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Fuzzy If-Then Rule in Graph

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ABSTRACT

In this paper we discuss the concept of bipartite graph and euler graph and the basic definition of bipartite graph and euler graph. Then we show the result based on fuzzy if-then rule on bipartite graph and euler graph.
Keywords : Bipartite graph, Euler graph, Fuzzy if-then rule.

I. INTRODUCTION

Graph theory serves as a mathematical model to represent any system having a binary relation and fuzzy set presented by Zadeh in 1965. Fuzzy graph theory has various applications in various fields like traffic signal, evaluation of human cardiac function, medical, science, decision theory etc. In [1] the concept of domination in 4-regular graph and in [3] introduced the concept of Hamiltonian fuzzy cycles in quartic fuzzy graphs. kohila and vimal kumar recently introduced the fuzzy if-then rule in k-regular graph. Throughout this paper, we discuss the basic result of fuzzy if-then rule in bipartite graph and euler graph.

II. PRELIMINARIES

Basic definition relevant to this paper as follows.

Definition1: A bipartite graph, also called a bigraph, is a set of graph vertices decomposed into two disjoint sets such that no two graph vertices within the same set are adjacent. A bipartite graph is a special case of a k-partite graph with k=2.

Definition2: If some closed walk 'w' in a graph G contains all the edges of the graph G then 'w' is called an euler line(path) and the given graph G is called euler graph.

Definition3: Fuzzy rules are used within fuzzy logic systems to infer an output based on input variables. IF x is A THEN y is B, where x and y are linguistic variables; A and B are linguistic values determined by fuzzy sets on the universe of discourse x and y respectively. The if-part of the rule "x is A" is called the antecedent. Then-part of the rule "y is B" is called the consequence.

Definition4: The degree of the vertices of a graph is the number of edges incident to the vertex, with loops counted twice. The degree of a vertex is denoted by deg(v).

Main Result: Now we show that some theorem for bipartite and euler graph

III. FUZZY IF-THEN RULE IN BIPARTITE GRAPH

Theorem: In bipartite graph, the sum of degrees of vertices is equal to the twice the sum of degree of membership of all the edges.

Proof: Let G be a bipartite graph with 8 vertices {σ(v1), σ(v2), σ(v3), σ(v4), σ(v5), σ(v6), σ(v7), σ(v8)} given in the following figure.

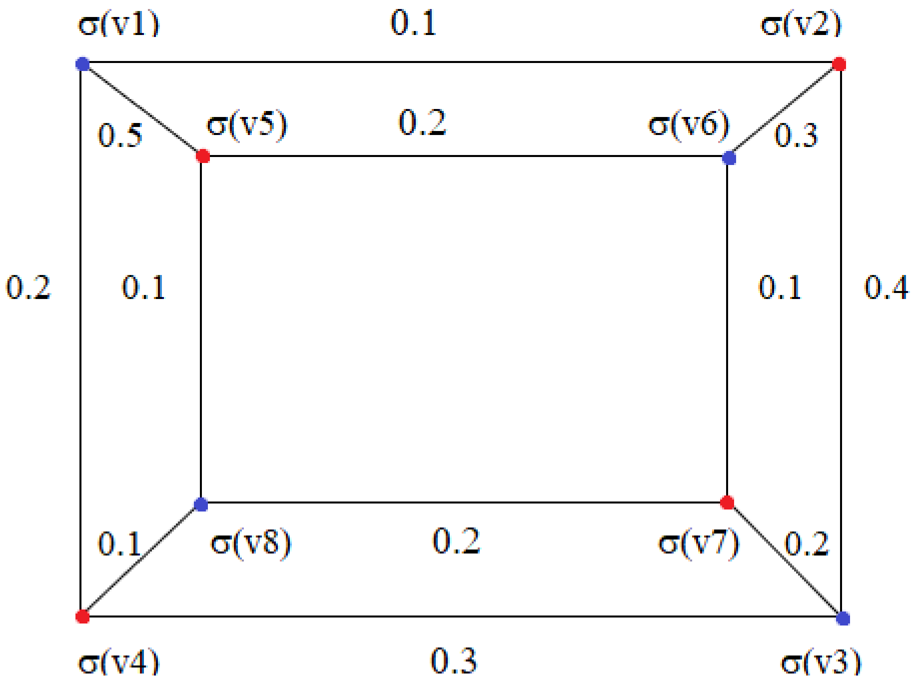

Figure 1

IV. BIPARTITE GRAPH

IF we add the membership grades of edges, THEN we can obtain the degree of edges.

