Application of Fuzzy TOPSIS Method in Scholarship Interview

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Abstract—Decision-making problem is the process of determines the best options of all feasible alternative. In some problems, decision-making process involves the attributes of linguistic as in scholarship interview, which is one of the multi-objective decision-making (MODM) problem. The aim of this paper is to apply Fuzzy TOPSIS method in scholarship interview. Scholarship Interview that defined in this paper was implemented to $\boldsymbol{m}$ candidates by $\boldsymbol{n}$ questions for each candidate and assessed by $\boldsymbol{p}$ interviewers. Technique for the Order of Preference by Similarity to Ideal Solution (TOPSIS) method is a multi-attribute decision-making (MADM) method. The basic principle of the TOPSIS method is to choose the alternative that has similarity with the ideal solution. So that the TOPSIS method can be applied in a scholarship interview, in the first step is used fuzzy method to reduce the $\boldsymbol{p}$-dimensional objective space to be one-dimensional objective space. Then applied the TOPSIS steps by fuzzy approaching to find the best alternative. In this paper will be used a scholarship interview case to illustrate more obviously steps. With this approach, the determination of the scholarship recipients can be more powerful and assured.

Keywords—Fuzzy, TOPSIS, Multi-objective decision-making, Scholarship Interview.

INTRODUCTION

Recently, along with the funds a scholarship offered by the foundation or government in Indonesia is very large and can be easily accessed by anyone. Increased number of applicants scholarship to continue his studies. Although a quota of scholarships offered are many, but the scholarship givers must remain rigorous in doing the selection. In order for the grant of scholarships can be directly proportional to the increase in the quality of human resources that are sanctioned. Scholarship selection is done in several stages, the last stage is the interview process. Scholarship interview is included in the determination of the issue of the decision of the multi purpose. In practice, in addition to the subjective nature of the assessment in the interview, scholarship also involves a linguistic variable such as "fair", "good", "very good", etc. So the needed methods that can properly solve the problem of determining the decisions on multi wawancaa scholarships. In this paper fuzzy topsis method will be applied to mementukan for candidates the best scholarship recipients in stages based on the assessment interview interviewer against each candidate's answer to the question that was specified earlier.

METHODS

a. TOPSIS Method

TOPSIS is a technique to sort the available alternatives based on its similarity to an ideal solution. TOPSIS introduced by Kwangsun Yoon and Hwang Ching-Lai in 1980. Principle basis of TOPSIS method is to choose the alternative that has the shortest distance to the positive ideal solution and the farthest distance from the negative ideal solution. With the goal even though the chosen alternative is not a positive ideal solution, but the solution chosen is a solution that is as close as possible to the positive ideal solution. Because it is in real life is very difficult to obtain a positive ideal solution.

Suppose there are m decision and n criteria, the value of the destination decision on criteria j-th is $x_j = [x_{1j} \quad x_{2j} \quad \cdots \quad x_{mj}]^T$, $1 \le j \le n$. So the decision matrix X can be obtained as follows:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}. \quad (1)$$

The steps in TOPSIS method is as follows.

1) Normalized decision matrix
For maximizing problem, normalization can be done using Equation 2, $1 \le i \le m$,

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}. \quad (2)$$

While for minimizing problem, use equation

$$r_{ij} = \frac{-x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}. \quad (3)$$

So the retrieved results matrix the normalization of R, i.e.

