Original Article

A Noval Approach on Triangular Fuzzy Unisum Labeling in Pharmaceutical Research

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Abstract

Triangular fuzzy graph labeling is used to create a networking model in the field of pharmaceutical research which will provide a structure for taking advantage of proposed medicines and segregate suitable compounds in case of vagueness of dataset of medicines. Especially all acyclic fuzzy graphs are most commonly used to represent a pharmaceutical model. In this paper,Triangular fuzzy unisum labeling has been introduced which is used to attain the accuracy value in the consecutive distinct edge labeling. Also the researcher have been shown the existence of unisum labeling in triangular fuzzy bistar graph 〖B〗_(m,n):(σ,μ) ∀ m,n . Also the researcher have been proved the results such that every triangular fuzzy bistar graph admits the condition of unisum labeling which is leading to obtain the triangular fuzzy graceful bistar graph.

Keywords: Triangular fuzzy graceful labeling, Triangular fuzzy unisum labeling.

1. INTRODUCTION

During and after the pandemic period, pharmaceutical networking is one of the most important usage in day today life which is used to separate drugs in large number of data sets. In starting days, transferring of chemical bonds in medicine are represented by crisp graph labeling which is used only for crisp data points. But in case of uncertainty of signals, more perfect results will not be getting using crisp graph labeling . A.Nagoorgani and et al [2-5] have discussed more results on fuzzy graph labeling and its properties which are more helpful to assign labels in all network models of chemical bonding in pharmaceutical medicines in case of ambiguity .Unified Graph Theory-Based Modeling concepts have been given by Jingyang Fang [1]. Lalitha.P [6] have provided some results on unisum labeling of hydra hexagons. N.Sujatha and et al [7-10] have proved many results on fuzzy magic and fuzzy graceful on acyclic fuzzy graphs. Also the results have been extended by assigning labels of vertices and edges in the fuzzy graph labeling by using triangular fuzzy numbers . K.Thirusangu and et al[12] have discussed some concepts on fuzzy bi magic and fuzzy anti magic labeling . Triangular fuzzy graph labeling is used to create a networking model in the field of pharmaceutical research which will provide a structure for taking advantage of proposed medicines and segregate suitable compounds in case of vagueness of dataset of medicines. Especially all acyclic fuzzy graphs are most commonly used to represent a pharmaceutical model. In this paper,Triangular fuzzy unisum labeling has been introduced which is used to attain the accuracy value in the consecutive distinct edge labeling. Also the researcher have been shown the existence of unisum labeling in triangular fuzzy bistar graph 〖B〗_(m,n):(σ,μ) ∀ m,n . Also the researcher have been proved the results such that every triangular fuzzy bistar graph admits the condition of unisum labeling which is leading to obtain the triangular fuzzy graceful bistar graph.

2. Preliminaries

Definition 2.1. [2]

A fuzzy graph $G = (\sigma, \mu)$ is a pair function $\sigma : V \to [0, 1]$ and $\mu : V \times V \to [0, 1]$ where for all $u, v \in V$. We have μ(u,

v) ≤σ(u) ∧σ(v).

Definition 2.2. [2]
A fuzzy graph G = (σ, μ) is said to be a fuzzy labeling graph, if σ : V → [0, 1] and μ : V × V → [0, 1] is injective such that the membership value of edges and vertices are distinct and μ(u, v) <σ(u) ∧σ(v) for all u, v ∈ V.

Definition 2.3. [6]
Let G=(V,E) be a graph where 'V' indicates the elements of vertices as X(G) = {1, 2, 3, …, n + 1} and 'E' shows the components of edges as Y(G) = {1, 2, 3,..., n + 1}, where 'n' is the number of edges of the graph G. Then the Unisum labelling of the edges of G takes the value '|s–t| + 1' where s, t ϵ X (G)

Definition 2.4. [4] Triangular Fuzzy Number
It is a fuzzy number represented with three points as follows : $\tilde{A} = [a_{1,}\ a_{2,}\ a_3]$. This representation is interpreted as membership functions and holds conditions.

