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Application of Fuzzy soft Bi-partite graph in Matrimonial process

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Abstract: *Fuzzy sets and soft sets are two different tools for representing uncertainty and vagueness. In this paper We introduce the notions of fuzzy soft bi-partite graph, Size and degree of fuzzy soft bi-partite graph and investigating some of their applications.*
Keywords: *fuzzy soft graph, fuzzy soft bi-partite graph, and size and degree of fuzzy soft bi-partite graph.*

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I. INTRODUCTION

The Concept of soft set theory was initiated by Molodtsov [1] for dealing uncertainties. A Rosenfeld [2] developed the theory of fuzzy graphs in 1975 by considering fuzzy relation on fuzzy set, which was developed by Zadeh [3] in the year 1965. Some operations on fuzzy graphs are studied by Mordeson an C.S. Peng [4] .Later Ali et al. discussed about fuzzy sets and fuzzy soft sets induced by soft sets. M.Akram and S Nawaz [5] introduced fuzzy soft graphs in the year 2015. Sumit mohinta and T K samanta [6] also introduced fuzzy soft graphs independently. The notion of fuzzy soft graph and few properties related to it are presented in their paper. In this paper , fuzzy soft bipartite graph, Size and degree of Fuzzy soft bi-partite graph and Application of fuzzy soft bi-partite graph in matrimonial process are discussed.

II. PRELIMINARIES

We now review some elementary concepts of bipartite graph and fuzzy soft graph

Definition : 2.1

Let U be an initial universe set and E be the set of parameters. Let A $\subset E$, A pair (F,A) is called ***fuzzy soft set*** over U where F is a mapping given by F : A → I^U, where I^U denotes the collection of all fuzzy subsets of U.

Definition : 2.2

Let V be a nonempty finite set and $\sigma : V \rightarrow [0, 1]$. Again , let $\mu : V\,X\,V \rightarrow [0,1]$ such that $\mu(x, y) \leq \sigma(x) \wedge \sigma(y)$ for all $(x, y) \in V\,X\,V$. Then the pair $G = (\sigma, \mu)$ is called ***a fuzzy graph over the set V***. Here σ *and* μ are respectively called *fuzzy vertex and fuzzy edge* of the fuzzy graph
G = (σ , μ)

Definition : 2.3

The ***degree of any vertex*** $\sigma(x_i)$ of a fuzzy graph is sum of degree of membership of all those edges which are incident on a vertex $\sigma(x_i)$ and is denoted by $deg(\sigma(x_i))$.

Definition : 2.4

Let $G = (\sigma , \mu)$ be a fuzzy graph. The ***Order of G*** $= (\sigma , \mu)$ is defined as

$$O(G) = \sum_{u \in V} \sigma(u)$$

and *the size of* $G = (\sigma , \mu)$ is defined as

$$S(G) = \sum_{u,v \in V} \mu(u, v).$$

Definition : 2.5

A fuzzy graph G = (μ, ρ) is said be a fuzzy Bi-partite graph. If the vertex set V is petitioned into two disjoint union of two vertex sets V_1 and V_2 such that for all x, y ε V_1 or for all x, y ε V2 ρ(x, y) = $\frac{1}{2}$ $[\square(x) \wedge \square(y)]$. This fuzzy Bi-partite graph can be denoted by $G(V_1, V_2, \mu, \rho)$.

Definition : 2.6

Let $G_{A,V}$ = ((A,ρ),(A,μ)) is said be a fuzzy soft graph. Then the order of $G_{A,V}$ is defined as

O $(G_{A,V}) = \sum_{e\ \varepsilon\ A} \sum_{x_i\ \varepsilon\ V} \rho_e(x_i)$ and the size of $G_{A,V}$ is defined as:

S $(G_{A,V}) = \sum_{e\ \varepsilon\ A} \sum_{x_i x_j\ \varepsilon\ V} \mu_e(x_i , x_j)$

