
Schools, Hosptitals & Public offices	2	1	7

Comparing the distance and number of schools, hospitals and public offices, it shall be concluded from the above table that route 2 is better in day time. The schools and public offices are not functioning durning night (10PM-8AM) time in Ernakulam and the number of vehicles is less during night comparing with day. So route 2 is the best one and route 3 is also better in night time for smooth journey.

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To make it easily available to layman, the data shall be stored in mobile application and just as voice message, the information can be given connecting with GPS location navigator.

The following are the commonly used applications of fuzzy mathematics in traffics networks.

1. Application of Fuzzy logics in traffic signals.
2. Fuzzy graphs deal with the flows in a network. Design of traffic network simulating fuzzy graphs that helps to control the flows.

4 Mathematical Model of Vague Networks

Graph with respect to time represents a network. Fuzzy graphs shall be used to simulate vague network.A fuzzy graph is always associated with an underlying crisp graph. Accordinng to Zimmerman, fuzzy graph is restricted by the condition that the flows in links never exceed the minimum of the flows in respective nodes. The strong fuzzy graphs always allow possible maximum flow through the links. If the existing traffic network in a city is considered as an underlying crisp graph then the density of traffic in the junctions (selecting maximum value 100%) and in respective links creates a fuzzy graph. So the problems of traffic jams comes under how the exisiting networks can be modeled by restricting flows.Or design of traffic network simulating fuzzy graphs that helps to control the flows shall discuss traffic problems in networks. Fly over roads, metro service are some examples on how the flow is controlled. When network and flow are assumed, the complement flows must be considered for the completion and should be assumed that a new route is not possible which is not described in underlying crisp graph.

5 Fuzzy Graph- Basic definition

It is quite well known that graphs are simply models of relations. A graph is a convenient way of representing information involving relationship between objects. The objects are represented by vertices and relations by edges. When there is vagueness in the description of the objects or in its relationships or in both, it is natural that we need to design a 'Fuzzy Graph Model'.

Application of fuzzy relations are widespread and important; especially in the Field of clustering analysis, neural networks, computer networks, pattern recognition, decision making and expert systems. In each of these, the basic mathematical structure is that of a fuzzy graph.

We know that 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 in 1973, based on Zadeh's fuzzy relations But it was Azriel Rosenfeld who considered fuzzy relations on fuzzy sets and developed the theory of fuzzy graphs in 1975.

Definition 5.1: A fuzzy graph G = (σ, μ) is a pair of functions $\sigma : V \rightarrow [0,1]$ and $\mu : V \times V \rightarrow [0,1]$, where for all $u, v \in V$, we have $\mu(u,v) \leq \sigma(u) \wedge \sigma(v)$.

6 Literature review

Properties of fuzzy graphs: Mcallister [6] proved that intersection of two fuzzy graphs is again a fuzzy graph. Radha etal. [7] explained the degree of an edge in union and join of fuzzy graph through some illustrations. Nagoor Gani et al. [8] discussed degree of a vertex in composition and Cartesian product. Nirmala et al. [9] explained degree of a vertex in Tensor product and normal product of fuzzy graph. Prabir Bhattacharya et al. [10] presented an algorithm to find the supremum of max-min powers of a map by characterizing the path in a fuzzy graph. Mordeson et al. [11]

