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APPLICATION OF TRANSLATE OPERATORS ON VAGUE SETS OF DIAGNOSIS OF THE TYPES OF GLAUCOMA DECEASE OF EYE

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ABSTRACT:

In this paper, we propose a vague method for the diagnosis ofthe types of glaucoma. This method is based on the relationsbetweenthesymptomsanddiseasesby vaguesets(VSS).Forthispurpose,wedevelophypotheticalmedical information with assigned degree of membership anddegreeofnon-membershipbasedontherelationbetweensymptomsandvarioustypes and apply translate operators on vague sets.

Keywords: Vaguesets (VSS),Medicalin sequence (MIS)

AMS Subject classification: 03E71, 03F64

1. Introduction:

Zadeh [14] was the first to establish the idea of a fuzzy set. The fuzzy set can express the state between "belong to" and "not belong to" by assigning a membership degree between 0 and 1 to items with respect to a set. As a result, fuzzy sets can be used to explain a large number of uncertainties that aren't adequately represented by classical sets. Since its inception, fuzzy set hypothesis has been employed in various applications, counting automatic control, pattern recognition, and decision-making. The hypothesis of fuzzy sets has been found to be unsatisfactory in many actual circumstances. As a result, numerous higher theories have arisen over time, such as vague sets (VSS), Pythagorean fuzzy sets, q-rung fuzzy sets given by Lin (2020) and so on.vague sets by Gowh and buhere is a higher hypothesis that is a notion of fuzzy sets that ask specialists to provide non-membership opinions on set elements. As a result,vague set (VSS) are frequently employed in pattern recognition applications suggested by W.L.Gahu, D.J. Buehrer [12] vague sets. The tools that are frequently employed in those application challenges are similarity and distance measures. These two ideas are complimentary in the sense that by subtracting one from a unit, one can be derived from the other. Similarity measure can be used to solve issues in a range of contexts, like decision making, machine learning, and pattern detection suggested by Wei (2017, 2018). Despite the fact that (VSS) are superior to FSs at conveying cloudy and unclear data, they shortage a crucial notion, namely degree of neutrality, which is relevant in a variety of circumstances such includes human voting, medical diagnosis, and personal selection, to name a few examples. When it comes to general election, a person has four choices: poll in favor, poll against, abstain from polling, or refuse to poll. In medical diagnostics, symptoms such as fever and headache may have little influence on disorders such as chest pain and stomach pain. the objective of this paper is further contribution, The objective of this paper,

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we propose a vague method for the diagnosis ofthe types of glaucoma. This method is based on the relationsbetweenthesymptomsanddiseasesby vaguesets(VSS).Forthispurpose,wedevelophypotheticalmedical information with assigned degree of membership anddegreeofnon-membershipbasedontherelationbetweensymptomsandvarioustypes and apply translate operators on vague sets.

2. Preliminaries:

In this sectionwe give here a review of some definitions and results which are in

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Definition [1]2.1: Let X be a non-empty set. A fuzzy set A drawn from X is defined as $A=\{x, m_A(x): x \in X\}$, where $m_A(x):X\to [0, 1]$ is the membership function of the fuzzy set A .

Definition[8] 2.2: A vague set A in the universe of discourse X is a pair $A= (m_A ,n_A)$ where $m_A :X\to[0 ,1]$, $n_A: X\to [0,1]$ such that $m_A(x)+n_A(x) \leq 1$ for all x in X. Here m_A is called the membership function and f_A is called non-membership function and also called truth function, false function respectively.

Definition 2.3 [4] The vague set A of a set X with $t_A(x)=0$ and $f_A(x)=1$, for all $x\in X$ is called the zero vague set of X. It is denoted by $\bar{0}=(0,1)$.

Definition 2.4 [5] The vague set A of a set X with $t_A(x)=1$ and $f_A(x)=0$, for x ∈,for all $x\in X$ is called the unit vague set of X. It is denoted by $\bar{1}=(1,0)$.

Definition 2.5: Let $A = (t_A, f_A)$, $B = (t_B, f_B)$ be two vague sets of a set X then their union is defined as $A\cup B = (t_{A\cup B},f_{A\cup B})$ where,$t_{A\cup B} = \max\{t_A,t_B\}$ and $f_{A\cup B}= \min\{f_A, f_B\}$.