Definition : 2.7

Let $G_{A,V}$ = ((A,ρ),(A,μ)) is said be a fuzzy soft graph. Then the degree of vertex u is defined as $d_{G_{A,V}}(\mathrm{u}) = \sum_{e\,\varepsilon\,A} \sum_{v\,\varepsilon\,V, u\neq v} \mu_e(u, v)$

III. FUZZY SOFT BI-PARTITE GRAPH

In this section , We now introduce some basic concepts of fuzzy soft bi-partite graph

Definition : 3.1

A fuzzy soft graph $G_{A,V}$ = ((A,ρ),(A,μ)) is said be a fuzzy **soft Bi-partite graph**. If the vertex set V is petitioned into two disjoint vertex pair and $\mu_e(x_i, y_j) = \rho_e(x_i) \wedge \rho_e(y_j)$ for all $x_i\ \varepsilon\ v_i$ and $y_j\ \varepsilon\ v_j$

Definition : 3.2

If a fuzzy soft graph $G_{A,V}$ = ((A,ρ),(A,μ)) is said be a fuzzy soft Bi-partite graph,then **Size of Fuzzy soft bi-partite graph** is

$$S\,(G_{A,}v_i \cup v_j) = \sum_{e\,\varepsilon\,A} \sum_{x_i y_j\,\varepsilon\,v_i \cup v_j} \mu_e(x_i, y_j)$$

Example : 3.1

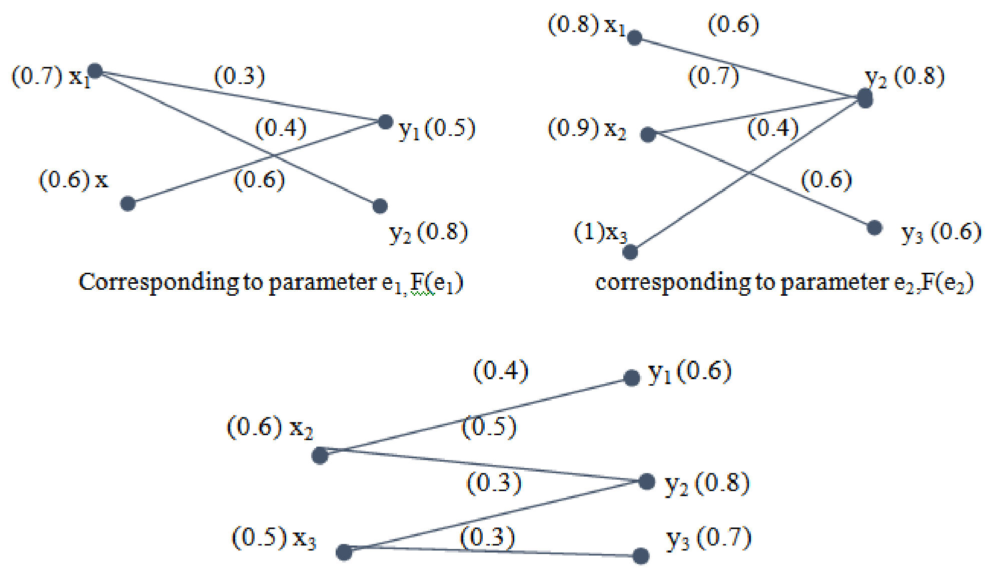
Consider a fuzzy soft graph $G_{A,V}$, where V $=v_i \cup v_j$ ={x_1 ,x_2 ,x_3 ,y_1 ,y_2 ,y_3} and E = {e_1 ,e_2 ,e, }. Here$G_{A,V}$ described by table and$\mu_e(x_i, y_j) = 0$ for all $(x_i, y_j)\,\varepsilon\ v_i \times v_j \setminus \{ (x_1, y_1)$ (x_1, y_2),(x_2, y_1).(x_2, y_2).(x_2, y_3).(x_3, y_2).(x_3, y_3)}and for all$e\ \varepsilon\ E$

