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APPLICATION OF TRANSLATES OF VAGUE SETS ON ELECTORAL-DEMOCRACY MODEL

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ABSTRACT

Vague set has proven paramount in fuzzy mathematics due to its ability of tackling uncertainty involve in decision making. In this research, we proposed a relation between vague sets and democracy called vague set-democracy model. Delegate's votes are obtained assuming primary elections are conducted for a particular region with five aspirants within a political party. The delegates votes are converted into translate of vague values, and from which declaration is made based translate of vague values.

Key words: Vague set, Aspirants, Delegates, Models, Democracy, Translate of vague set.

INTRODUCTION

An important point in the evaluation of the modern concept of uncertainty was the notation of Zadeh[12] defing by fuzzy set and it has revolutionized the theory of mathematical modeling, Decision making etc., in handling the imprecise real life situations mathematically. It is believed that vague sets[3] will be more useful in decision making, and other areas of mathematical modeling. A fuzzy set t_A of a set X is a mapping from X : $\rightarrow$ [0,1], where as a vague set A of set X is a pair (t_A, f_A), where t_A, f_A are functions from X $\rightarrow$ [0,1] with $t_A(x) + f_A(x) \leq 1$ for all x in X. The algebraic aspects of vague sets were initiated by Ranjit[2] by studying the concepts of vague groups, vague normal groups etc., as generalization of the theory of fuzzy groups etc. Further Ramakrishna[7,8] continued the study of vague algebra.

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In this paper, we will discuss the vague translation operators $T_{\alpha+}$ and $T_{\alpha-}$ and reviewed the concept of vague set and apply translate operators on vague set, also proposed its application of decision for electing a leader of particular region in any election in the democracy system. To measure the each participant vague value in an election by using definion (2.4) and the largest vague value will be gives the the wining of aspirants in an election.

Preliminaries

We give here a review of some definitions and results, which are in Gau and Buhere[3], Ramakrishana[7,8] and Ranjit[2].

Definition (2.1)[12]: Let X be a non-empty set. A fuzzy set A drawn from X is defined as A = {x, $\mu_A(x)$: x □ X}, where μ_A (x): X $\rightarrow$ [0, 1] is the membership function of the fuzzy set A.

Definition (2.2)[4]: A vague set A in the universe of discourse U is a pair (t_A, f_A) where t_A: X $\rightarrow$ [0, 1], f_A: X $\rightarrow$ [0,1] with $t_A(x) + f_A(x) \leq 1$ for all x in X. Here t_A is called the membership function and f_A is called non-membership function and also called true membership function, false membership function, respectively.

Definition (2.3)[5]: Let X be a non-empty set, let A= (t_A, f_A) be a vague set of X and $\alpha \in [0,1]$. Then

(a) $T_{\alpha+}(A) = (t_{T\alpha+}, f_{T\alpha+})$

where $t_{T\alpha+}(x) = \min\{t_A(x) + \alpha, 1\}$ and $f_{T\alpha+}(x) = \max\{f_A(x) - \alpha, 0\}$

(b) $T_{\alpha-}(A) = (t_{T\alpha-}, f_{T\alpha-})$

where $t_{T\alpha-}(x) = \max\{t_A(x) - \alpha, 0\}$ and $f_{T\alpha-}(X) = \min\{f_A(x) + \alpha, 1\}$

Here we call $T_{\alpha+}(A)$ is called translate of vague increasing operator and $T_{\alpha-}(A)$ is called translate of Vague decreasing operators, respectively. Here α is a real number in [0 1], which determines either cast vote or not.

Remark (2.4)[5]: $T_{\alpha+}(A)$ and $T_{\alpha-}(A)$ are vague sets of X where A is a vague set of X, Since $0 \leq t_{T\alpha+}(x) + f_{T\alpha+}(x) \leq 1$ and $0 \leq t_{T\alpha-}(x) + f_{T\alpha-}(x) \leq 1$.

We define the following:

Definition (2.5): Let $A = (t_A, f_A)$ be a vague set of a non-empty set X then the vague decision for delegates in election of a particular region can be defined by –

(a) The membership function = $\frac{1}{n}\left[\sum_{i=1}^{n}\left(t_A(x_i)\right)\right]$ and

(b) Vague decision of against for aspirant's of delegates in election of particular region can be defined by (Non-membership function) = $\frac{1}{n}\left[\sum_{i=1}^{n}\left(f_A(x_i)\right)\right]$.