Definition 2.63}[4]: Let $A = (t_A, f_A)$, $B = (t_B, f_B)$ be two vague sets of set X then their intersection is defined as $A\cap B = (t_{A\cap B}, f_{A\cap B})$

where, $t_{A\cap B} = \min\{t_A,t_B\}$ and $f_{A\cap B}= \max\{f_A, f_B\}$.

3. Vague sets:

The vague set theory has been developed in [3] as a generalization of the ordinary fuzzy set theory [3]. As an extension to the conventional Boolean set theory with its two possible values, true and false, the fuzzy set theory handles values that are partially true - partially false. In classical set theory the membership of an element to a given set is assessed byan indicator function that anbe either 0 for non-membership, or 1 for membership. By c onstructs, in thefuzzy set theory the membership of an element to a given set is caused by a membership function that can take any real value in the interval [0, 1].Thismembershipfunction,denotedbyμistermeddegreeofmembership. The c omplementofthemembershipfunctionto1,denotedbyν,istermeddegreeofnon-membership.Botht$_A$ and f_A can take real values in the interval [0, 1], such that $0\leq m_A(x)+ n_A x)\leq 1$. In the classical set theory either $m_A{}^{(x)} = 1$ and $n_A{}^{(x)} = 0$, or $m_A{}^{(x)} = 0$

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and n_A (x)=1.The vague set theory further generalizes the ordinary fuzzy set theory by allowing the degrees of membership and non-membership not necessarily add up to 1,so that $0 \leq m_A^{(x)} + n_A^{(x)} \leq 1$.The c omplementofthesumofthedegreesofmembershipandnon-membershipto1, denoted by π, is termed degree of uncertainty about membership or non-membership. Allthethreedegrees$m_A^{(x)}$,$n_A^{(x)}$andπ, cantakerealvaluesintheinterval[0,1],suchthatm_A (x)+ n (x) + π = 1. In the ordinary fuzzy set theory $\pi = 0$.

Table: 3.1

P= {A, B, C, D, E} be the set of patients and G= {g_1,g_2,g_3,g_4, g_5} be the set of symptoms of different stages present in patients which are converted to vague values (membership and non-membership values) of vague sets as follows.

Patients / disease	g_1 (Headache)	g_2 (eye pain)	g_3 (Vomiting)	g_4 (Blurred vision)	g_5 (Eye redness)
A	(0.6, 0.2)	(0.5, 0.1)	(0.7, 0.1)	(0.4, 0.3)	(0.3, 0.1)
B	(0.7, 0.1)	(0.4, 0.2)	(0.5, 0.2)	(0.5, 0.4)	(0.7, 0.1)
C	(0.4, 0.3)	(0.5, 0.3)	(0.6, 0.2)	(0.8, 0.1)	(0.5, 0.1)
D	(0.3, 0.1)	(0.7, 0.2)	(0.5, 0.3)	(0.5, 0.1)	(0.7, 0.1)
E	(0.7, 0.2)	(0.5, 0.1)	(0.4, 0.1)	(0.3, 0.2)	(0.5, 0.1)

Table 3.2:

Let B represents the membership, on-membership values of a vague sets in which are affected of the persons A, B, C.D, E of glaucoma disease values which are identified by doctors in a laboratory as follows.

Patients /symptoms	Open angle (early stage)	Angle closure (acute)	Normal tension glaucoma	Primary juvenile glaucoma	Secondary higher glaucoma
A	(0.5, 0.3)	(0.7, 0.2)	(0.3, 0.1)	(0.6, 0.2)	(0.6, 0.2)
B	(0.2, 0.1)	(0.5, 0.3)	(0.7, 0.2)	(0.6, 0.2)	(0.4, 0.1)
C	(0.3, 0.2)	(0.2, 0.2)	(0.2, 0.2)	(0.4, 0.2)	(0.3, 0.1)
D	(0.5, 0.3)	(0.8, 0.2)	(0.6, 0.1)	(0.8, 0.1)	(0.4, 0.2)
E	(0.9, 0.1)	(0.2, 0.2)	(0.4, 0.2)	(0.5, 0.1)	(0.5, 0.2)