(i) a_1 to a_2 is an increasing function

(ii) a_2 to a_3 is a decreasing function

and

$$\mu_{\tilde{A}}(x) = \begin{cases} 0 & for\ x < a_1 \\ \dfrac{x - a_1}{a_2 - a_3} & for\ a_1 \le x \le a_2 \\ \dfrac{a_3 - x}{a_3 - a_2} & for\ a_2 \le x \le a_3 \\ 0 & for\ x > a_3 \end{cases}$$

Definition 2.5[4]
Addition and Subtraction operation of triangular fuzzy numbers are given as follows.

Let $\tilde{A} = [a_1, a_2, a_3]$ and $\tilde{B} = [b_1, b_2, b_3]$

$\tilde{A} + \tilde{B} = [a_1 + b_1,\ a_2 + b_2,\ a_3 + b_3]$

$\tilde{A} - \tilde{B} = [a_1 - b_3, a_2 - b_2, a_3 - b_1]$

Definition 2.6. [9] The process of assigning triangular fuzzy numbers to each fuzzy labeled vertices and fuzzy labeled edges of a fuzzy labeled graph $G:(\sigma,\mu)$ is known as triangular fuzzy labeling.

Definition 2.7.[9] A fuzzy labeled graph $G:(\sigma,\mu)$ is said to be triangular fuzzy labeled graph if it admits triangular fuzzy labeling with

$\sigma : V \to [0,1]$ and $\mu : V \times V \to [0,1] \ni \mu(u,v) < [\sigma(u) \cap \sigma(v)]\ \forall\, u,v \in V.$

Definition 2.8. [7]
If every edges and vertices of a triangular fuzzy labeled graph $G:(\sigma,\mu)$ satisfies the condition of unisum labeling then G is said to be triangular fuzzy unisum graph.

3. Main Results

In this section Triangular fuzzy unisum bistar graph $B_{m,n}: (\sigma,\mu)\ \forall\, m,n$ has been shown with the help of the following algorithm. Also the researcher have been proved that if the above mentioned graph admits the condition of triangular fuzzy unisum labeling then it satisfies the condition of triangular fuzzy graceful labeling with the help of following theorem.

Algorithm 3.1

Input: Fuzzy bistar graph

Procedure

{ *Triangular fuzzy unisum bistar graph* $B_{m,n}:(\sigma,\mu)\ \forall\, m,n$

$$(v_0, w_0) \rightarrow Apex\, vertices\ of\ B_{m,n}$$

$$\sigma(v_0) = [p_0, q_0, r_0] = [\ [4*m], [(4*m)+1],\ [(4*m)+2\ ]]$$

$$\sigma(w_0) = [x_0, y_0, z_0] = \left[\left[\frac{3*n}{2}\right], \left[\left[\frac{(3*n)}{2}\right]+2\right], \left[\left[\frac{(3*n)}{2}\right]+4\right]\right]$$

$$\mu\ \lfloor v_0,\ w_0 \rfloor = [d_0, e_0, f_0] = |\sigma(v_0) - \sigma(w_0)| + 1$$