Now IF we add the membership grades of edges in the following:

d[σ(v1)] = 0.1+0.2+0.5 = 0.8

d[σ(v2)] = 0.1+0.4+0.3 = 0.8

d[σ(v3)] = 0.4+0.2+0.3 = 0.9

d[σ(v4)] = 0.3+0.2+0.1 = 0.6

d[σ(v5)] = 0.2+0.1+0.5 = 0.8

d[σ(v6)] = 0.2+0.3+0.1 = 0.6

d[σ(v7)] = 0.1+0.2+0.2 = 0.5

d[σ(v8)] = 0.1+0.1+0.2 = 0.4

THEN we obtain the degree of edges. $\sum_{i=1}^{8} \mu(v_i, v_{i+1})$ = 0.1+0.4+0.3+0.2+0.5+0.3+0.2 +0.1+0.2+0.1+0.2+0.1 = 2.7, if $v_{i+1} \leq v_8$

Therefore $\sum_{i=1}^{8} \mu(v_i, v_{i+1})$ = 2.7, if $v_{i+1} \leq v_8$

From this we get, $\sum_{i=1}^{8} d[\sigma(v_i)] = 2\sum_{i=1}^{8} \mu(v_i, v_{i+1}) =$ 5.4, if $v_{i+1} \leq v_8$

In general, $\sum_{i=1}^{n} d[\sigma(v_i)] = 2\sum_{i=1}^{n} \mu(v_i, v_{i+1})$, if $v_{i+1} \leq v_n$

the sum of degrees of vertices = twice the sum of degree of membership of all the edges.

Hence the proof.

V. FUZZY IF-THEN RULE IN EULER GRAPH

Theorem: In euler graph, the sum of the degree of vertices of even degree is equal to the twice the degree of membership of all the edges and the difference of the sum of degrees of vertices of odd degree.

Proof: Let G be a euler graph with 5 vertices. Consider 5 vertices {σ(v1),σ (v2), σ(v3), σ(v4), σ(v5)} on euler graph.

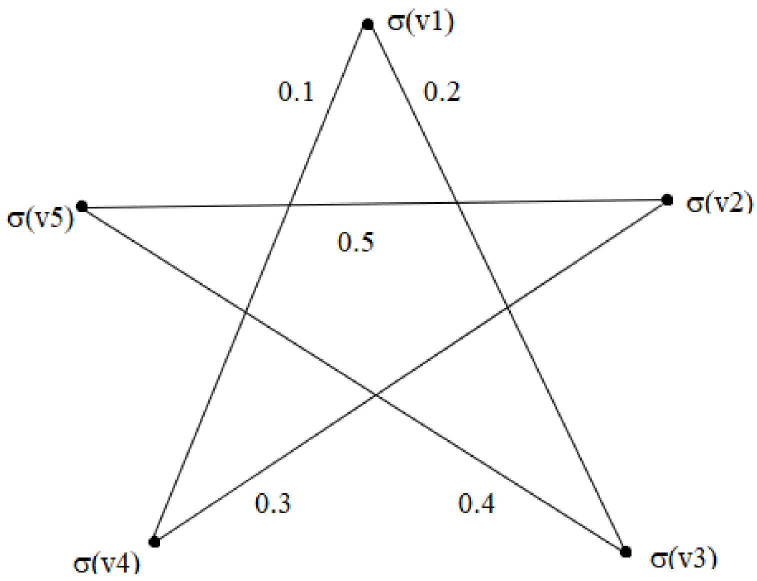

Figure 2

VI. EULER GRAPH

IF the membership grades of edges which are incident on any degree of vertex σ(v) are added, THEN the sum of corresponding membership values of vertices vary.

d[σ(v1)] = 0.1+0.2 = 0.3

d[σ(v2)] = 0.3+0.5 = 0.8

d[σ(v3)] = 0.4+0.2 = 0.6

d[σ(v4)] = 0.3+0.1 = 0.4

d [σ(v5)] = 0.4+0.5 = 0.9

IF the membership grades of edges are added THEN we get the degree of edges,

$\sum_{i=1}^{8} \mu(u_i, v_{i+1})$ = 0.2+0.1+0.5+0.4+0.3 = 1.5

$\sum_{i=1}^{n} d[\sigma(v_i)] =$ Twice the sum of degree of membership of (u_i, v_{i+1})

Therefore, $\sum_{i=1}^{n} d(v_i) = 2\sum_{i=1}^{n} \mu(u_i, v_{i+1})$

But we split deg[$\sigma(v_i)$] into two parts $\sum_{i=1}^{k} d(v_i) + \sum_{i=1}^{n} d(w_k) = 2\sum_{i=1}^{n} \mu(u_i, v_{i+1})$

$\sum_{i=1}^{k} d(v_i)$ denotes the sum over even degree vertices

$\sum_{i=1}^{k} d(v_i)$ = 0.8+0.4 = 1.2

$\sum_{i=1}^{n} d(w_k)$ denotes the sum over odd degree vertices

$\sum_{i=1}^{n} d(w_k)$ = 0.3+0.6+0.9 = 1.8

IF the sum of the degree of vertices of even degree is 1.2, THEN it is equal to the twice the degree of membership of all the edges and the difference of the sum of degrees of vertices of odd degree.

$\sum_{i=1}^{k} d(v_i) = 2\sum_{i=1}^{n} \mu(u_i, v_{i+1}) - \sum_{i=1}^{n} d(w_k)$

1.2 = 2(1.5) – 1.8

1.2 = 3.0 – 1.8

1.2 = 1.2

Hence the proof.

VII. CONCLUSION

We applied IF-THEN rule in bipartite and euler graph and generalized result has been obtained by using two theorems.

VIII. REFERENCES

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