Tabular representation of fuzzy soft bi partite graph

Table 3.1

ρ	x_1	x_2	x_3	y_1	y_2	y_3
e_1	0.7	0.6	0	0.5	0.8	0
e_2	0.8	0.9	1.0	0	0.8	0.6
e_3	0	0.6	0.5	0.6	0.8	0.7

μ	x_1,y_1	x_1,y_2	x_2, y_1	x_2, y_2	x_2, y_3	x_3, y_2	x_3, y_3
e_1	0.3	0.6	0.4	0	0	0	0
e_2	0	0.6	0	0.7	0.4	0.6	0
e_3	0	0	0.4	0.5	0	0.3	0.3



Corresponding to parameter e_3, F (e_3)

Fig 3.1 Fuzzy soft bi-partite graph $G_{A,V}$

The size of Fuzzy soft bi-partite graph $G_{A,V}$ is

S (F(e_1)) =$\sum_{x_i y_j\,\varepsilon\,v_i \cup v_j} \mu_e(x_i, y_j)$

= 0.3+0.6+0.4 =1.3

S (F(e_2)) =$\sum_{x_i y_j\,\varepsilon\,v_i \cup v_j} \mu_e(x_i, y_j)$

= 0.6+0.7+0.4+0.6 = 2.3

S (F(e_3)) =$\sum_{x_i y_j\,\varepsilon\,v_i \cup v_j} \mu_e(x_i, y_j)$

$= 0.4+0.5+0.3+0.3 = 1.5$

$S(G_{A}, v_i \cup v_j) = \sum_{e \, \varepsilon \, A} \sum_{x_i y_j \, \varepsilon \, v_i \cup v_j} \mu_e(x_i, y_j)$

$= (0.3+0.6+0.4)+(0.6+0.7+0.4+0.6)+(0.4+0.5+0.3+0.3)$

$= 1.3+2.3+1.5$

$= 5.1$

The degree of the vertices

$d_{G_{A}, v_i \cup v_j}(x_1) = 1.5$, $d_{G_{A}, v_i \cup v_j}(x_2) = 2.1$, $d_{G_{A}, v_i \cup v_j}(x_3) = 1.5$, $d_{G_{A}, v_i \cup v_j}(y_1) = 1.1$,

$d_{G_{A}, v_i \cup v_j}(y_2) = 2.4$, $d_{G_{A}, v_i \cup v_j}(y_3) = 1.3$

IV. Application of fuzzy soft bi-partite graph in matrimonial process

'Marriages are made in heaven'-This has become obsolete and the current trend is "marriages are made by the marriage- facilitators". The characteristics of the aspirants are highlighted by the facilitators and the most liked traits are favourably chosen by the bidders themselves. Generally, there are different types of characterised brides and bridegrooms who search for their perfect match. Here, by using fuzzy soft bi partite graph a research is carried out. The goal of the research is on selection of most preferable brides and bridegrooms and also aims at finding the most occurring match. By considering bride and bride groom as two sets of disjoint vertex sets and their qualities required for matching as parameters and the preference between the bride and bride groom as edges.

Let $V = V_i \cup V_j$ = { V_i: (x_1, x_2, x_3, x_4), V_j : (y_1, y_2, y_3, y_4)} are set of all two disjoint vertices and A = {e_1, e_2, e_3, e_4, e_5} are parameterised set where

Identified qualities of different types of bride as follows

X_1 – beautiful and educated

X_2 – Beautiful and wealthy

X_3 – Beautiful and Working

X_4 – Wealthy and educated

Identified qualities of different types of bride groom follows

Y_1 – Handsome and employee

Y_2 – Handsome and business man

Y_3 – Handsome and settled

Y_4 – Business man and well settled

And the parameters

e_1 = {Bride – Beautiful, Bride groom – Handsome}

e_2 = {Bride – Beautiful, Bride groom – settled}

e_3 = {Bride – Wealthy, Bride groom – settled}

e_4 = {Bride – Educated, Bride groom – Business man}

e_5 = {Bride – Educated, Bride groom – Business man}

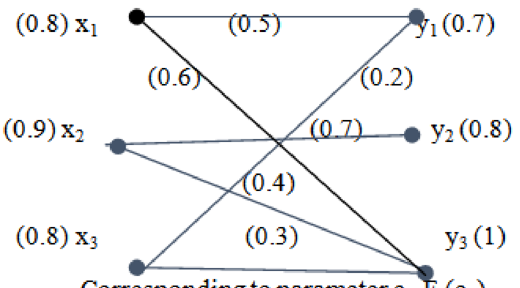
Tabular representation of fuzzy soft bi partite graph