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix}. \quad (4)$$

2) Determine the ideal point
Positive ideal point denoted by r^+, while the negative ideal point denoted by r^-. Positive and negative ideal point respectively defined by the

$$r^+ = [r_1^+ \quad r_2^+ \quad \cdots \quad r_n^+]^T, \quad (5)$$
$$r^- = [r_1^- \quad r_2^- \quad \cdots \quad r_n^-]^T. \quad (6)$$

Where

$$r_j^+ = \max_i\{r_{ij}\},$$
$$r_j^- = \min_i\{r_{ij}\}.$$

3) Calculate the distance
The distance from i-th goal against the positive ideal point r^+ defined by

$$d_i^+ = \sqrt{\sum_{j=1}^{n} \left(r_{ij} - r_j^+\right)^2} \quad (7)$$

While the distance to the i-th goal to the negative ideal point r^- defined

$$d_i^- = \sqrt{\sum_{j=1}^{n} \left(r_{ij} - r_j^-\right)^2} \quad (8)$$

4) Calculate the approach degree
The relative approach degree to the i-th destination to the positive ideal point defined by

$$C_i = \frac{d_i^-}{d_i^+ + d_i^-} \quad (9)$$

5) Gives the ranking order of preference
Every goal can be ranked by descending order of C_i.

b. Fuzzy System

Problems in real life almost always associated with uncertainty, which can be expressed in linguistic variables “older”, “too hot”, “handsome”, etc. Likewise, in MODM kesubjektifan and there are many uncertainties. To declare subjectiveness and uncertainties during the interview process, the weight of the question and the value of using variable lingistik and represented by triangular fuzzy numbers. A triangular fuzzy numbers is a convex fuzzy set, often expressed as the triple $\tilde{A} = (a, b, c)$, with membership functions defined by

$$\mu_{\tilde{A}}(x)=\begin{cases}0 & ,x<a\\ \dfrac{x-a}{b-a} & ,a\le x<b\\ \dfrac{c-x}{c-b} & ,b\le x\le c\\ 0 & ,x>c\end{cases}.$$

Where b is middle value, a is upper value, and c is lower value from fuzzy number $\tilde{A}$. So that $\mu_{\tilde{A}}(x)=0$ if $x=a$ or $x=c$, and $\mu_{\tilde{A}}(x)=1$ if $x=b$.

Operations of addition, multiplication, division and Euler distance to the fuzzy numbers $\tilde{A}_1=(a_1,b_1,c_1)$ and $\tilde{A}_2=(a_2,b_2,c_2)$ defined by,

1) Addition: $\tilde{A}_1+\tilde{A}_2=(a_1+a_2,b_1+b_2,c_1+c_2)$,
2) Multiplication: $\tilde{A}_1\times\tilde{A}_2=(a_1\times a_2,b_1\times b_2,c_1\times c_2)$,
3) Division: $\frac{\tilde{A}_1}{\tilde{A}_2}=\left(\frac{a_1}{a_2},\frac{b_1}{b_2},\frac{c_1}{c_2}\right)$,
4) Euler Distance:

$$\tilde{d}(\tilde{A}_1,\tilde{A}_2)=\sqrt{\frac{1}{3}[(a_1-a_2)^2+(b_1-b_2)^2+(c_1-c_2)^2]}.$$

In an interview scholarship in general, each candidate answers will be assessed by a number between 0 and 100. Also each of the questions will be weighted between 0% and 100%. In this paper, every answer will be rated using the linguistic variables "very bad", "bad", "bad enough", "medium", "good enough", "good" or "excellent". While each of the questions will be weighted by linguistic variables "very not important", "not important", "not important enough", "medium", "important enough", "important" or "very important". So as to obtain a triangular fuzzy numbers in Table 1 and Table 2.

Table 1. Fuzzy Numbers of Answer Score

Linguistic Variable	Fuzzy Number
Very bad	$(0,0,10)$
Bad	$(0,10,30)$
Bad enough	$(10,30,50)$
Medium	$(30,50,70)$
Good enough	$(50,70,90)$
Good	$(70,90,100)$
Excellent	$(90,100,100)$

Table 2. Fuzzy Number of Question Weight

Linguistic Variable	Fuzzy Number
Very not important	$(0,0,0.1)$
Not important	$(0,0.1,0.3)$
Not important enough	$(0.1,0.3,0.5)$
Medium	$(0.3,0.5,0.7)$
Important enough	$(0.5,0.7,0.9)$
Important	$(0.7,0.9,1.0)$
Very Important	$(0.9,1.0,1.0)$

Figures of membership degree, $\mu_{\tilde{A}}(x)$, fuzzy number of answer score and question weight is shown in Figure 1 and Figure 2.

