ANALYZATION OF FIVE ROAD JUNCTION IN TRAFFIC LIGHTS PROBLEM USING FUZZY GRAPH

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ABSTRACT

In this paper fuzzy graph classical to denote a traffic network of a city and is argue a method to find the distinct type of accidental zones in traffic flows by Edge coloring of a fuzzy graph in five road junction.

Key words: Coloring of a graph, Arcs in a fuzzy graph, Connectivity.

1. INTODUCTION

A graph is a appropriate way of expressive information involving relationship among objects. The objects are expressive by vertices and relations by edges. In a group ofreal world problems, we get limited information about that problem. So there is ambiguity in the clarification of the stuff or in its relations or in both. To make strong this type of relation, we need to design graph illustration with fission of type 1 fuzzy set. This fission of fuzzy set with graph is well-known as fuzzy graph. Graph coloring is one of the mainlysignificantideas in graph theory. The proper coloring of a graph vertices with slightest number of colors such that no two adjacent vertices should have the identical color. The least number of colors is called as the chromatic number along with the graph is called correctly colored graph.

2. PRELIMINARIES

2.1 Definition

Fuzziness occurs in a fuzzy graph in five dissimilar ways, presented by M.Blue. Fuzzy graph is a graph GF fulfilling one of the subsequent types of fuzziness (GF of the ith type) or a few of its combination:

(i) GF_1= {G_1, G_2, G_3, GF} where fuzziness is on each graph Gi

(ii) GF_2= {V, EF} where the edge set is fuzzy.

(iii)GF_3= {V, E (tF , hF) } where both the vertex and edge groups are crisp, but the edges have fuzzy heads $h(e_i)$ and fuzzy tails $t(e_i)$

(iv) GF_4= {V_F, E} where the vertex set is fuzzy.

(v) GF_5 = {V, E (W_F)} where both the vertex and edge sets are crisp but the edges have fuzzy weights.

2.2 Definition

A fuzzy graph G=(V,E,σ, μ) is called strong if μ(u,v)= min(σ(u), σ(v)) for all(u,v)in μ* and is complete if μ(u,v)= min(σ(u), σ(v)) for all (u,v) in σ*.

3. REPRESENTING THE TRAFFIC LIGHTS PROBLEM IN FIVE ROAD JUNCTION USING FUZZY GRAPH

The fiveright turns do not interfere with the other traffic flows; they can safely be dropped from the conversation. The enduring traffic directions are labeled A through H and their membership values are depicted in table1.If the number of vehicles in any track is greater than 7000 per hour than believethe membership value of that track is high. If the number of vehicles in any track is greater than or equal to 4000 per hour than believe the membership value of that track is medium. If the number of vehicles in any track is less than 4000 per hour believe the membership value of that track is low. Membership values are denoted by representative name H for high, M for medium, L for low correspondingly.

Table 1: Membership values of the vertices

Vertex	A	B	C	D	E	F	G	H	I	J
Σ	M	H	M	L	M	H	M	L	M	L

To change a traffic pattern so that vehicles can pass through the crossroads without intrusive with other traffic flows.

In this problem, design of each traffic flow using the vertices of the fuzzy graph and their membership value depends upon the number of the vehicle of that road. Two vertices are adjacent if the corresponding traffic flows cross each other. For case in point, direction C and H intersect, so vertices C and H are together. If two vertices are together then there is a possibility of accident. The chance of accident depends on the neighboring vertices membership value which characterizes number of vehicles on the road.

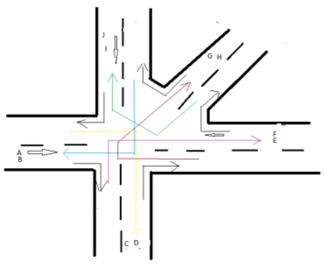

Fig 3.1

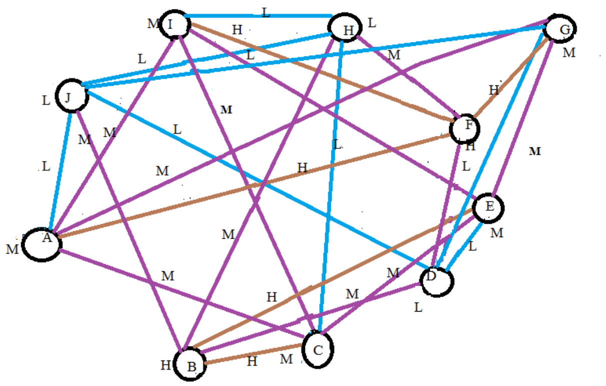

Fig 3.2

If membership values of the together two vertices are high (H) then we considers the membership value of that arc is high (H). We think the arc membership value is low (L) if both the vertices have low (L) membership or one adjacent vertex has low (L) membership value and another node has medium (M) membership value. In additional condition, if the membership value of one together vertex is high (H) and another has low (L) membership value or both node has medium (M) membership value then we believe the membership value of that arc is medium (M). In this paper, design of each possibility of accident with an edge and their membership value is given Membership values of edges are given below in Table 2.

