Faculty of Engineering

Smgrc Group

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Intelligent Control

Assignment

Fuzzy rules and fuzzy inference engine
Fuzzification and defuzzification

Deadline: 24 Nov.

University of Kurdistan

1- Suppose that a fuzzy rule base consists of two rule:

$$\begin{cases} \text{IF } x_1 \text{ is } A_1 \text{ and} \cdots \text{and } x_n \text{ is } A_n \text{ THEN } y \text{ is } B \\ \text{IF } x_1 \text{ is } C_1 \text{ and} \cdots \text{and } x_n \text{ is } C_n \text{ THEN } y \text{ is } D \end{cases}$$

where

$$\mu_B(y) = \begin{cases} 1-|y| & |y| \le 1 \\ 0 & o.w. \end{cases} \quad \text{and} \quad \mu_D(y) = \begin{cases} 1-|y-1| & |y-1| \le 1 \\ 0 & o.w. \end{cases}$$

and let $\mu_A(x^*) = \prod_{i=1}^{n} \mu_{A_i}(x_i^*)$ and $\mu_C(x^*) = \prod_{i=1}^{n} \mu_{C_i}(x_i^*)$.

a) Obtain $\mu_{B'}(y)$ by using the singleton fuzzifier and product inference engine.
b) Calculate the fuzzy system output y^* by employing center average defuzzifier and maximum defuzzifier.

2- Suppose that a fuzzy rule base consists of the M rules:

$$\text{IF } x_1 \text{ is } A_1^l \text{ and} \cdots \text{and } x_n \text{ is } A_n^l \text{ THEN } y \text{ is } B^l$$

where

$$\mu_{A_i^l}(x_i) = \begin{cases} 1 - \dfrac{x_i - \bar{x}_i^l}{\sigma_i^l} & \left|x_i - \bar{x}_i^l\right| \le \sigma_i^l \\ 0 & o.w. \end{cases}$$

and that we use the triangular fuzzifier. Determine the output of the fuzzy inference engine $\mu_{B'}(y)$ for:

a) product inference engine with algebraic product t-norm.
b) minimum inference engine with minimum t-norm.