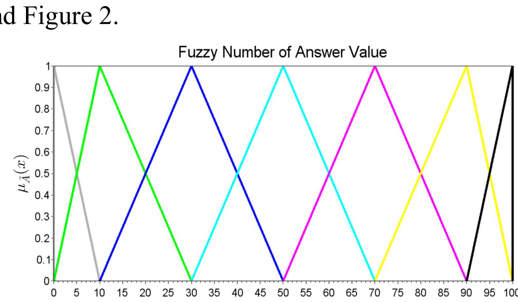

Fig 1. Membership Degree Of Answer Score

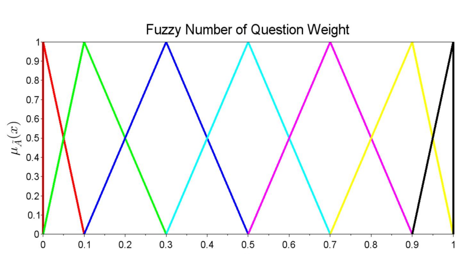

Fig 2. Membership Degree Of Question Weight

c. Fuzzy TOPSIS Method

1. Build a decision matrix

Suppose that in an interview scholarship candidates are m, n questions , and p interviewers. The scores given by the k-th interviewer to i-th candidat's answer for j-th question is denoted by $\tilde{x}_{ij}^k$, where $1\le i\le m, 1\le j\le n, 1\le k\le p$. So as to obtain a decision matrix of the k-th interviewer, i.e.

$$\tilde{X}^k=\begin{bmatrix}\tilde{x}_{11}^k & \tilde{x}_{12}^k & \cdots & \tilde{x}_{1n}^k\\ \tilde{x}_{21}^k & \tilde{x}_{22}^k & \cdots & \tilde{x}_{2n}^k\\ \vdots & \vdots & \ddots & \vdots\\ \tilde{x}_{m1}^k & \tilde{x}_{m2}^k & \cdots & \tilde{x}_{mn}^k\end{bmatrix} \quad (10)$$

Defined $\tilde{x}_{ij}=\frac{1}{p}\left(\tilde{x}_{ij}^1+\tilde{x}_{ij}^2+\cdots+\tilde{x}_{ij}^p\right)$, so that it can be obtained a decision matrix $\tilde{X}$.

$$\tilde{X}=\begin{bmatrix}\tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n}\\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n}\\ \vdots & \vdots & \ddots & \vdots\\ \tilde{x}_{m1} & \tilde{x}_{m2} & \cdots & \tilde{x}_{mn}\end{bmatrix} \quad (11)$$

1. Normalized decision matrix

Normalization done using equation

$$\tilde{r}_{ij}=\frac{\tilde{x}_{ij}-\min_i(\tilde{x}_{ij})}{\max_i(\tilde{x}_{ij})-\min_i(\tilde{x}_{ij})}. \quad (12)$$

So obtained normal decision matrix $\tilde{R}$.

$$\tilde{R}=\begin{bmatrix}\tilde{r}_{11} & \tilde{r}_{12} & \cdots & \tilde{r}_{1n}\\ \tilde{r}_{21} & \tilde{r}_{22} & \cdots & \tilde{r}_{2n}\\ \vdots & \vdots & \ddots & \vdots\\ \tilde{r}_{m1} & \tilde{r}_{m2} & \cdots & \tilde{r}_{mn}\end{bmatrix} \quad (13)$$

2. Weighted the normal decision matrix

If $\tilde{W}^k=[\tilde{w}_1^k \quad \tilde{w}_2^k \quad \cdots \quad \tilde{w}_n^k]^T$ is a vector weight for n question provided by k-th interviewer, defined

$$\tilde{w}_j=\frac{1}{p}\left(\tilde{w}_j^1+\tilde{w}_j^2+\cdots+\tilde{w}_j^p\right), \quad (14)$$

can be obtained from the question weight vector, i.e.