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proved a necessary and sufficient condition for a graph to be a Cartesian product of two fuzzy subgraphs and union of two fuzzy subgraphs of a graph is again a fuzzy subgraph. Nair [12] discussed few properties of complete fuzzy graph and fuzzy trees. He proved triangle laws, parallelogram laws and few equivalences of bridges in fuzzy graphs. Mordeson and Nair studied on fuzzy hypergraphs [5]. Sunitha et al. [13] studied certain properties of fuzzy bridges, fuzzy cut nodes and using them they obtained a characterization of fuzzy trees and fuzzy cut node. Nagoor Gani et al. [14] proved the inequality involving order and size of a fuzzy graph. Mordeson [11] has defined the complement of a fuzzy graph. Arindam Dey et al. [15] presented a program to determine the fuzzy complement of a fuzzy graph. Nagoor Gani and Chandrasekaran [16] defined μ-complement of a fuzzy graph. Nagoor Gani et al. [17] discussed few properties of μ-complement of fuzzy graph. They proved that μ-complement of a fuzzy graph has isolated nodes if and only if the given graph is a strong fuzzy graph. Sandeep Narayanan et al. [18] presented an illustration of a fuzzy graph containing three vertices and its complement.

Strong arcs in fuzzy graphs: Bhutani et al. [19] defined strong arcs in fuzzy graphs and proved that a strong arc need not be a bridge whereas a bridge is a strong arc. Sunil Mathew et al.[20] proved that a fuzzy graph is a fuzzy tree iff there exists an unique α-strong path between any two nodes and also proved that an arc in a fuzzy tree is α-strong iff it is an arc of the spanning tree of the fuzzy graph.

Connectivity in a fuzzy graph: Sandeep Narayanan et al.[18] proved that the complement of a fuzzy graph is connected if the given fuzzygraph without m-strong arcs is connected. Also proved that a graph and its complement are connected iff the given graph has atleast one connected spanning fuzzy subgraph without any m-strong arcs.

Blocks and Cycles in fuzzy graphs: Mini Tom et al. [21]proved that the fuzzy graph satisfying the condition that either(u, v) is an δ-arc or μ(u, v) = 0 is a block iff there exists atleast two internally disjoint strongest u − v paths. Also they proved that if the underlying graph G* is a complete graph then the fuzzy graph G without δ -arc is a block. Mordeson et al. [22] proved that a fuzzy graph which is a cycle is a fuzzy cycle iff it is not a fuzzy tree.They also proved that the fuzzy graph (σ, μ) does not have a fuzzy bridge iff it is a cycle and μ is a constant function assuming that the dimension of the cycle space of the underlying graph (σ^*, μ^*) is unity.

Domination in fuzzy graphs: Manjunisha et al. [23] proved that the strong domination number of a non trivial fuzzy graph is equal to the size of the fuzzy graph iff each node is either an isolated node or has an unique strong neighbour and all arcs are strong.

Automorphism of fuzzy graphs: Bhattacharya [24] obtained a fuzzy analog from graph theory to fuzzy graph theory which states that we can associate a group with fuzzy graph as an automorphism group. Bhutani [25] introduced the concept of isomorphism between fuzzy graphs. He proved that every fuzzy group has an embedding into the fuzzy group of the group of automorphism of a fuzzy graph.Let (σ_1, μ_1) and (σ_2, μ_2) be fuzzy subgraphs of graphs $(\sigma_1{}^*, \mu_1{}^*)$ and $(\sigma_2{}^*, \mu_2{}^*)$ respectively. Then Mordeson [26] proved that any weak isomorphism of (σ_1, μ_1) onto (σ_2, μ_2) is again an isomorphism of $(\sigma_1{}^*, \mu_1{}^*)$ onto $(\sigma_2{}^*, \mu_2{}^*)$ .Sunitha et al. [27] proved that the set all automorphisms of a fuzzy graph will be a group when the binary relation is set theoretic composition of maps. Sathyaseelan et al. [28] proved that the order and size of any two isomorphic fuzzy graphs are the same. They also proved that the relation Isomorphism betweenfuzzy graphs satisfies reflexivity, symmetricity and transitivity. i.e. It is an equivalence relation.