$$for\ \ i = 1\ \ to\ \ m$$

{

$$p_i = \left[\left(\frac{(5*m)-i+1}{5}\right)\right]$$

$$q_i = \left[\left(\frac{5*p_i\ +(2*i)}{5}\right)\right]$$

$$r_i = \left[\left(\frac{5*q_i + (i+2)}{5}\right)\right]$$

$$[v_i] \leftarrow pendent\ vertices\ \ of\ B_{m,n}$$

$$\sigma\lfloor v_{i,} \rfloor = \lfloor p_i, q_{i,}, r_i \rfloor$$

$$\lfloor v_0,\ v_i \rfloor \leftarrow pendent\ edges\ of\ B_{m,n}$$

$$\mu\ \lfloor v_0,\ v_i \rfloor = [d_i, e_i, f_i]$$

$$d_i = |[p_0 - r_i]| + 1$$

$$e_i = |[q_0 - q_i] + 1|$$

$$f_i = |[r_0 - p_i] + 1|$$

}

$$for\ \ j = 1\ \ to\ \ n$$

{

$$x_j = \left[\frac{(10*n) - j + 1}{10}\right]$$

$$y_j = \left[\frac{(10*x_j\ ) + 2*j}{10}\right]$$

$$z_j = \left[\left(\frac{(10*y_j) + j + 2}{10}\right)\right]$$

$$\lfloor w_j \rfloor \leftarrow pendent\ vertices\, of\ B_{m,n}$$

$$\sigma\lfloor w_{j,} \rfloor = \lfloor x_j, y_{j,}, z_j \rfloor$$

$$\lfloor w_0,\ w_j \rfloor \leftarrow pendent\, edges\ of\ B_{m,n}$$

$$\mu\ \lfloor w_0,\ w_j \rfloor = \lfloor a_j, b_j, c_j \rfloor$$

$$a_j = |[x_0 - z_j]| + 1$$

$b_j = |[y_0 - y_j] + 1|$

$c_j = |[z_0 - x_j] + 1$

}

}

end procedure

Theorem 3.1:

If $B_{m,n}: (\sigma, \mu)\ \forall\, m, n$ the triangular fuzzy bistar graph in which the labels of vertices and edges are assigned with the triangular fuzzy numbers , then the said graph satisfies the condition of triangular fuzzy unisum labeling.

Proof:

Given $B_{m,n}: (\sigma, \mu)\ \forall\, m, n$ be the triangular fuzzy bistar graph in which the labels of vertices and edges are assigned with the triangular fuzzy numbers.

To prove $B_{m,n}: (\sigma, \mu)\ \forall\, m, n$ be the triangular fuzzy unisum bistar graph.

That is to prove that

$$\mu\ [v_0\ ,\ w_0] = |v_0 - w_0| + 1\ ,\quad \mu\ [v_0\ ,\ v_i] = |v_0 - v_i| + 1, \quad \forall v_i \in V$$

$and\ \mu\ [w_0\ ,\ w_j] = |w_0 - w_j| + 1, \quad \forall\, w_j \in W$ with distinct membership values of edges and vertices .The proof can be shown in three stages.

Stage- I

By using algorithm 3.1,we have

$$\sigma(v_0) = [p_0, q_0, r_0] = [\ [4*m], [(4*m)+1]\ ,\ [(4*m)+2\ ]]$$

$$\sigma(w_0) = [x_0, y_0, z_0] = \left[\left[\frac{3*n}{2}\right], \left[\left[\frac{(3*n)}{2}\right]+2\right], \left[\left[\frac{(3*n)}{2}\right]+4\right]\right]$$

Hence for all m,n , We have

$$\mu(v_0, w_o) \ = |\,\sigma(v_0) - \sigma(w_0)\,| + 1 \ \ , v_0, w_0 \in V, W ....(3.1)$$

Stage- II

By Algorithm 3.1,

$$\mu\ [v_0\ ,\ v_i] = [d_i\ , e_i\ ,\ f_i] ....(3.2)$$

Now

$$d_i = |p_0 - r_i| + 1$$

$$d_i = \left| p_0 - m - \left[\frac{3}{5}\right] - \left[\frac{2*i}{5}\right] \right| + 1 .... \quad (3.3)$$

Also $\quad e_i = |[q_0 - q_i]| + 1$

$$e_i = \left|\left[q_o - m + \left[\frac{i-1}{5}\right] - \left[\frac{2*i}{5}\right]\right]\right| + 1 .... \quad (3.4)$$

Similarly,

$$f_i = |[r_0 - p_i] + 1|$$

$$f_i = \left|\left[r_0\ - m + \left[\frac{i-1}{5}\right]\right]\right| + 1 ....(3.5)$$

By (3.3),(3.4) &(3.5) $\quad ,\ \mu\ [v_0\ ,\ v_i] = |v_0 - v_i| + 1 = [d_i\ , e_i\ ,\ f_i]$ ....(3.6)

Also for any $g,h \in i \ \mu \ \lfloor v_{0\,,}\ v_g \rfloor \neq \mu \ \lfloor v_{0\ ,}\ v_h \rfloor$ ....(3.7)

Stage III

By Algorithm 3.1.