Table 3.3:

The distance between the symptoms of glaucoma and the set of glaucoma disease values of the present having the patients which is identified by doctors in a laboratory is

d(G,B):$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Distances	Headache /Open angle	eye pain/ Angle closure	Vomiting/ Normal tension glaucoma	Blurred vision/ Primary juvenile	Eye redness / Secondary higher
A	0.1414	0.2236	0.4123	0.0500	0.3162
B	0.5000	0.1414	0.2000	0.2236	0.3000
C	0.2236	0.5099	0.4000	0.4123	0.2000
D	0.2828	0.1000	0.2236	0.3000	0.3162
E	0.2236	0.3162	0.1000	0.2236	0.1000

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4. Translate operators onsymptoms of vague glaucoma on the patients for vague diagnosis Procedure for the type of Glaucoma:

In this section we apply translate operators on vague glaucoma of the patients for vague diagnosis Procedure for the types of glaucoma of the set of symptoms of different stages present in patients and distinct stages of glaucoma disease vague values

Definition 4.1.: Let X be a universal set and A=(x, $m_A^{(x)}$, $n_A^{(x)}$) be a vague set of X then vague increasing translate operator $T_{\alpha+}$(A) on X can be defined

$T_{\alpha+}$(A)= ($m_{AT_{\alpha+}}$(x) , $n_{AT_{\alpha+}}$(x)) where

1. $m_{AT_{\alpha+}}$(x)=min{ $m_{AT_{\alpha+}}$(x) $+\alpha$, 1}.

A={(g_1, 0.6, 0.2), ($g_2$0.5, 0.1), ($g_3$0.7, 0.1), (g_4,0.4, 0.3), ($g_5$0.3, 0.1)

(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8

(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7

(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9

(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6

(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5.

2. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha, 0$ }

(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha, 0$ }= max{0.2–0.2,0 }=0.0

(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha, 0$ }= max{0.1–0.2,0 }=0.0

(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha, 0$ }= max{0.1–0.2,0 }=0.0

(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha, 0$ }= max{0.3–0.2,0 }=0.1

(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha, 0$ }= max{0.1–0.2,0 }=0.0

Therefore $T_{\alpha+}$(A)={(g_1, 0.8, 0.0), ($g_2$0.7, 0.0), ($g_3$0.6, 0.0), (g_4,0.6, 0.1), ($g_5$0.5, 0.0)}.

3. B={(0.7, 0.1), (0.4, 0.2), (0.5, 0.2), (0.5, 0.4), (0.7, 0.1) }

(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9

(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6

(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7

(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7

(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9.

4. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha, 0$ }

(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha, 0$ }= max{0.1–0.2,0 }=0.0

(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha, 0$ }= max{0.0–0.2,0 }=0.0

(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha, 0$ }= max{0.0–0.2,0 }=0.0

(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha, 0$ }= max{0.1–0.2,0 }=0.0

(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha, 0$ }= max{0.0–0.2,0 }=0.0

Therefore $T_{\alpha+}$(B)={(g_1, 0.9, 0.0), ($g_2$0.6, 0.0), ($g_3$0.7, 0.0), (g_4,0.7,0.0), ($g_5$0.9, 0.0)}.

5.C={ (g_1,0.3, 0.2), (g_2,0.2, 0.2), ($g_3$0.2, 0.2), ($g_4$0.4, 0.2), ($g_5$0.3, 0.1)}

(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5

(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.2 +0.2, 1}=0.4

(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.2 +0.2, 1}=0.4

(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6

(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5.
6. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha$, 0 }
(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.1
(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
Therefore $T_{\alpha+}$(C)={(g_1, 0.8, 0.0), ($g_2$0.7, 0.0), ($g_3$0.6, 0.0), (g_4,0.6, 0.1), ($g_5$0.5, 0.0)}.

D={ (g_1,0.3, 0.1), (g_2,0.7, 0.2), ($g_3$0.5, 0.3), ($g_4$0.5, 0.1), (g_5,0.7, 0.1)}

7.(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5
(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9
(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8
(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8
(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7.
8. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha$, 0 }
(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.1–0.2,0 }=0.0
(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.1–0.2,0 }=0.0
Therefore $T_{\alpha+}$(D)={(g_1, 0.5, 0.0), (g_2,0.9, 0.0), ($g_{3,}$0.8, 0.0), (g_4,0.8, 0.1), (g_5,0.7, 0.0)}.