Coloring and Clustering of fuzzy graphs: Eslahchi et al.[29] introduced fuzzy coloring of a fuzzy graph. Arindam Dey et.al [30] introduced an algorithm with an illustration to color the complement of a fuzzy graph through α-cuts by considering three cases.Nivethana et al. [31] presented executive committee problem as an illustration to find the chromatic number of a fuzzy graph. Ananthanarayanan et al. [32] explained how to find the chromatic number of a fuzzy graph using α -cuts by considering fuzzy

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graphs with crisp vertices and fuzzy edges through illustrations. Sameena [33] presented an algorithm for constructing ε clusters using strong arcs and explained the procedure to obtain ε-clusters through some illustrations where $0 \leq \varepsilon \leq 1$.

Interval valued Fuzzy line graphs: Moderson [26] presented a necessary and sufficient condition for a fuzzy graph to be a fuzzy line graph. Craine [34] analysed various properties of fuzzy interval graphs. Naga Maruthi Kumari et.al [35] proved that the composition of two strong interval valued fuzzy graphs is a strong interval valued fuzzy graph. Hossein Rashmanlou et.al [36] proved that the semi strong product and strong product of two interval valued fuzzy graphs is complete. Akram [37] stated a proposition that Interval valued fuzzy graph is isomorphic to an interval valued fuzzy intersection graph. Sen et al. [38] proved that fuzzy intersection graph is chordal iff for a, b, c, d in the semigroup, some pair from {a, b, c, d} has a right common multipleproperty.

Intuitionistic Fuzzy Graphs: Deng-Feng li [39] proposed two linear dissimilarity measures between intuitionistic fuzzy sets.Akram et.al [40] discussed few metric aspects of intuitionistic fuzzy graphs. Nagoor Gani et.al [41] proved that the sum of the degree of membership value of all vertices in an intuitionistic fuzzy graph is two times the sum of the membership value of all edges and the sum of the degree of non membership value of all vertices in an intuitionistc fuzzy graph is two times the sum of the non membership value of all edges. Karunambigai et.al[42] discussed three cases where strong path is a strongest path in intuitionistic fuzzy graphs. Akram et.al[43] proved that the join of two strong intuitionistic fuzzy graphs is again a strong intuitionistic fuzzy graph. Karunambigai et.al [44] proved that the order and size of two isomorphic intuitionistic fuzzy graphs are same. Karunambigai et.al [45] proved that every complete intuitionistic fuzzy graph is balanced. Karunambigai et al.[46] presented a necessary and sufficient condition for intuitionistic fuzzy graph to be self centered. Parvathi et al. [47] proved a necessary and sufficient condition for a dominating set to be a minimal dominating set in intuitionistic fuzzy graph.Anthony Shannon et al. [48] presented some generalizations of intuitionistic fuzzy graph. Mishra et al. [49] investigated the results based on product of interval valued intuitionistic fuzzy graph. Sankar Sahoo et al. [50] explained different types of products on intuitionistic fuzzy graph through some illustrations. Panangiotis Chountas et al. [51] presented the index matrix interpretation of the intuitionistic fuzzy trees. Nagoor Gani et al. [52] presented a method to obtain an intuitionistic fuzzy shortest path length. Borzooei et al. [53] explained the degree of vertices in cartesian product, normal product,tensor product of vague graphs.

Bipolar and m-polar Fuzzy graphs: Hossein Rashmanlou et al. [54] proved that the direct product of two strong bipolar fuzzy graphs is strong and strong product of two complete bipolar fuzzy graph is complete. Sovan Samanta et al. [55] discussed some results of bipolar fuzzy graphs. Ganesh Gorai et al. [56] showed that every product m-polar fuzzy graph is a m-polar fuzzy graph. They also analyzed certain operations like Cartesian product, composition, union, join in m-polar fuzzy graphs [57].

7 CONCLUSION

In this article practical view on a research project in Mathematics from Kerala State ,India is discussed. Fuzzy graphs simulates networks. To model the flows in network (traffic networks, anonymous overlay networks, facility sharing networks, artificial neural communication networks,etc) the studies on fuzzy graph that controles the flows and complement flows is required. It is planned in future studies.

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