Real life problem into Mathematical problem using soft set Theory

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How to convert the Real life problem into Mathematical problem

c_1

c_2

c_3

c_4

c_5

E XAMPLE

U={c_1, c_2, c_3, c_4, c_5}, $E = \{e_1, e_2, e_3, e_4, e_5\}$

e_1 =Expensive, e_2 =Beautiful,

e_3 =Attractive, e_4 =Comfortable seating,

e_5 = Colourful

$F_E =$

$\{(e_1, \{c_2, c_3, c_5\}), (e_2, \{c_2, c_4\}), (e_3, \{c_1\}), (e_4, \{U\}), (e_5, \{c_3, c_5\})\}$

Decision

Decision can be converted as a set

U={c_1, c_2, c_3, c_4, c_5}, $E = \{e_1, e_2, e_3, e_4, e_5\}$

e_1 =Expensive, e_2 =Beautiful, e_3 =Attractive e_4 =Comfortable seating,

e_5 = Colourful

A, B, C, $\subseteq E$

Mother (**Comfortable**)

$$F_A = \{(e_1, \{c_2\}), (e_2, \{c_2, c_4\}), (e_3, \{c_2\}), (e_5, \{c_3, c_5\})\}$$

Brother (**Attractive**)

$$F_B = \{(e_1, \{c_2, c_3, c_5\}), (e_2, \{c_2, c_4\}), (e_4, \{c_1\}), (e_5, \{c_3, c_5\})\}$$

Sister (Expensive,comfortable , colourful)

$$F_C = \{(e_2, \{c_2, c_4\}), (e_3, \{c_1, c_2, c_4\})\}$$

SOFT SET

SOFT SET

U --→ Initial universe   E ---→ set of parameters.

$A \subseteq E$.

P (U) --→power set of U.

$F : A \to P(U)$

F_A **is called a soft set over U**

$F_A = \{(e, F(e))\ where \in A, F(e) \in P(U)\},$

$F(e) = \emptyset$ **if** $e \notin A$.

$U=\{c_1, c_2, c_3, c_4, c_5\}$, $E=\{e_1, e_2, e_3, e_4, e_5\}$

Let $A \subseteq E$, $A=\{e_1, e_2, e_3, e_5\}$, $F: A \rightarrow P(U)$

$$F_A=\{(e_1,\{c_2\}),(e_2,\{c_2,c_4\}),(e_3,\{c_2\}),(e_5,\{c_3,c_5\})\}$$

Let $B \subseteq E$, $B=\{e_2, e_3\}$, $F: B \rightarrow P(U)$

$$F_B=\{(e_2,\{c_2,c_4\}),(e_3,\{c_1,c_2,c_4\})\}$$

Relationship between soft set with other set

Every ordinary set is a soft set itself.

Every fuzzy set may be considered as a special case of soft set.

Soft subsets

Let F_A, G_B be two soft sets over a common universe U and A,B$\subseteq$ E

If

(i). $A \subseteq B$ and

(ii). For all $e \in A$, F(e) and G(e) are identical approximations.

Then F_A is a soft subset of G_B denoted by $F_A \tilde{\subseteq} G_B$.

Example-soft subset

U={c_1, c_2, c_3, c_4, c_5}, $E = \{e_1, e_2, e_3, e_4, e_5\}$

Let A $\subseteq E$, $A = \{e_2, e_3\}$, $F: A \to P(U)$

$$F_A = \{(e_2, \{c_4\}), (e_3, \{c_1, c_2\})\}$$

Let B $\subseteq E$, $B = \{e_1, e_2, e_3, e_5\}$, $G: B \to P(U)$

$$G_B = \{(e_1, \{c_2, c_4\}), (e_2, \{c_2, c_4\}), (e_3, \{c_1, c_2, c_4\}), (e_5, \{c_3, c_5\})\}$$

$$F_A \tilde{\subseteq} G_B$$

Example- Not a soft subset

U={c_1, c_2, c_3, c_4, c_5}, $E = \{e_1, e_2, e_3, e_4, e_5\}$

Let A $\subseteq E$, $A = \{e_2, e_3\}$, $F: A \to P(U)$

$$F_A = \{(e_2, \{c_4\}), (e_3, \{c_1, c_2, c_4\})\}$$

Let B $\subseteq E$, $B = \{e_1, e_2, e_3, e_5\}$, $G: B \to P(U)$

$$G_B = \{(e_1, \{c_2, c_4\}), (e_2, \{c_2, c_4\}), (e_3, \{c_1, c_2\}), (e_5, \{c_3, c_5\})\}$$

$$F_A \tilde{\not\subset} G_B$$

Number of possible subsets
for
a soft set

Let F_E be a soft set over U.

soft power set of F_E is denoted by $\widetilde{P}(F_E)$

$\left|\widetilde{P}(F_E)\right| = 2^{\sum_{e\in E}|F(e)|}$, where $|F(e)|$ is the cardinality of $F(e)$.