E={ (g_1,0.7, 0.2), (g_2,0.5,0.1), (g_3,0.4, 0.1), ($g_4$0.3, 0.2), (g_5,0.5, 0.1)}
9.(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9
(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.9 +0.2, 1}=1
(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.8 +0.2, 1}=1
(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.8 +0.2, 1}=1
(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.8 +0.2, 1}=1
10. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha$, 0 }
(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.1–0.2,0 }=0.0
(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.0–0.2,0 }=0.0
Therefore $T_{\alpha+}$(E)={(g_1, 0.9, 0.0), (g_2,1,0.0), ($g_{3,}$1, 0), (g_4, 1, 0), (g_5,1, 0)}.

4.2 Translate operators onsymptoms of vague glaucoma on the patients for vague diagnosis Procedure for the type of Glaucoma

Patients / disease	Open angle (early stage)	Angle closure (acute)	Normal tension glaucoma	Primary juvenile glaucoma	Secondary higher glaucoma
$T_{\alpha+}$(A)	(g_1, 0.8, 0.0)	(g_2,0.7, 0.0)	($g_{3,}$0.6, 0.0)	(g_4,0.6, 0.1)	(g_5,0.5, 0.0)
$T_{\alpha+}$(B)	(g_1, 0.9, 0.0)	($g_{2,}$0.6, 0.0)	(g_3,0.7, 0.0)	(g_4,0.7,0.0)	(g_5,0.9, 0.0)

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$T_{\alpha+}$(C)	(g_1, 0.8, 0.0)	(g_2,0.7, 0.0)	(g_3,0.6, 0.0)	(g_4,0.6, 0.1)	(g_5,0.5, 0.0)
$T_{\alpha+}$(D)	(g_1, 0.5, 0.0)	(g_2,0.9, 0.0)	(g_3,0.8, 0.0)	(g_4,0.8, 0.1)	(g_5,0.7, 0.0)
$T_{\alpha+}$(E)	(g_1, 0.9, 0.0)	(g_2,1,0.0)	(g_3,1.0, 0.0)	(g_3,1.0, 0.0)	(g_5,1.0, 0.0)

4.3 Translate operators on vague values affected by glaucoma disease:

In this section we apply for the translate operators on the vague values affected of the persons A, B, C.D, E of glaucoma disease values which is identified by doctors in a laboratory as follows.

$T_{\alpha+}$(A) on X can be defined

$T_{\alpha+}$(A)= ($m_{AT_{\alpha+}}$(x) , $n_{AT_{\alpha+}}$(x)) where

1. $m_{AT_{\alpha+}}$(x)=min{ $m_{AT_{\alpha+}}$(x) $+\alpha$, 1}.

A={ (g_1,0.5, 0.3), (g_2,0.7, 0.2), (g_3,0.3, 0.1), (g_4,0.6, 0.2), (g_5,0.6, 0.2)}

(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7

(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9

(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5

(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8

(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8.

2. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha$, 0 }

(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha$, 0 }= max{0.3–0.2,0 }=0.1

(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha$, 0 }= max{0.2–0.2,0 }=0.0

(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha$, 0 }= max{0.1–0.2,0 }=0.0

(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.2–0.2,0 }=0.0

(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.2–0.2,0 }=0.0

Therefore $T_{\alpha+}$(A)={(g_1, 0.7, 0.1), (g_2,0.9, 0.0), (g_3,0.5, 0.0), (g_4,0.8, 0.0), (g_5,0.8, 0.0)}.