$$\tilde{W}=[\tilde{w}_1 \quad \tilde{w}_2 \quad \cdots \quad \tilde{w}_n]^T. \quad (15)$$

Then defined $\tilde{u}_{ij}=\tilde{w}_j\times\tilde{r}_{ij}$, to obtain normal weighted decision matrix $\tilde{U}$.

$$\tilde{U}=\begin{bmatrix}\tilde{u}_{11} & \tilde{u}_{12} & \cdots & \tilde{u}_{1n}\\ \tilde{u}_{21} & \tilde{u}_{22} & \cdots & \tilde{u}_{2n}\\ \vdots & \vdots & \ddots & \vdots\\ \tilde{u}_{m1} & \tilde{u}_{m2} & \cdots & \tilde{u}_{mn}\end{bmatrix}. \quad (16)$$

3. Determine the weighted ideal point

Positive ideal point $\tilde{r}^+$ and negative ideal point $\tilde{r}^-$ from normal decision matrix $\tilde{R}$ are

$$\begin{aligned}\tilde{r}^+ &= [\tilde{r}_1^+ \quad \tilde{r}_2^+ \quad \cdots \quad \tilde{r}_n^+]^T\\ &= [(1,1,1) \quad (1,1,1) \quad \cdots \quad (1,1,1)]^T,\end{aligned}$$

$$\begin{aligned}\tilde{r}^- &= [\tilde{r}_1^- \quad \tilde{r}_2^- \quad \cdots \quad \tilde{r}_n^-]^T\\ &= [(0,0,0) \quad (0,0,0) \quad \cdots \quad (0,0,0)]^T.\end{aligned}$$

So the weighted positive ideal point $\tilde{u}^+$ and weighted negative ideal point $\tilde{u}^-$ can be defined by

$$\begin{aligned}\tilde{u}^+ &= [\tilde{u}_1^+ \quad \tilde{u}_2^+ \quad \cdots \quad \tilde{u}_n^+]^T\\ &= [\tilde{w}_1\times\tilde{r}_1^+ \quad \tilde{w}_2\times\tilde{r}_2^+ \quad \cdots \quad \tilde{w}_n\times\tilde{r}_n^+]^T\\ &= [\tilde{w}_1 \quad \tilde{w}_2 \quad \cdots \quad \tilde{w}_n]^T\\ &= \tilde{W}\end{aligned} \quad (17)$$

$$\begin{aligned}\tilde{u}^- &= [\tilde{u}_1^- \quad \tilde{u}_2^- \quad \cdots \quad \tilde{u}_n^-]^T\\ &= [\tilde{w}_1\times\tilde{r}_1^- \quad \tilde{w}_2\times\tilde{r}_2^- \quad \cdots \quad \tilde{w}_n\times\tilde{r}_n^-]^T\\ &= [(0,0,0) \quad (0,0,0) \quad \cdots \quad (0,0,0)]^T.\end{aligned} \quad (18)$$

4. Calculate distance

Using the definition of euler distance, the distance i-th candidate to weighted positive ideal point $\tilde{u}^+$ and weighted negative ideal point $\tilde{u}^-$, respectively, defined as $\tilde{D}_i^+$ dan $\tilde{D}_i^-$.

$$\tilde{D}_i^+=\tilde{D}(\tilde{u}^+,\tilde{u}_i)=\sqrt{\sum_{j=1}^n\left[\tilde{d}(\tilde{u}_j^+,\tilde{u}_{ij})\right]^2}, \quad (19)$$

$$\tilde{D}_i^-=\tilde{D}(\tilde{u}^-,\tilde{u}_i)=\sqrt{\sum_{j=1}^n\left[\tilde{d}(\tilde{u}_j^-,\tilde{u}_{ij})\right]^2}. \quad (20)$$

5. Calculate the approach degree

Afterward can be calculated degree of relative approah i-th candidates to weighted ideal point.

$$\tilde{C}_i = \frac{\tilde{D}_i^-}{\tilde{D}_i^+ + \tilde{D}_i^-}. \quad (21)$$

6. Gives the ranking order of preference

Each candidate ranked by approach degrees $\tilde{C}_i$. Candidates with largest $\tilde{C}_i$ will be given the first place, which means the most recommended to get a scholarship.