We have

$$\mu \ \lfloor w_{0\ ,}\ w_j \rfloor = \lfloor a_j , b_j , c_j \rfloor \text{.............................(3.8)}$$

Now

$$a_j = |x_0 - z_j| + 1$$

$$a_j = \left| x_0 - n - \left[\frac{3}{10} \right] - \left[\frac{2 * j}{10} \right] \right| + 1 \text{...............................} \quad (3.9)$$

Also $b_j = |\lfloor y_0 - y_j \rfloor + 1$

$$b_j = \left\| \left[y_o - n + \left[\frac{j-1}{10} \right] - \left[\frac{2 * j}{10} \right] \right] \right\| + 1 \text{..........................} \ (3.10)$$

Similarly,

$$c_j = |\lfloor z_0 - z_j \rfloor + 1|$$

$$c_j = \left\| \left[z_0 - n + \left[\frac{j-1}{10} \right] \right] \right\| + 1 \text{....................(3.11)}$$

By (3.9),(3.10) &(3.11) , $\mu \ \lfloor w_{0\ ,}\ w_j \rfloor = |w_0 - w_j| + 1 = \lfloor a_j , b_j , c_j \rfloor$ ....(3.12)

Also for any $s,t \ \in j \ \mu \ \lfloor w_{0\,,}\ w_s \rfloor \neq \mu \ \lfloor w_{0\ ,}\ w_{,t} \rfloor$ ....(3.13)

Hence by Stage-I,Stage- II and Stage- III,

$B_{m,n}$: (σ, μ) $\forall \ m, n$ admits the condition of triangular fuzzy unisum labeling.

Example 3.1:

Triangular fuzzy graceful bistar graph $B_{99,99}$: (σ, μ)have been shown in the following

Figure1

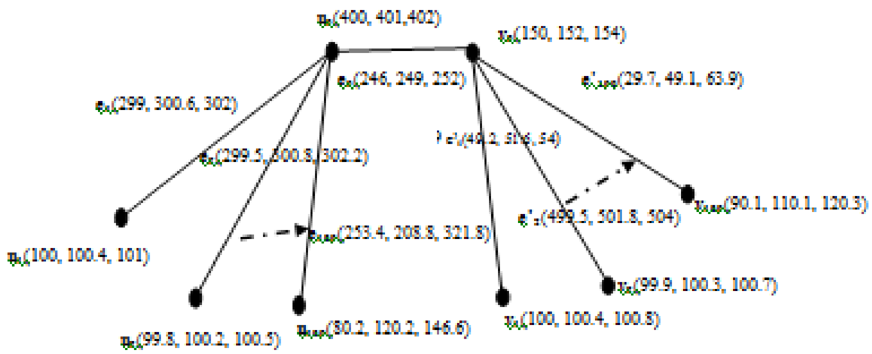

Figure 1 Triangular fuzzy unisum bistar graph $B_{99,\,99} : (\sigma, \mu)$

Theorem 3.2:

Every triangular fuzzy unisum bistar graph leads to the triangular fuzzy graceful bistar graph.

Proof:

Given $B_{m,n}: (\sigma, \mu)\ \forall\, m, n$ be the triangular fuzzy unisum bistar graph.

By Theorem 3.1 ,

Clearly for all m,n, the membership values of edges satisfies

$$\mu\ [v_{0\ ,}\ w_0] = |v_0 - w_0|\ ,\quad \mu\ [v_{0\ ,}\ v_i] = |v_0 - v_i|\ ,\quad \forall v_i \in V$$

$$and\ \ \mu\ [w_{0\ ,}\ w_j] = |w_0 - w_j|,\qquad \forall\, w_j \in W$$ with distinct membership values of edges and vertices .

Hence $B_{m,n}: (\sigma, \mu)\ \forall\, m, n$ be the triangular fuzzy graceful bistar graph.

4. CONCLUSION

In case of ambiguity in pharmaceutical networking which is occurred in chemical bonding, triangular fuzzy unisum labeling plays a vital role which is used to obtain an accuracy of consecutive distinct edge labeling in the above mentioned research. By providing an algorithm, Triangular fuzzy unisum bistar graph have been shown 〖B〗_(m,n):(σ,μ) ∀ m,n Also the result has been extended towards the existence of graceful labeling in the above mentioned graph through which gives effectiveness and accuracy of signals. Further research work can also be extended by using trapezoidal fuzzy numbers in acyclic fuzzy graph .

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