

Fuzzy Modelling

Exercise 3

Write a script to draw the sigmoidal membership functions, which are described by the following mathematical relations:

a)

$$\mu_A(x) = \frac{1}{1 + e^{-4(x-3)}} \quad \mu_B(x) = \frac{1}{1 + e^{-2(x-5)}} \quad \mu_C(x) = \frac{1}{1 + e^{-8(x-5)}}$$

C1 – red

C2 – green

C3 – blue

Z1 – line character „*”

Z2 – line character „+”

Z3 – line character „d”

DS = 0.25

R=[-1, 9]

b)

$$\mu_A(x) = \frac{1}{1 + e^{-2(x-2)}} \quad \mu_B(x) = \frac{1}{1 + e^{-2(x-6)}} \quad \mu_C(x) = \frac{1}{1 + e^{-4(x-6)}}$$

C1 – cyan

C2 – magenta

C3 – black

Z1 – line character „x”

Z2 – line character „o”

Z3 – line character „d”

DS = 0.2

R=[-2, 10]

Draw the membership functions $\mu_A(x)$, $\mu_B(x)$ and $\mu_C(x)$ on one graph in the range of R. Use the following colors $\mu_A(x)$ – C1, $\mu_B(x)$ – C2, $\mu_C(x)$ – C3, a continuous line for each function and line characters Z1, Z2, Z3.

Sign the membership functions in the following way $\mu_A(x)$ – MFA, $\mu_B(x)$ – MFB and $\mu_C(x)$ – MFC. Use a DS discretization step.

Write the equation describing the α -cut of a fuzzy set. Determine the α -cut of the fuzzy sets: α -cut(A) for $\alpha=0.3$ and α -cut(B) for $\alpha=0.6$.