RESULTS

Scholarship interview process followed by 6 candidates, that is $C1$, $C2$, $C3$, $C4$, $C5$, and $C6$. Each candidate gets same questions, questions is like in Table 3. Assessment by 3 interviewer ($I1$, $I2$, $I3$) that already has expertise in assessing the answer candidates.

Table 3. Scholarship Interview Questions

$Q1$	Tell us about yourself!
$Q2$	What is your greatest strength and weakness?
$Q3$	Where do you see yourself in ten years?
$Q4$	With what activities are you most involved?
$Q5$	What makes you special to receive this scholarship?

The interviewer will first give weight to each question. In accordance with the linguistic variable weighting questions in Table 2, the interviewer gives weight questions such as in Table 4.

Table 4. Question Weight from Interviewers

	$Q1$	$Q2$	$Q3$	$Q4$	$Q5$
$I1$	Very important	Important	Medium	Important	Not important
$I2$	Important	Very important	Not important enough	Medium	Important
$I3$	Important enough	Important	Very important	Not important	Medium

If the linguistic variables in Table 4 is converted into fuzzy numbers accordance with Table 2, it will obtain $\widetilde{W}^1$, $\widetilde{W}^2$, dan $\widetilde{W}^3$.

$$\widetilde{W}^1 = \begin{bmatrix} (0.9, 1.0, 1.0) \\ (0.7, 0.9, 1.0) \\ (0.3, 0.5, 0.7) \\ (0.7, 0.9, 1.0) \\ (0.0, 0.1, 0.3) \end{bmatrix}, \quad \widetilde{W}^2 = \begin{bmatrix} (0.7, 0.9, 1.0) \\ (0.9, 1.0, 1.0) \\ (0.1, 0.3, 0.5) \\ (0.3, 0.5, 0.7) \\ (0.7, 0.9, 1.0) \end{bmatrix}, \quad \widetilde{W}^3 = \begin{bmatrix} (0.5, 0.7, 0.9) \\ (0.7, 0.9, 1.0) \\ (0.9, 1.0, 1.0) \\ (0.0, 0.1, 0.3) \\ (0.3, 0.5, 0.7) \end{bmatrix}.$$

Therefore, by using Equation 14 is obtained weight vector

$$\widetilde{W} = \begin{bmatrix} (0.70, 0.87, 0.97) \\ (0.77, 0.93, 1.00) \\ (0.43, 0.60, 0.73) \\ (0.33, 0.50, 0.67) \\ (0.33, 0.50, 0.67) \end{bmatrix}.$$

The third assessment by the interviewer to answer the candidates are presented in Table 5, Table 6 and Table 7.

Table 5. Score from First Interviewer

	$Q1$	$Q2$	$Q3$	$Q4$	$Q5$
$C1$	Very bad	Bad	Excellent	Excellent	Excellent
$C2$	Bad	Good enough	Good enough	Good	Very bad
$C3$	Bad enough	Excellent	Bad	Good enough	Excellent
$C4$	Medium	Excellent	Very bad	Medium	Very bad
$C5$	Good enough	Good	Medium	Bad enough	Medium
$C6$	Good	Medium	Good	Bad	Good

Table 6. Score from Second Interviewer

	$Q1$	$Q2$	$Q3$	$Q4$	$Q5$
$C1$	Bad	Bad	Excellent	Excellent	Medium
$C2$	Bad enough	Medium	Good enough	Excellent	Bad
$C3$	Medium	Good	Bad enough	Good	Medium
$C4$	Medium	Good	Bad	Good	Medium
$C5$	Good enough	Good enough	Medium	Good	Good
$C6$	Good	Medium	Good	Medium	Good enough