Electoral model of vague set

The idea of vague sets in[2] by Gahu, Buehrer and Elebrated, distances between Intuitionistic fuzzy sets in some medical applications, Notes on IFS was in[11] but here, we present a step by step model of translate operators on vague sets[3-5] and find out the Translate of vague scores for favourable, translate of vague scores for un favourable by using the definition (2.4). Let $P = \{x_1, x_2, x_3, x_4, x_5,\}$ be the set of all candidates participating in election, X be the set of all delegates, $t_A(x)$ be the number of delegates that voted for (favourable), $f_A(x)$ be the number of delegates that voted for unfavourable (against), if 'n' is the total number of delegates from each region and $f_A(x) = 1 - t_A(x)$.

Application of vague sets as electorate system (3.1)

We assume after the polling process, we obtained the results in the following and converted vague sets as membership function $(t_A(x))$ non-membership function $(f_A(x))$, respectively.

$A = \{(x_1, 0.5, 0.1), (x_2, 0.8, 0.2), (x_3, 0.6, 0.2), (x_4, 0.5, 0.3), (x_5, 0.6, 0.2)\}$

$B = \{(x_1, 0.8, 0.1), (x_2, 0.6, 0.2), (x_3, 0.7, 0.1), (x_4, 0.8, 0.1), (x_5, 0.7, 0.1)\}$

$C = \{(x_1, 0.6, 0.3), (x_2, 0.5, 0.2), (x_3, 0.7, 0.1), (x_4, 0.6, 0.2), (x_5, 0.5, 0.1)\}$

$D = \{(x_1, 0.5, 0.4), (x_2, 0.7, 0.3), (x_3, 0.6, 0.2), (x_4, 0.7, 0.1), (x_5, 0.6, 0.1)\}$

$E = \{(x_1, 0.7, 0.1), (x_2, 0.9, 0.1), (x_3, 0.7, 0.2), (x_4, 0.5, 0.3), (x_5, 0.6, 0.2)\}$

$F = \{(x_1, 0.8, 0.2), (x_2, 0.7, 0.1), (x_3, 0.6, 0.3), (x_4, 0.7, 0.1), (x_5, 0.7, 0.2)\}$
and $\alpha = 0.1$

Translate operators on vague sets in electorate system (3.2)

From the definition (2.2), we can take the translate of vague sets in electorate system are respectively. α increases the membership function (favourable for won in election) and decreases the non-membership function (unfavourable) for contest in the election.

$A = \{(x_1, 0.5, 0.1), (x_2, 0.8, 0.2), (x_3, 0.6, 0.2), (x_4, 0.5, 0.3), (x_5, 0.6, 0.2)\}$ and $\alpha = 0.1$

$t_{T\alpha+}(x_1) = \min \{t_A(x_1) + \alpha, 1\}$ and $f_{T\alpha+}(x_1) = \max\{f_A(x_1) - \alpha, 0\}$

$t_{T\alpha+}(x_1) = \min \{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_1) = \max \{0.1- 0.1, 0\} = 0$

$t_{T\alpha+}(x_2) = \min \{0.8 + 0.1, 1\} = 0.9$ and $f_{T\alpha+}(x_2) = \max \{0.2-0.1, 0\} = 0.1$

$t_{T\alpha+}(x_3) = \min \{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_3) = \max \{0.2-0.1, 0\} = 0.1$

$t_{T\alpha+}(x_4) = \min \{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_4) = \max \{0.3-0.1, 0\} = 0.2$

$t_{T\alpha+}(x_5) = \min \{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_5) = \max \{0.2-0.1, 0\} = 0.1$

$T_{\alpha+}(A) = \{(x_1, 0.8, 0), (x_2, 0.9, 0.1), (x_3, 0.7, 0.1), (x_4, 0.6, 0.2), (x_5, 0.7, 0.1)\}$ and $\alpha = 0.1$

$B = \{(x_1, 0.8, 0.1), (x_2, 0.6, 0.2), (x_3, 0.7, 0.1), (x_4, 0.8, 0.1), (x_5, 0.5, 0.2)\}$ and $\alpha = 0.1$

$t_{T\alpha+}(x_1) = \min \{0.8 + 0.1, 1\} = 0.9$ and $f_{T\alpha+}(x_1) = \max \{0.1- 0.1, 0\} = 0.1$

$t_{T\alpha+}(x_2) = \min \{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_2) = \max \{0.2-0.1, 0\} = 0.1$

$t_{T\alpha+}(x_3) = \min \{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_3) = \max \{0.1-0.1, 0\} = 0$

$t_{T\alpha+}(x_4) = \min \{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_4) = \max \{0.1-0.1, 0\} = 0$

$t_{T\alpha+}(x_5) = \min \{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_5) = \max \{0.1-0.1, 0\} = 0$

$T_{\alpha+}(B) = \{(x_1, 0.9, 0.1), (x_2, 0.7, 0.1), (x_3, 0.8, 0), (x_4, 0.8, 0), (x_5, 0.6, 0.1)\}$ and $\alpha = 0.1$

