Multi Softset for Decision Making

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Abstract: ***Decision making is involved in all facets of our daily life. We use our intelligence, reasoning, analytical ability and available information for decision making. Most of the time the information available is not precise, giving rise to uncertainty in decision making. To deal with the uncertainty, the various mathematical tools like probability, fuzzy sets, rough sets, vague sets and soft sets etc are being widely used. But these tools are not completely capable to deal with all the types of uncertainty. In view of above a multi soft set approach is proposed in this paper to deal with uncertainty in decision making. A doubly soft set is proposed and illustrated with the help of suitable example. This multi soft set is illustrated to deal with uncertainty at two levels of hierarchy.***

1. Introduction

In our daily life we encounter numerous problems which require decision making. For example purchasing items, planning our career, choosing place to visit, choosing our friends etc. These decisions in turn depend on various parameters and constraints based on our society, culture, financial position, psychology etc. The major challenge in decision making is the uncertainty arising due to various reasons like incomplete information, imprecise information, contradictory information etc. Various mathematical tools like probability, fuzzy sets, rough sets, vague sets and soft sets have been proposed by research workers [1,2,3,4,5] in the past to deal with uncertainty. However these tools are not completely capable to deal with all kinds of uncertainty. Therefore combinations of these mathematical tools are being explored to deal with uncertainty in decision making. Also attempts are being made by research workers to modify the existing tools and propose new mathematical tools to deal with the uncertainty.

In the present paper an attempt has been made to propose a multisoft set to deal with the uncertainty in decision making. This multisoft set is constructed by parameterizing the set at two levels to obtain doubly softset. A suitable example has been used to illustrate the proposed multisoft

2. Multi Soft Set

In order to define and construct multi soft set it is necessary to define a soft set.

Soft Set:
Let X, P(X) and E denote a universal set, power set of X, and set of all parameters respectively.Let $A \subset E$Then, a soft set (F,A) over xis a set defined by a function F(A) representing a mapping $F_A : E \rightarrow P(X)$ Such that [4]
$F_A(y) = \emptyset$ if $y \notin A$

Here, F_A is called approximate function of the soft set F_A, and the value $F_A(y)$ is a set called y-element of the soft set for all $y \subset E$[4] .It is a parameterized family of subsets of X.

A Two level Multi Soft Set: let (F,E) is a soft set. let $A \subset E$ and the parameters in A depend on another set of parameters $\alpha \in G$. Let (A,G) forms another soft set. Then (F,A,G) forms a two level multi soft set , which is also termed as doubly soft set.

3. Application of Multi softset in Decision Making

In this section the application of multisoftset in decision making is presented with the help of following example.

Let X = {H_1, H_2, H_3, H_4, H_5, H_6} be a set of six houses. E = { cheap, beautiful, good location, wooden, green surrounding} be a set of parameters. Consider a soft set (F,E) which describes a good house.

Let E = { e_1, e_2, e_3, e_4, e_5 }
Where : e_1= cheap, e_2 = beautiful, e_3 = good location, e_4 = wooden, e_5 = green surrounding

Here the parameter good location will further depend upon the new set of parameters denoted by
G_1 = { g_1, g_2, g_3}

Where g_1 = near the market, g_2 = near railway station, g_3 = near the office.

Thus the parameter e_3 = good location will form a soft set (f, G)
Let $F(e_1)$ = cheap houses = { H_1, H_2, H_3, H_4, H_5, H_6},$F(e_2)$ = beautiful houses = {H_1, H_2, H_3, H_4, H_5},
$F(e_4)$ = wooden house = {H_2, H_3, H_6}and$F(e_5)$ = green surrounding houses = {H_1, H_2, H_3, H_4, H_6}
Let us assume that following houses have location.
$f(g_1)$ = near the market = {H_1, H_2, H_3, H_4, H_6},$f(g_2)$ = near railway station = {H_1, H_2, H_3, H_5} and
$f(g_3)$ = near the office = {H_1, H_2, H_3, H_4, H_5}

Let us have tabular representation of soft set named location.
If $H_i \in f(g)$ then $H_{ij} = 1$ else $H_{ij} = 0$

Table 1: Soft set for location of house

X	g_1	g_2	g_3	score
H_1	1	1	1	3/3=1
H_2	1	1	1	3/3=1
H_3	1	1	1	3/3=1
H_4	1	0	1	2/3
H_5	0	1	1	2/3
H_6	1	0	0	1/3

The score is calculated by adding entries in each row and dividing the sum by number of entries in that row.

The tabular form of soft set(F,E) for a good house will be given by

Table 2: Soft set for a good house

X	e_1	e_2	e_3	e_4	e_5	score
H_1	1	1	1	0	1	4/5
H_2	1	1	1	1	1	5/5=1
H_3	1	1	1	1	1	5/5=1
H_4	1	1	2/3	0	1	11/15
H_5	1	1	2/3	0	0	8/15
H_6	1	0	1/3	1	1	10/15=2/3

Here e_3 is taken from the score of Table 1. The score is calculated by adding the entries of each rowand dividing the sum by the number of entries in that row.

Based on the score in Table 2,the houses H_2 and H_3 are the best as they have the highest scores.

The combination of two soft sets i.e. a good house and good location forms a two level soft set in which first the soft set for good location is evaluated to input the value to soft set for good house.

4. Conclusion

A two level multisoft set namely doubly soft set is proposed and successfully employed for making decision to purchase a good house. The human thinking is granular in nature. The proposed multisoft set provides the required granularity in decision making. More parameters depending on the purchase requirements can be used further to extend this two level multisoft set for better decision making. Further this multilevel soft set can be further extended to n levels depending on the dependence of some parameters on the n hierarchical levels of the parameters arising due topractical conditions of the problem. In all it is a new contribution to mathematics as well as in the area of decision making.

References

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