Table 4.1

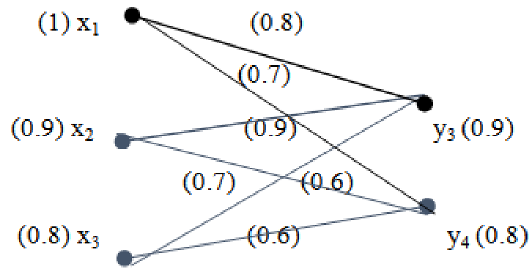
μ	x_1,y_1	x_1,y_2	x_1,y_3	x_1,y_4	x_2,y_2	x_2,y_3	x_2,y_4	x_3,y_1	x_3,y_3	x_3,y_4	x_4,y_2	x_4,y_3	x_4,y_4
e_1	0.5	0	0.6	0	0.7	0.4	0	0,2	0.3	0	0	0	0
e_2	0	0	0.8	0.7	0	0.9	0.6	0	0.7	0.6	0	0	0
e_3	0	0	0	0	0	0.7	0.5	0	0	0	0	0.3	0.2
e_4	0	0.5	0	0.4	0	0	0	0	0	0	0.3	0	0.2
e_5	0	0	0	0	0	0	0	0.5	0.2	0	0	0	0

P	x_1	x_2	x_3	x_4
e_1	1.1	0.9	0.5	0
e_2	0.5	1.5	1.3	0
e_3	0	1.3	0	0.7
e_4	0.9	0	0	0.5
e_5	0	0	0.7	0

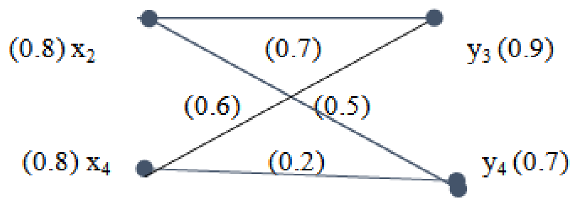
ρ	y_1	y_2	y_3	y_4
e_1	0.7	0.7	1.4	0
e_2	0	0	2.4	1.9
e_3	0	0	1.2	0.8
e_4	0	0.8	0	0.6
e_5	0.5	0	0.2	0



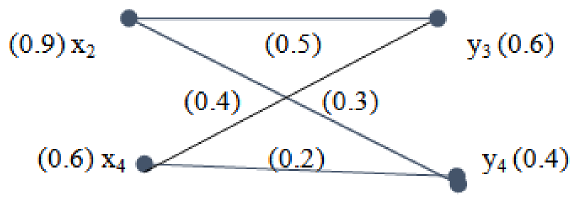
Corresponding to parameter e_1, F (e_1)



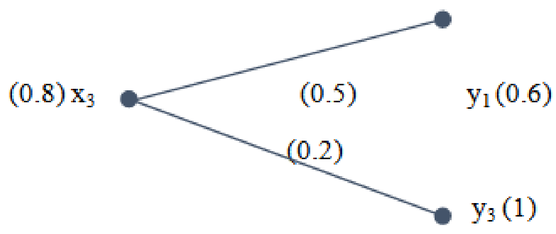
Corresponding to parameter e_2, F (e_2)



Corresponding to parameter e_3, F (e_3)



Corresponding to parameter e_4, F (e_4)



Corresponding to parameter e_5, F (e_5)

