Selection of higher studies institution using fuzzy decision making

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Abstract
Selecting a course of action out of different courses to solve a problem is called a decision making. The Decision may be major/minor strategies or operational, long term or short term. The importance of decision, however, varies at each level. Decision making is a modest attempt to find the best alternatives. Based on the knowledge he/she acquired to select the environment of higher studies. The choice is based on many factors such as fee, distance, quality of institution etc. In fuzzy individual decision making (FIDM), only a single person is responsible for taking decisions. The goals and constraints of IDM are expressed in terms of fuzzy set.

Keywords
Fuzzy individual decision making (FIDM), Goals and Constraints.

AMS Subject Classification
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1. Introduction
The theme of decision making is the learning of how decisions are absolutely made and how they can be made more desirable or more accomplishment. Usually some classes of decision making problems are acknowledged. A single decision maker problems and several decision maker problem are the arrangement of decision making problem in a decision making process. The above problem refer to viz individual decision making and multi-person decision making respectively. Decision making involving the innovative concept of goals and constraints [2]. Proper and Good education is very important for all of us. It facilitates quality learning all through the life among people of any age group, caste, creed, religion. It is the process of achieving knowledge, values, skills, beliefs and moral habits. In the field of management, in which the decision making process significantly for functions such as inventory control, investment, allocation of resources, etc. In general, decision making itself is defining to incorporate any selection of alternatives and hence it is a key importance in many fields such as social sciences, natural sciences, Engineering discipline, etc [2]. In any decision process, we contemplate the particulars about a concern or result and elect among two or more alternatives for final action [5].

2. Basic Definitions
1. A membership function denoted by $\mu_A(x)$ is related to the fuzzy set $A$ such that the function maps every element of the universe of discourse $X$ to the interval $[0, 1]$ by $\mu_A : X \rightarrow [0, 1]$
2. Given two fuzzy sets $A$ and $B$ their standard intersection is defined by
   \[(A \cap B)(x) = \min[A(x), B(x)] \forall x \in X\] where ‘min’ denote the minimum operator.
3. The standard composition of two binary fuzzy relations $A(X, Y)$ and $B(Y, Z)$ is represented by
   \[R(X, Z) = [A \circ B](x, z) = \max \{\min A(x, y), B(y, z)\} \forall x \in X, y \in Y, z \in Z.\]
4. Let $O'_i$ and $L'_j$ be fuzzy sets assigned on sets $X_i$ and $Y_j$ respectively where $i \in N_n$ and $j \in N_m$. Consider these fuzzy sets represent goals and constraints expressed by the decision maker. Then for each $i \in N_n$ and $j \in N_m$, we delineate the meaning of actions in the set $A$ in terms of sets $X_i$ and $Y_j$ by functions $o_i : A \rightarrow X_i$, $l_j : A \rightarrow Y_j$ and express the goals $O_i$ and constraints $L_j$ by the compositions of $o_i$ with $O'_i$ and the compositions of $l_j$ with $L'_j$; i.e., $O_i(a) = O'_i(o_i(a)), L_j(l_j(a)) = L'_j(l_j(a))$ for each $a \in A$.

5. The Judgement/Decision is denoted by the formula

$$J(a) = \min [\inf_{i \in N_n} O_i(a), \inf_{j \in N_m} L_j(a)] \forall a \in A,$$

provided that the standard operator of fuzzy intersection is employed, $O_i$ and $L_j$ represent the objective/goal and limitations/constraints respectively.

### 3. Role of Fuzzy Decision Making

Distinct part of the problem in which a person should know are, the decision maker, objectives, the system or environment, alternating course of actions, choices must have distinctive adaptability for the desired outcomes. The above five components helps him to formulate the decision making and to understand the nature of the problem and finally to find the best solutions or outcomes from the different alternatives. Most vital part in the fact that someone even to some group must have the problem. Thus, individual or group is malcontent with some facet of the state of events and there upon need to make a decision with looked on to altering it, and it is mentioned here, the decision maker. He may also be referred as authoritative or accomplisher. The decision maker must have some aim which he has not acquired the level he desires, in order have a problem, he must know something other than what he has, is denoted as objectives. An environment is an organized system to hold a man. A problem cannot subsist without the decision maker has a choice from at least two alternative courses of action or strategies is mentioned here alternating course of action. The course of action accessible to him must bring some chance to find his aim, but they cannot afford to same chance, or else, his choice would not be significant, is referred as choices must have distinctive adaptability for the desired outcomes [5]. There are three types of environment in which decisions are made, certainty, uncertainty and risk. In the case of certainty only one states of nature exists, in uncertainty, more than one states of nature exists, and in the case of risk more than one states of nature exists, but the decision maker has sufficient knowledge to select the states [3]. Classical decision making is according to a set of different states of nature, that are available to the decision maker, the payback from each alternative action. The fuzzy decision making is striving to be understood with the blurriness and non specificity intrinsic in human formulation of groove, restrictions and goals [6]. Bellman and Zadeh (1970) propose a model of decision making in which compatible goals and limitations are expressed in terms of fuzzy sets, and a decision is found in an applicable collection of these fuzzy sets [1].