Table: Membership value of edges

Edge	AJ	AI	AG	AF	AC	BJ	BH	BE	BD
μ	L	M	M	H	M	M	M	H	M
Edge	BC	CI	CH	CE	DJ	DG	DF	DE	EI
μ	H	M	L	M	L	L	M	L	M
Edge	EG	FI	FH	FG	GJ	HI	HJ		
μ	M	H	M	H	L	L	L		

4. TYPES OF ACCIDENTAL ZONE IN A TRAFFIC NETWORK

Conditionalahead the membership values of the edges and $CONNG_{(x,y)}$ an arc (x,y) in a fuzzy graph G order the dissimilar type of accident zones in traffic flow. Hereafter define three unlike type of accidental zone in the traffic flow. Consider a fuzzy graph G= (V, E , σ, μ). Using the fuzzy graph (G), signify a traffic flow of a city. Let u,v be two ways in the traffic flows and two vertices are adjacent if the equivalent traffic flows cross each other. Let e=(u,v) be an arc in graph G such that μ(u,v)=x>0.

Then do the following step:

1. Obtain G- e
2. Find the value of$CONN_{G(x,y)}$.
3. (a) If $x > CONN_{G(x,y)}$ then e is α-strong accidental zone.

(b) If $CONN_{G(x,y)} = x$ then e is β-strong accidental zone.

(c) If $CONN_{G(x,y)} > x$ then e is δ-strong accidental zone.

4. Repeat steps 1–4 for all arcs in G.

Relate this method to order the accidental zone of a traffic flows in a city. Then relate the method to the problem. In this fuzzy graph α-strong accidental zone are AF,BC,BE,FG ,FI and β-strong accidental zone are AG,AI,AC,BD,BJ,BH,CI,DF,GE,CE,EI,FH and δ-strong accidental zone are AJ, CH, DE, DG,DJ,GJ,HJ,HI. This arrangement will help manage the traffic flow of a city.

Color this fuzzy graph using the concept of Eslahchi and Onagh. They definite fuzzy chromatic number as the least value of k for which the fuzzy graph G has k –fuzzy coloring and k –fuzzy coloring is defined as follows. A family Γ= {$\gamma_1, \gamma_2 .... \gamma_K$} of fuzzy sets on V is called a k - coloring of fuzzy graph G=(V, E, σ, μ)

(a) V Γ = σ,

(b) $\gamma_1 \cap \gamma_2 = 0$

(c) For every strong edge xy of G, min {γ_1 (x), γ_2 (y)} =0 (1 ≤ i ≤ k).

Let Γ= {$\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5$ } be a family of fuzzy sets defined on V by

$$\gamma_1(vi) = \begin{cases} M \text{ if } i=A \\ M \text{ if } i=E \\ 0 \text{ otherwise} \end{cases} \qquad \gamma_2(vi) = \begin{cases} H \text{ if } i=B \\ H \text{ if } i=F \\ 0 \text{ otherwise} \end{cases}$$

$$\gamma_3(vi) = \begin{cases} L \text{ if } i=D \\ L \text{ if } i=H \\ 0 \text{ otherwise} \end{cases} \qquad \gamma_4(vi) = \begin{cases} M \text{ if } i=C \\ M \text{ if } i=G \\ 0 \text{ otherwise} \end{cases}$$

$$\gamma_5(vi) = \begin{cases} M \text{ if } i=I \\ M \text{ if } i=G \\ 0 \text{ otherwise} \end{cases}$$

Here it is experimental that the family $\Gamma = \{ \gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5 \}$ contents the conditions of definition of vertex coloring. Thus the fuzzy graph in this example has 5-fuzzy vertex coloring and this is the minimal vertex fuzzy coloring since any family with less than 5 members does not content the situations of the definition. Thus the fuzzy vertex chromatic number Ψ (G) = 5.

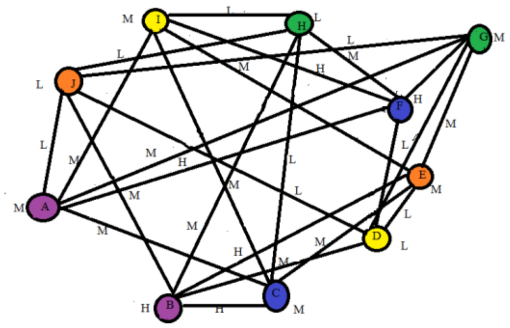

Fig 4.1

This fig 4.1 shows a coloring of graph with precisely five colors, which depicts an efficient way of designing the traffic signal pattern. It consists of four phases:

Traffic light pattern

Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Only A and E proceed	Only B and F proceed	Only D and H proceed	Only G and I proceed	Only C and G only

In these traditional road traffic lights have the similar cycle time T. So the length of the all the phase will be equal and that is T. In this problem, accept that number of vehicles in A and E direction is maximum and B and F direction is minimum. That means number of vehicles in all paths are not equal. If B and F need T time to pass all the vehicles then A and E will need more time than T. So total waiting time of vehicles on the roads will be increase and there may be a opportunity of traffic jam or accident. fuzzy graph, can be recycled to solve this problem. The give the period time of the traffic light depends upon on the vehicle number (it is represented by vertex membership value). If the node membership value is high then it needs more time to flow ther all vehicles. In this problem duration of the Phase 2 will be maximum and Phase 3 will be minimum. Using this concept, total waiting time of the vehicles will be minimizing.

5. CONCLUSIONS

In this paper, illustration of the traffic flows using a fuzzy graph whose vertices and edges both are fuzzy vertices and fuzzy arcs is given so there is vagueness in vertices and also in edges. With the support of these kinds of fuzzy graph coloring we can minimize the waiting time of vehicles.

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