Fig 4.1 Fuzzy soft bi-partite graph $G_{A,V}$

The size of each parameterised graphs is calculated below

S (F (e_1)) = $\sum_{x_i y_j \,\varepsilon\, v_i \cup v_j} \mu_{e_1}(x_i, y_j)$

$= 0.5+0.6+0.7+0.4+0.2+0.3 = 2.7$

S (F (e_2)) = $\sum_{x_i y_j \,\varepsilon\, v_i \cup v_j} \mu_{e_2}(x_i, y_j)$

= 0.8+0.7+0.9+0.6+0.7+0.6 = 4.3

S (F (e_3)) $=\sum_{x_i y_j \, \varepsilon \, v_i \cup v_j} \mu_{e_3} (x_i , y_j)$

= 0.7+0.5+0.3+0.2 = 1.7

S (F (e_4)) $=\sum_{x_i y_j \, \varepsilon \, v_i \cup v_j} \mu_{e_4} (x_i , y_j)$

= 0.5+0.4+0.3+0.2 = 1.3

S (F (e_5)) $=\sum_{x_i y_j \, \varepsilon \, v_i \cup v_j} \mu_{e_5} (x_i , y_j)$

= 0.5+0.2 = 0.7

From the above discussion the following fact is revealed:" The most favourable matching happens between beautiful brides and well settled bride grooms "

(ii) To find the most preferable bride and bride groom here we going to calculate degrees of each vertex

Table 4.2

ρ	x_1	x_2	x_3	x_4		ρ	y_1	y_2	y_3	y_4
e_1	1.1	0.9	0.5	0		e_1	0.7	0.7	1.4	0
e_2	0.5	1.5	1.3	0		e_2	0	0	2.4	1.9
e_3	0	1.3	0	0.7		e_3	0	0	1.2	0.8
e_4	0.9	0	0	0.5		e_4	0	0.8	0	0.6
e_5	0	0	0.7	0		e_5	0.5	0	0.2	0
d(x_i)	2.5	3.7	2.5	1.2		d(y_j)	1.2	1.5	5.2	3.3

As regards brides:

The vertex x_2 depicts the quality of most sought after bride. It is inferred that beautiful and wealthy brides are preferable over the rest.

In the case of bridegroom:

The vertex y_3 dominate the other qualities, the bridegroom most wanted are those who are handsome and well settled.

V. Conclusion

Finally, we have revealed the most favourable matching happens between beautiful brides and well settled bride grooms and inferred that beautiful and wealthy brides are preferable over the rest and the bridegroom most wanted are those who are handsome and well settled

References

[1]. T.K.Mathew Varkey, A.M. Shyla . A Note on Bipartite and Balanced Fuzzy Graph Structures 6 ,7 (2017) : 12637 – 12640.

[2]. A.Rosenfeld, Fuzzy graph , in ; L.A.Zadeh, K.S.Fu, K.Tanaka, M.Shimura (edS), Fuzzy Sets and Their Applications to cognitive and decision Process , Acaemic Press, New York, 1975, pp. 75 – 95.

[3]. Dr. K. Kalaiarasi and L. Mahalakshmi, An Introduction to Fuzzy strong graphs, Fuzzy soft graphs, compliment of fuzzy strong and soft graphs,13,November 6(2017), 2235-2254.

[4]. J.N.Mordeson an C.S.Peneg, Operations on fuzzy graphs, Information sciences, 79, September 1994, 159 – 170.

[5]. M. Akram, S. Nawaz, On fuzzy soft graphs , Italian Journal of Pure and Applied M,

[6]. S.Mohinta , T.K.Samanta, An Introduction to fuzzy soft graph , Mathematics Moravica 19 – 2 (2015) 35 – 48.

[7]. M. Akram, S. Nawaz, Fuzzy soft graphs with applications , Journal of Intelligent and Fuzzy Systems 30 (6) (2016) 3619 – 3632.

[8]. M. Akram, S. Nawaz , Operations onsoft graphs, Fuzzy Information and Engineering 7(4) (2015) 423 – 449.

[9]. D.A. Molodtsov , Soft set theory -f irst results , Computers and Mathematics with Applications 37, (1999) ,19 – 31.

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