The following are the fundamental concepts of this decision situation

- A set A of possible measure.
- A set of goals $O'_i$ ($i \in N_n$), each of which is expressed in terms of fuzzy set defined on A
- A set of constraints $L'_j$ ($j \in N_m$) each of which is also expressed by a fuzzy set defined on A.

We decline the concept of fuzzy decision making using IDM method, proposed by Bellman and Zadeh by a simple example.

Consider an individual (male / female) wants to choose their higher studies institution by fuzzy individual decision making method among the four possible alternatives (actives) $i_1, i_2, i_3, i_4$. An individual finds a goal to choose a better institution which he/she will study with considerable fee and their constraints are driving distance are closer and his/her viewed as interest. Here an individual goal and constraints are considered to be a fuzzy set. Each has their own domain and co domain. Let $O$ and $L$ represent the goal and constraints respectively. We can describe a function such as $O' : X \rightarrow [0,1]$ and $L' : Y \rightarrow [0,1]$.

Let $I = \{i_1, i_2, i_3, i_4\}$ and the fuzzy set involved represents a concept of considerable fee structure as $\mathcal{R} 30,000, \mathcal{R} 40,000, \mathcal{R} 70,000, \mathcal{R} 80,000$ respectively, interesting of institution with the degree $0.8, 0.6, 0.4$ and $0.4$ respectively and close driving distance are $17$ km, $7.5$ km, $10$ km and $2.5$ km respectively.

The goal is specified by monetary term subsistence of an institution obtainable. Thus we define the fuzzy set expressing the goal by $O$, its membership function is defined as

$$O'(x) = \begin{cases} 
\frac{x - 27,000}{84,000 - 27,000}, & 27,000 \leq x \leq 84,000 \\
1, & x \geq 84,000 
\end{cases}$$

and it is shown in Fig. 3.1.

![Figure 3.1. Goal $O'$ (considerable fees).](image)
To assign each institution’s corresponding fee, we deliberate through a function \( O : I \rightarrow R^+ \).

Consider \( o(i_1) = Rs. 30,000 \), \( o(i_2) = Rs. 40,000 \),
\( o(i_3) = Rs. 70,000 \), \( o(i_4) = Rs. 80,000 \).

Composing the function \( o \) and \( O' \), according to \( O(i) = O' (O'(a)) \) we get the fuzzy set
\[
O = \frac{0.05}{i_1} + \frac{0.22}{i_2} + \frac{0.75}{i_3} + \frac{0.92}{i_4}
\]
which express the goal in terms of the available institution in set \( I \).

Consider
\[
l_1 (i_1) = 17 \text{ km} \quad l_1 (i_2) = 7.5 \text{ km} \\
l_1 (i_3) = 10 \text{ km} \quad l_1 (i_4) = 2.5 \text{ km}
\]

By composing functions \( l_1 \) and \( L'_1 \) by the formula
\[
L_j(i) = L'_1 (l_j(i))
\]
we obtain the fuzzy set
\[
L_1 = \frac{0.2}{i_1} + \frac{0.8}{i_2} + \frac{0.6}{i_3} + \frac{1}{i_4}
\]
In Fig. 3.2 the distance of the institution is also shown specifically.

![Figure 3.2. Constraint \( L'_1 \) (closed driving distance).](image)

Now the second constraint, i.e., the interest of view is represented directly in terms of the fuzzy set. Therefore,
\[
L_2 = \frac{0.8}{i_1} + \frac{0.6}{i_2} + \frac{0.4}{i_3} + \frac{0.5}{i_4}
\]

Now applying the formula
\[
J(i) = \min \left[ \inf_{i \in N} O_i (i), \inf_{j \in N} L_j(i) \right], \forall i \in I
\]
We obtain the fuzzy set
\[
J = \frac{0.05}{i_1} + \frac{0.22}{i_2} + \frac{0.4}{i_3} + \frac{0.5}{i_4}
\]
which represents a fuzzy characterization of the concepts of desirable institution.

We elect \( i = i_4 \) is the best institution and this is the most suitable institution among the given available institution under the given goal \( O \) and constraints \( L_1 \) and \( L_2 \).

### 4. Conclusion

We conclude that, an individual chooses his/her best higher studies institution by fuzzy individual decision making method, though (he/she) affected by the factors with considerable fee, closed arriving distance and own interest of view. Since the aim of education is the knowledge lot of facts but of values. So we suggest fuzzy individual decision making method with goals and constraints.

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