3.B={(g_1, 0.2, 0.1), (g_2,0.5, 0.3), (g_3,0.7, 0.2), (g_4,0.6, 0.2), (g_5,0.4, 0.1)}

(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.2 +0.2, 1}=0.4

(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7

(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.7 +0.2, 1}=0.9

(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8

(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6

4. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha$, 0 }

(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha$, 0 }= max{0.1–0.2,0 }=0.0

(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)$ $-\alpha$, 0 }= max{0.3–0.2,0 }=0.1

(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)$ $-\alpha$, 0 }= max{0.2–0.2,0 }=0.0

(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.2–0.2,0 }=0.0

(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)$ $-\alpha$, 0 }= max{0.1–0.2,0 }=0.0

Therefore $T_{\alpha+}$(B)={(g_1, 0.4, 0.0), (g_2,0.7, 0.1), (g_3,0.9, 0.0), (g_4,0.8, 0.0), (g_5,0.6, 0.0)}.

5.C={ (g_1,0.3, 0.2), (g_2,0.2, 0.2), (g_3,0.2, 0.2), (g_4,0.4, 0.2), (g_5,0.3, 0.1)}

(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5

(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.2 +0.2, 1}=0.4

(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.2 +0.2, 1}=0.4

(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6

(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.3 +0.2, 1}=0.5

6. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha$, 0 }

(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)$ $-\alpha$, 0 }= max{0.2–0.2,0 }=0.0

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(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)-\alpha, 0$ }= max{0.1–0.2,0 }=0.0
Therefore $T_{\alpha+}$(C)={(g_1, 0.5, 0.0), (g_2,0.4, 0.0), (g_3,0.4, 0.0), (g_4,0.6, 0.0), (g_5,0.5, 0.0)}.
7.D={ (g_1,0.5, 0.3), (g_2,0.8, 0.2), (g_3,0.6, 0.1), (g_4,0.8, 0.1), (g_5,0.4, 0.2)}
(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7
(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.8 +0.2, 1}=1.0
(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.6 +0.2, 1}=0.8
(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.8 +0.2, 1}=1.0
(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6
8. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha, 0$ }
(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)-\alpha, 0$ }= max{0.3–0.2,0 }=0.1
(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)-\alpha, 0$ }= max{0.1–0.2,0 }=0.0
(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)-\alpha, 0$ }= max{0.1–0.2,0 }=0.0
(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)-\alpha, 0$ }= max{0.4–0.2,0 }=0.2
Therefore $T_{\alpha+}$(D)={(g_1, 0.7, 0.1), (g_2,1.0, 0.0), (g_3,0.8, 0.0), (g_4,1.0, 0.0), (g_5,0.6, 0.2)}.

9.D={ (g_1,0.9, 0.1), (g_2,0.2, 0.2), (g_3,0.4, 0.2), (g_4,0.5, 0.1), (g_5,0.5, 0.2)}
(a) $m_{AT_{\alpha+}}(g_1)$=min{ $m_A(g_1)$ $+\alpha$,1}= min{ 0.9 +0.2, 1}=1.0
(b) $m_{AT_{\alpha+}}(g_2)$=min{ $m_A(g_2)$ $+\alpha$,1}= min{ 0.2 +0.2, 1}=0.4
(c) $m_{AT_{\alpha+}}(g_3)$=min{ $m_A(g_3)$ $+\alpha$,1}= min{ 0.4 +0.2, 1}=0.6
(d) $m_{AT_{\alpha+}}(g_4)$=min{ $m_A(g_4)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7
(e) $m_{AT_{\alpha+}}(g_5)$=min{ $m_A(g_5)$ $+\alpha$,1}= min{ 0.5 +0.2, 1}=0.7
10. $n_{AT_{\alpha+}}$(x)=max{ $n_{AT_{\alpha+}}$(x) $-\alpha, 0$ }
(a) $n_{AT_{\alpha+}}(g_1)$=max{ $n_A(g_1)-\alpha, 0$ }= max{0.1–0.2,0 }=0.0
(b) $n_{AT_{\alpha+}}(g_2)$=max{ $n_A(g_2)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
(c) $n_{AT_{\alpha+}}(g_3)$=max{ $n_A(g_3)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
(d) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)-\alpha, 0$ }= max{0.1–0.2,0 }=0.0
(e) $n_{AT_{\alpha+}}(g_4)$=max{ $n_A(g_4)-\alpha, 0$ }= max{0.2–0.2,0 }=0.0
Therefore $T_{\alpha+}$(D)={(g_1, 1.0, 0.0), (g_2,0.4, 0.0), (g_3,0.6, 0.0), (g_4,0.7, 0.0), (g_5,0.7, 0.0)}.

