Jessica Braganza
F17112151
BE Comp 2

PAGE NO :
DATE :

SCOA Assignment 1

1) Explain Classical set Vs Fuzzy set ?

Ans. Classical set :

i) It is a collection of distinct objects. For example, a set of student's passing grades.

ii) Each individual entity in a set is called a member or an element of the set.

iii) The classical set is defined in such a way that the universe of discourse is splitted into 2 groups : members and non-members. Hence, in case of classical sets, no partial membership exists.

iv) Let A be a given set. The membership function can be used to define a set A and is given by,

$$\mu_A(x) = \begin{cases} 1 & \text{, if } x \in A \\ 0 & \text{, if } x \notin A \end{cases}$$

v) Operations on classical sets - union (logical OR)
intersection (logical AND)
complement
difference

Fuzzy set :

i) It is a set having degrees of membership between 1 and 0.

ii) Fuzzy sets are represented with tilde character ($\sim$).

iii) For example, number of cars following traffic signals at a particular time out of all cars present will have membership value between [0,1]

iv) Partial membership exists when member of one fuzzy set can also be a part of other fuzzy sets in the same universe.

v) The degree of membership or truth is not same as probability, fuzzy truth represents membership in vaguely defined sets.

vi) A fuzzy set $A\sim$ in the universe of discourse, U, can be defined

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as a set of ordered pairs and is given by.

$\tilde{A} = \{ (x, \mu_{\tilde{A}}(x)) \mid x \in X \}$

2) Difference between fuzzification and defuzzification.

Ans

	Key	Fuzzification	Defuzzification
1)	Definition	It is the process of transforming a crisp set to a fuzzy set or a fuzzy set to fuzzier set.	It is the process of reducing a fuzzy set into a crisp member
2)	Purpose	It converts a precise data into impreciise data	It converts an impreciise data into preciise data.
3)	Example	voltmeter	Stepper motor
4)	Methods used	Inference, rank ordering, angular fuzzy sets, neural network.	maximum membership function, centroid method, weighted average method, center of sums.
5)	Complexity	It is easy.	quite complex to implement.
6)	Approach	It uses if-then rules to fuzzify the crisp value.	Uses center of gravity methods to get centroid of sets.

3) Consider the 2 fuzzy sets

$B1 = \{ 1/1.0 + 0.75/1.5 + 0.3/2.0 + 0.15/2.5 + 0/3.0 \}$

$B2 = \{ 1/1.0 + 0.6/1.5 + 0.2/2.0 + 1.0/2.5 + 0/3.0 \}$

Find the following : 1) $B1 \cup B2$ 2) $B1 \cap B2$ 3) $\overline{B1}$ 4) $\overline{B2}$

5) $B1 | B2$ 6) $\overline{B1 \cup B2}$

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Ans. 1. $B_1 \cup B_2 = \max [\mu_{B_1}(x), \mu_{B_2}(x)]$

$= \{ 1/1.0 + 0.75/1.5 + 0.3/2.0 + 0.15/2.5 + 0/3.0 \}$

2. $B_1 \cap B_2 = \min [\mu_{B_1}(x), \mu_{B_2}(x)]$

$= \{ 1/1.0 + 0.6/1.5 + 0.2/2.0 + 0.1/2.5 + 0/3.0 \}$

3. $\bar{B_1} = 1 - \mu_{B_1}(x)$

$= \{ 0/1.0 + 0.25/1.5 + 0.7/2.0 + 0.85/2.5 + 1/3.0 \}$

4. $\bar{B_2} = 1 - \mu_{B_2}(x)$

$= \{ 0/1.0 + 0.4/1.5 + 0.8/2.0 + 0.9/2.5 + 1/3.0 \}$

5. $B_1 | B_2 = B_1 \cap B_2$

$= \{ 1/1.0 + 0.4/1.5 + 0.3/2.0 + 0.15/2.5 + 0/3.0 \}$

6. $\overline{B_1 \cup B_2} = \bar{B_1} \cap \bar{B_2}$

$= \{ 0/1.0 + 0.25/1.5 + 0.7/2.0 + 0.85/2.5 + 1/3.0 \}$

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