U=$\{x, y\}$, E=$\{e_1, e_2\}$

$$F_E = \{(e_1, \{x, y\}), (e_2, \{x, y\})\}.$$

$$\left|\widetilde{P}(F_E)\right| = 2^{\sum_{e \in E} |F(e)|}$$

$$= 2^{|F(e_1)| + |F(e_2)|} = 2^{2+2}$$

$$= 2^4 = 16$$

$F_E = \{(e_1, \{x, y\}), (e_2, \{x, y\})\}$, $\emptyset$, $F_{E_1} = \{(e_1, \{x\})\}$,

$F_{E_2} = \{(e_1, \{y\})\}$, $F_{E_3} = \{(e_1, \{x, y\})\}$,

$F_{E_4} = \{(e_2, \{x\})\}$, $F_{E_5} = \{(e_2, \{y\})\}$, $F_{E_6} = \{(e_2, \{x, y\})\}$,

$F_{E_7} = \{(e_1, \{x\}), (e_2, \{x\})\}$, $F_{E_8} = \{(e_1, \{x\}), (e_2, \{y\})\}$,

$F_{E_9} = \{(e_1, \{x\}), (e_2, \{x, y\})\}$, $F_{E_{10}} = \{(e_1, \{y\}), (e_2, \{x\})\}$,

$F_{E_{11}} = \{(e_1, \{y\}), (e_2, \{y\})\}$, $F_{E_{12}} = \{(e_1, \{y\}), (e_2, \{x, y\})\}$,

$F_{E_{13}} = (e_1, \{x, y\})(e_2, \{x\})\}$, $F_{E_{14}} = \{(e_1, \{x, y\}), (e_2, \{y\})$.

Soft Equal sets

Two soft sets F_A and G_B over a common universe U are said to be soft equal if F_A is soft subset of G_B and G_B is soft subset of F_A.

$F_A \tilde{\subseteq} G_B$ and $G_B \tilde{\subseteq} F_A$

UNION

Let F_A and G_B be two soft sets over the common universe U .Then the union is defined by $F_A \tilde{\cup} G_B = H_C$

where $C = A \cup B$ and $\forall e \in C$,

$$H(e) = \begin{cases} F(e), & if \quad e \in A \setminus B; \\ G(e), & if \quad e \in B \setminus A; \\ F(e) \cup G(e), & if \quad e \in A \cap B. \end{cases}$$

Intersection

Let F_A and G_B be two soft sets over the common universe U .Then the intersection of this is defined by

$F_A \tilde{\cap} G_B = H_C \quad C = A \cap B$ and $\forall e \in C$,

$$H(e) = F(e) \cap G(e)$$

c_1

c_2

c_3

c_4

c_5

U={c_1, c_2, c_3, c_4, c_5}, $E = \{e_1, e_2, e_3, e_4, e_5\}$

e_1 =Expensive, e_2 =Beautiful, e_3 =Attractive e_4 =Comfortable seating,

e_5 = Colorful Let A, B, C, $\subseteq E$

Yours $E = \{e_1, e_2, e_3, e_4, e_5\}$

$$F_E = \{(e_1, \{c_2, c_3, c_5\}), (e_2, \{c_2, c_4\}), (e_3, \{c_1\}), (e_4, \{U\}), (e_5, \{c_3, c_5\})\}$$

Mother $A = \{e_1, e_2, e_3, e_5\}$

$$G_A = \{(e_1, \{c_2\}), (e_2, \{c_2, c_4\}), (e_3, \{c_2\}), (e_5, \{c_3, c_5\})\}$$

Brother $B = \{e_1, e_2, e_4, e_5\}$

$$H_B = \{(e_1, \{c_2, c_3, c_5\}), (e_2, \{c_2, c_4\}), (e_4, \{c_1\}), (e_5, \{c_3, c_5\})\}$$

Sister $C = \{e_2, e_3\}$ $I_C = \{(e_2, \{c_4\}), (e_3, \{c_1, c_2, c_4\})\}$

Find $F_E \tilde{\cap} G_A \tilde{\cap} H_B \tilde{\cap} I_C = J_D$ **where** D= $E \cap A \cap B \cap C$ **and**

$\forall e \in D,\ J(e) = F(e) \cap G(e) \cap H(e) \cap I(e)$

To find D

D= $E \cap A \cap B \cap C$

$=\{e_1, e_2, e_3, e_4, e_5\} \cap \{e_1, e_2, e_3, e_5\} \cap \{e_1, e_2, e_4, e_5\}\{e_2, e_3\}$

D=$\{e_2\}$

To find $J(e)$ For each $e \in D$

$$J(e) = F(e) \cap G(e) \cap H(e) \cap I(e)$$

$$=\{c_2, c_4\} \cap \{c_2, c_4\} \cap \{c_2, c_4\} \cap \{c_4\} = \{c_4\}$$


Thank You