Table 7. Score from Third Interviewer

	$Q1$	$Q2$	$Q3$	$Q4$	$Q5$
$C1$	Bad enough	Bad enough	Excellent	Excellent	Medium
$C2$	Medium	Good enough	Good enough	Good	Good
$C3$	Good enough	Excellent	Medium	Good	Good enough
$C4$	Good enough	Excellent	Bad enough	Good enough	Medium
$C5$	Good	Good	Medium	Good enough	Bad
$C6$	Excellent	Good enough	good	Bad enough	Good enough

From the results of these assessments can be obtained by the decision matrix $\tilde{X}^1$, $\tilde{X}^2$, and $\tilde{X}^3$.

$$\tilde{X}^1 = \begin{bmatrix} (0,0,10) & (0,10,30) & (90,100,100) & (90,100,100) & (90,100,100) \\ (0,10,30) & (50,70,90) & (50,70,90) & (70,90,100) & (10,30,50) \\ (10,30,50) & (90,100,100) & (0,10,30) & (50,70,90) & (90,100,100) \\ (30,50,70) & (90,100,100) & (0,0,10) & (30,50,70) & (0,0,10) \\ (50,70,90) & (70,90,100) & (30,50,70) & (10,30,50) & (30,50,70) \\ (70,90,100) & (30,50,70) & (70,90,100) & (0,10,30) & (70,90,100) \end{bmatrix},$$

$$\tilde{X}^2 = \begin{bmatrix} (0,10,30) & (0,10,30) & (90,100,100) & (90,100,100) & (30,50,70) \\ (10,30,50) & (30,50,70) & (50,70,90) & (90,100,100) & (0,10,30) \\ (30,50,70) & (70,90,100) & (10,30,50) & (70,90,100) & (30,50,70) \\ (30,50,70) & (70,90,100) & (0,10,30) & (70,90,100) & (30,50,70) \\ (50,70,90) & (50,70,90) & (30,50,70) & (70,90,100) & (70,90,100) \\ (70,90,100) & (30,50,70) & (70,90,100) & (30,50,70) & (50,70,90) \end{bmatrix},$$

$$\tilde{X}^3 = \begin{bmatrix} (10,30,50) & (10,30,50) & (90,100,100) & (90,100,100) & (30,50,70) \\ (30,50,70) & (50,70,90) & (50,70,90) & (70,90,100) & (70,90,100) \\ (50,70,90) & (90,100,100) & (30,50,70) & (70,90,100) & (50,70,90) \\ (50,70,90) & (90,100,100) & (10,30,50) & (50,70,90) & (30,50,70) \\ (70,90,100) & (70,90,100) & (30,50,70) & (50,70,90) & (0,10,30) \\ (90,100,100) & (50,70,90) & (70,90,100) & (10,30,50) & (50,70,90) \end{bmatrix}.$$

So as to obtain a decision matrix $\tilde{X}$,

$$\tilde{X} = \begin{bmatrix} (3.3,13.3,30) & (3.3,16.7,36.7) & (90,100,100) & (90,100,100) & (50,66.7,80) \\ (13.3,30,50) & (43.3,63.3,83.3) & (50s,70,90) & (76.7,93.3,100) & (26.7,43.3,60) \\ (30,50,70) & (83.3,96.7,100) & (13.3,30,50) & (63.3,83.3,96.7) & (56.7,73.3,86.7) \\ (36.7,56.7,76.7) & (83.3,96.7,100) & (3.3,13.3,30) & (50,70,86.7) & (20,33.3,50) \\ (56.7,76.7,93.3) & (63.3,83.3,96.7) & (30,50,70) & (43.3,63.3,80) & (33.3,50,66.7) \\ (76.7,93.3,100) & (36.7,56.7,76.7) & (70,90,100) & (13.3,30,50) & (56.7,76.7,93.3) \end{bmatrix}.$$

