

Decision Making in Fuzzy Environment

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Abstract

Fuzzy Logic is used in those type of problems in which the solution cannot be defined in rigid boundary either yes or no. In this environment the decision are not biased because the decisions are making on the basis of different criteria involved in that problem. Here membership function is given to that criteria and using various fuzzy operation the calculation is done. In this thesis we have studied about fuzzy set and fuzzy logic and implement this in our ranking problem. We have also develop a code in C using DevC++ compiler by which our ranking can be done among any alternatives in different criteria.

Keywords

Fuzzy, decision making, outranking, fuzzy logic, school survey, C program for outranking.

I. Introduction

This is a research integrated with fuzzy which contains brief study on Fuzzy Logic and its application and also implement the fuzzy logic in Decision making problem in our ranking problem. Decision making process is cognitive process that generally used very well in both industries and academics. In other words, decision making is the study of identifying and choosing alternatives based on different-different criteria the values and preferences of the decision maker. Analysis of individual decision may hamper decision making.

Thus fuzzy gives the option by which we can judge it irrational or rational on the basis of their explicit assumptions. Therefore group decision making is a decision making process in which individuals' decisions are unite together to solve the particular problem.

Crisp (Classical) Set:

Definition of Crisp Set: The Non empty set of well-defined objects. Thus a crisp non-empty set is defined as the set is of ordered pairs, in which the first member is the element of the set and second member is the characteristics function whose value is either 1 or 0 which denotes the presence and absence of an elements in the set.

Example:- Let $U = \{A_1, A_2, A_3, \dots, A_r, A_{r+1}, \dots\}$ be the universe of discourse.

Fuzzy Set

Definition: A fuzzy set is defined as the set of ordered pair given as

$$\left\{ \left(\frac{x_1}{\mu_{x_1}} \right), \left(\frac{x_2}{\mu_{x_2}} \right), \dots, \left(\frac{x_r}{\mu_{x_r}} \right), \left(\frac{x_{r+1}}{\mu_{x_{r+1}}} \right), \left(\frac{x_{r+2}}{\mu_{x_{r+2}}} \right) \right\}$$

$$0 \leq \mu_{x_j} \leq 1$$

here x_i is the element of the fuzzy set and μ_{x_i} is the membership function of x_i . Consider the set of intelligent Students in this Seminar. Here we can't divide the students in to two separate groups of intelligent students and not intelligent students. There is lack of sharp boundary between an intelligent and not intelligent student.

Determination For Membership

Here x_i is the element of the fuzzy set and μ_{x_i} is the membership function of x_i . Consider the set of intelligent Students in this Seminar. Here we can't divide the students in to two separate groups of intelligent students and not intelligent students. There is lack of FUNCTION

- By intuitive judgment of a single decision maker (Judge). Who is expert and well experienced in making decisions concerning the associated problem? Such a judgment may be biased.
- By intuitive judgment of a group of judges (Decision makers) and taking the suitable average or weighted average of their judgments given by the judges regarding the membership function. Such an articulation of the membership function is more rational and realistic.

Defination of Problem

Out ranking of a available good schools in a city based on different qualitative /quantitative criteria. A family is selecting a school among number of good schools situated in a city on the basis of their overall performance.

- These are the name of schools
- D.B.M.S. English School ,Kadma
 - St. Mary HighSchools ,Bistupur
 - BeldihHigh School ,Sakchi
 - DelhiPublic School,NH-33
 - Narbheram High School
 - BistupurKeralaPublic School ,Bistupur

Based on these criteria the selection will be done

- Yearly cost
- Quality of teaching
- Discipline
- Curricular Activities
- Aesthetics
- Qualified faculty and attitude
- Neatness
- Practical facilities
- Mentorship
- Transportation

Weight and membership value for different criteria is given by intuitive judgment. This problem is solved by multiple judgment where the membership values are given by

calculating the average of membership function given by four judges.

Let $\{C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8, C_9, C_{10}\}$ be the set of fuzzy criteria and $\{S_1, S_2, S_3, S_4, S_5, S_6\}$ is the set of fuzzy alternatives.

Calculating weight

Points given to different criteria

Transportation	15
Yearly cost	15
Quality of teaching	30
Discipline	20
Curricular Activities	15
Aesthetics	20
Qualified faculty and attitude	10
Neatness	10
Practical facilities	15
Mentorship	10
Sum	160

Calculating normalized weight

Weight for criteria = (Points given to criteria/sum of all criteria)/100

Weight for Transportation = $(15/160)/100=0.093$

Weight for Yearly cost = $(15/160)/100=0.093$

Weight for Quality of teaching = $(30/160)/100=0.187$

Weight for Discipline = $(20/160)/100=0.125$

Weight for Curricular Activities = $(15/160)/100=0.093$

Weight for Aesthetics = $(20/160)/100=0.125$

Weight for Qualified faculty and attitude = $(10/160)/100=0.062$

Weight for Neatness = $(10/160)/100=0.062$

Weight for Practical facilities = $(15/160)/100=0.093$

Weight for Mentorship = $(10/160)/100=0.062$

Table of membership function of different criteria on different alternatives

Schools criteria	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆
C ₁	0.55	0.50	0.60	0.82	0.60	0.57
C ₂	0.80	0.80	0.72	0.77	0.87	0.67
C ₃	0.75	0.57	0.65	0.80	0.67	0.80
C ₄	0.70	0.55	0.75	0.75	0.80	0.50
C ₅	0.52	0.60	0.80	0.85	0.75	0.65
C ₆	0.70	0.82	0.75	0.87	0.62	0.70
C ₇	0.82	0.85	0.65	0.67	0.70	0.82
C ₈	0.82	0.80	0.82	0.77	0.85	0.72
C ₉	0.50	0.82	0.72	0.80	0.65	0.70
C ₁₀	0.72	0.82	0.61	0.75	0.75	0.77
minimum	0.20	0.50	0.60	0.67	0.62	0.50
Weighted Average	0.6853	0.7275	0.7771	0.7493	0.7312	0.7193
Ranking	5	3	2	1	6	4

Future Scope

Instead of using intuitive judgments for calculating weight for criteria entropy can be used which is more efficient.

Using this concept decision making problem related to other object can be solved.

Conclusion

On the basis of this project we can make selection/decision among various alternatives with different criteria.

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arithmastic averaging SUM of DBMS = 0.685312
arithmastic averaging SUM of St.Mary = 0.727500
arithmastic averaging SUM of Beldih = 0.777187
arithmastic averaging SUM of DPS = 0.749375
arithmastic averaging SUM of Narbheram = 0.731250
arithmastic averaging SUM of Kerala_Public_School = 0.719375
AFTER RANKING
WITH point 0.777187 RANK 1 of ALTERNATIVE is Beldih
WITH point 0.749375 RANK 2 of ALTERNATIVE is DPS
WITH point 0.731250 RANK 3 of ALTERNATIVE is Narbheram
WITH point 0.727500 RANK 4 of ALTERNATIVE is St.Mary
WITH point 0.719375 RANK 5 of ALTERNATIVE is Kerala_Public_School
WITH point 0.685312 RANK 6 of ALTERNATIVE is DBMS
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Profile



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