Fuzzy Modelling

Exercise 6

Write a script to calculate the probabilistic sum and Łukasiewicz sum of fuzzy sets A and B, which are described using Gaussian membership functions:

a)

$$\mu_A(x) = e^{-(\frac{x+3}{2})^2}$$

$$\mu_B(x) = e^{-(\frac{x+6}{2})^2}$$

$$\mu_C(x) = e^{-(\frac{x+9}{2})^2}$$

$$\mu_D(x) = sum_{prob}\left(\mu_A(x), \mu_B(x)\right)$$

$$\mu_E(x) = sum_{Luk}\left(\mu_A(x), \mu_B(x)\right)$$

C1 – red	Z1 – continuous line
C2 – green	Z2 – continuous line
C3 – magenta	Z3 – continuous line
C4 – cyan	Z4 – continuous line, line character „d”
C5 – blue	Z5 – continuous line, line character „+”
DS = 0.2	P = [-14, 4]

Draw the membership functions $\mu_A(x)$, $\mu_B(x)$, $\mu_C(x)$, $\mu_D(x)$ and $\mu_E(x)$ on one graph in the range of R. Use the following colours $\mu_A(x)$ – C1, $\mu_B(x)$ – C2, $\mu_C(x)$ – C3, $\mu_D(x)$ – C4, $\mu_E(x)$ – C5, and continuous lines for each function and line characters Z1, Z2, Z3, Z4, Z5.

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

Write the equations describing the α-cut and the power of a fuzzy set. Determine the α-cut of the fuzzy sets: α-cut(D) for α=0.3 and α-cut(E) for α=0.5 and the power of the fuzzy sets: card(D), card(E).