The next step is to normalize the decision matrix $\tilde{X}$, thus obtained normal decision matrix $\tilde{R}$,

$$\tilde{R} = \begin{bmatrix} (0,0,0) & (0,0.04,0.1) & (1,1,1) & (1,1,1) & (0.54,0.62,0.71) \\ (0,0,0) & (0.47,0.53,0.67) & (0.58,0.63,0.8) & (1,1,1) & (0.21,0.21,0.2) \\ (0.24,0.3,0.4) & (1,1,1) & (0,0,0) & (0.71,0.8,0.93) & (0.62,0.65,0.73) \\ (0.42,0.52,0.67) & (1,1,1) & (0,0,0) & (0.58,0.68,0.81) & (0.21,0.24,0.29) \\ (0.8,0.8,0.89) & (1,1,1) & (0,0,0.11) & (0.4,0.4,0.44) & (0.1,0,0) \\ (1,1,1) & (0.37,0.42,0.53) & (0.89,0.95,1) & (0,0,0) & (0.68,0.74,0.87) \end{bmatrix}.$$

By using the weighting matrix $\widetilde{W}$ and the decision matrix can normally be obtained normal weighted decision matrix $\widetilde{U}$.

$$\widetilde{U} = \begin{bmatrix} (0,0,0) & (0,0.04,0.1) & (0.43,0.60,0.73) & (0.33,0.5,0.67) & (0.18,0.31,0.48) \\ (0,0,0) & (0.36,0.49,0.67) & (0.25,0.38,0.59) & (0.33,0.50,0.67) & (0.07,0.11,0.13) \\ (0.17,0.26,0.39) & (0.77,0.93,1) & (0,0,0) & (0.24,0.4,0.62) & (0.21,0.32,0.49) \\ (0.29,0.45,0.64) & (0.77,0.93,1) & (0,0,0) & (0.19,0.34,0.54) & (0.07,0.12,0.19) \\ (0.56,0.69,0.86) & (0.77,0.93,1) & (0,0,0.08) & (0.13,0.2,0.3) & (0.03,0,0) \\ (0.7,0.87,0.97) & (0.28,0.39,0.53) & (0.39,0.57,0.73) & (0,0,0) & (0.23,0.37,0.58) \end{bmatrix}.$$

By using Equation 19 and Equation 20 can be calculated distances $\widetilde{D}^+$ and $\widetilde{D}^-$.

$\widetilde{D}^+ = [1.223 \quad 1.042 \quad 0.851 \quad 0.823 \quad 0.834 \quad 0.728]^T$,

$\widetilde{D}^- = [0.867 \quad 0.858 \quad 1.110 \quad 1.105 \quad 1.175 \quad 1.187]^T$.

So as to obtain the approach degree by using Equation 21,

$\tilde{C} = [0.415 \quad 0.452 \quad 0.566 \quad 0.573 \quad 0.585 \quad 0.620]^T$,

and seen that $\tilde{C}_6 > \tilde{C}_5 > \tilde{C}_4 > \tilde{C}_3 > \tilde{C}_2 > \tilde{C}_1$. In order to obtain such a rating in Table 8.

Table 8. Ranking from Scholarship Interview Result

Candidat	Ranking
$C6$	1
$C5$	2
$C4$	3
$C3$	4
$C2$	5
$C1$	6

So the most recommended candidates for scholarship was the candidate of the $C6$, and after that the recommended candidate is $C5$, and then follow the rankings that have been obtained.

CONCLUSION

Fuzzy TOPSIS method can be properly and effectively used to solve the problem MODM containing linguistic variables. This method is also quite simple, so easy to use.

On the issue of this scholarship interviews, with fuzzy TOPSIS method in the judging process of the candidates by the interviewer, the result that the candidate C6 has ranked first and most recommended to get a scholarship.

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