Table 4.4:
Shortest distance between the symptoms of glaucoma present in patients and the set of glaucoma disease values which is identified by doctors in a labotary is
d(G,B):$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

Patients /symptoms	g_1 (Headache)	g_2 (eye pain)	g_3 (Vomiting)	g_4 (Blurred vision)	g_5 (Eye redness)
$T_{\alpha+}$(A)	(g_1, 0.7, 0.1)	(g_2,0.9, 0.0)	(g_3,0.5, 0.0)	(g_4,0.8, 0.0)	(g_5,0.8, 0.0)
$T_{\alpha+}$(B)	(g_1, 0.4, 0.0)	(g_2,0.7, 0.1)	(g_3,0.9, 0.0)	(g_4,0.8,0.0)	(g_5,0.6, 0.0)
$T_{\alpha+}$(C)	(g_1, 0.5, 0.0)	(g_2,0.4, 0.0)	(g_3,0.4, 0.0)	(g_4,0.6, 0.0)	(g_5,0.5, 0.0)
$T_{\alpha+}$(D)	(g_1, 0.9, 0.1)	(g_2,0.2, 0.2)	(g_3,0.4, 0.2)	(g_4,0.5, 0.1)	(g_5,0.5, 0.2)

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$T_{\alpha+}$(E)	(g_1, 1.0, 0.0)	(g_2,0.4,0.0)	($g_{3,}$0.6, 0.0)	($g_{4,}$0.7, 0.0)	(g_5,0.7, 0.0)

Table 4.5:

Patients / disease	Open angle (early stage)	Angle closure (acute)	Normal tension glaucoma	Primary juvenile glaucoma	Secondary higher glaucoma
$T_{\alpha+}$(A)	(g_1, 0.8, 0.0)	(g_2,0.7, 0.0)	($g_{3,}$0.6, 0.0)	(g_4,0.6, 0.1)	(g_5,0.5, 0.0)
$T_{\alpha+}$(B)	(g_1, 0.9, 0.0)	($g_{2,}$0.6, 0.0)	(g_3,0.7, 0.0)	(g_4,0.7,0.0)	(g_5,0.9, 0.0)
$T_{\alpha+}$(C)	(g_1, 0.8, 0.0)	($g_{2,}$0.7, 0.0)	($g_{3,}$0.6, 0.0)	(g_4,0.6, 0.1)	(g_5,0.5, 0.0)
$T_{\alpha+}$(D)	(g_1, 0.5, 0.0)	(g_2,0.9, 0.0)	($g_{3,}$0.8, 0.0)	(g_4,0.8, 0.1)	(g_5,0.7, 0.0)
$T_{\alpha+}$(E)	(g_1, 0.9, 0.0)	(g_2,1.0, 0.0)	($g_{3,}$1.0, 0.0)	($g_{3,}$1.0, 0.0)	(g_5,1.0, 0.0)

Table 4.6: The shortest distance between the translate operators on symptoms of glaucoma present in patients and the set of glaucoma disease values which is identified by doctors in a labotary is as follows

Distances	Headache / Open angle	eye pain / Angle closure	Vomiting / Normal tension glaucoma	Blurred vision/ Primary juvenile	Eye redness / Secondary higher
A	0.1000	0.2000	0.1000	0.2236	0.3000
B	0.4000	0.0400	0.2000	0.1000	0.3000
C	0.3000	0.3000	0.2000	0.1000	0.0000
D	0.4123	0.5000	0.4000	0.3900	0.0000
E	0.8000	0.6000	0.1000	0.5000	0.5000

5. **Conclusion:**

In this paper, the study of medical diagnosis of the type of glaucoma has been made with the generalized concept of vague set theory by taking a hypothetical medical knowledge theory. It is possible to classify the type of glaucoma using the above mentioned method. Here apply translate operators means apply the treatment on the patient in different categories we can differentiate patients according to the type of glaucoma they suffer from. This method is an efficient tool for medical diagnosis of any type of disease. The following out puts after applying translate operators the diseases of the patients.
1. The person "C, D "were recover from the glaucoma diseases.
2. The remaining patients A, B, E slowly recovered by the translate operators on the diseases of the patients.

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