$C = \{(x_1, 0.6, 0.3), (x_2, 0.5, 0.2), (x_3, 0.7, 0.1), (x_4, 0.6, 0.2), (x_5, 0.5, 0.1)\}$ and $\alpha = 0.1$

$t_{T\alpha+}(x_1) = \min \{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_1) = \max \{0.3-0.1, 0\} = 0.2$

$t_{T\alpha+}(x_2) = \min \{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_2) = \max \{0.2-0.1, 0\} = 0.1$

$t_{T\alpha+}(x_3) = \min\{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_3) = \max\{0.1\text{-}0.1, 0\} = 0$

$t_{T\alpha+}(x_4) = \min\{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_4) = \max\{0.2\text{-}0.1, 0\} = 0.1$

$t_{T\alpha+}(x_5) = \min\{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_5) = \max\{0.1\text{-}0.1, 0\} = 0$

$T_{\alpha+}(C) = \{(x_1, 0.7, 0.2), (x_2, 0.6, 0.1), (x_3, 0.8, 0), (x_4, 0.7, 0.1), (x_5, 0.6, 0.0)\}$ and $\alpha = 0.1$

$D = \{(x_1, 0.5, 0.4), (x_2, 0.7, 0.3), (x_3, 0.6, 0.2), (x_4, 0.7, 0.1), (x_5, 0.6, 0.1)\}$

$t_{T\alpha+}(x_1) = \min\{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_1) = \max\{0.4\text{-}0.1, 0\} = 0.3$

$t_{T\alpha+}(x_2) = \min\{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_2) = \max\{0.3\text{-}0.1, 0\} = 0.2$

$t_{T\alpha+}(x_3) = \min\{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_3) = \max\{0.2\text{-}0.1, 0\} = 0.1$

$t_{T\alpha+}(x_4) = \min\{0.8 + 0.1, 1\} = 0.9$ and $f_{T\alpha+}(x_4) = \max\{0.1\text{-}0.1, 0\} = 0.0$

$t_{T\alpha+}(x_5) = \min\{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_5) = \max\{0.1\text{-}0.1, 0\} = 0.0$

$T_{\alpha+}(D) = \{(x_1, 0.6, 0.3), (x_2, 0.8, 0.2), (x_3, 0.7, 0.1), (x_4, 0.9, 0.0), (x_5, 0.8, 0.1)\}$ and $\alpha = 0.1$

$E = \{(x_1, 0.7, 0.1), (x_2, 0.8, 0.1), (x_3, 0.7, 0.2), (x_4, 0.5, 0.3), (x_5, 0.6, 0.2)\}$ and $\alpha = 0.1$

$t_{T\alpha+}(x_1) = \min\{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_1) = \max\{0.1\text{-}0.1, 0\} = 0.0$

$t_{T\alpha+}(x_2) = \min\{0.8 + 0.1, 1\} = 0.9$ and $f_{T\alpha+}(x_2) = \max\{0.1\text{-}0.1, 0\} = 0.0$

$t_{T\alpha+}(x_3) = \min\{0.7 + 0.1, 1\} = 0.8$ and $f_{T\alpha+}(x_3) = \max\{0.2\text{-}0.1, 0\} = 0.1$

$t_{T\alpha+}(x_4) = \min\{0.5 + 0.1, 1\} = 0.6$ and $f_{T\alpha+}(x_4) = \max\{0.3\text{-}0.1, 0\} = 0.2$

$t_{T\alpha+}(x_5) = \min\{0.6 + 0.1, 1\} = 0.7$ and $f_{T\alpha+}(x_5) = \max\{0.2\text{-}0.1, 0\} = 0.1$

$T_{\alpha+}(E) = \{(x_1, 0.8, 0.0), (x_2, 0.9, 0.0), (x_3, 0.8, 0.1), (x_4, 0.6, 0.2), (x_5, 0.7, 0.1)\}$ and $\alpha = 0.1$

Translates of vague declaration and conclusion (3.2)

The following table represents translate of vague scores of the above 5 persons x_1, x_2, x_3, x_4, and x_5, respectively by using the definition (2.4).

Table 1:

Contests in election	Translate of vague scores for favourable	Translate of vague scores for un favour
X_1	0.81667	0.12
X_2	0.76667	0.10
X_3	0.7833	0.10
X_4	0.6833	0.12
X_5	0.7167	0.10

CONCLUSION

From the above table 1, the first aspirant won the election with average of translates of vague membership function of the value 0.81667. The interpretation suggests that, vague set is a convent and appropriate tool in democracy because it involves two parameters these are membership function $t_A(x)$, non-membership function $f_A(x)$, which are essential components in decision making.

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