

TD 3 Fuzzy logic

Exercise 1: A smart vacuum cleaner uses fuzzy logic to determine its cleaning intensity. Based on dust level and floor type, the system decides:

Output Variable: Cleaning_Power (0-100%) The controller uses two input variables with trapezoidal and triangular membership functions, and one output variable.

1. Dust_Level (0-100 particles per cubic foot) - Low - trapezoidal(0, 0, 20, 40) - Medium - triangular(30, 50, 70) - High - trapezoidal(60, 80, 100, 100)	Floor_Type (0-10 scale where 0=carpet, 10=hard floor) - Carpet - trapezoidal(0, 0, 3, 5) - Mixed - triangular(3, 5, 7) - Hard - trapezoidal(5, 7, 10, 10)
Output Variable & Fuzzy Sets Cleaning_Power (0-100%) - Gentle - trapezoidal(0, 0, 20, 40) - Moderate - triangular(30, 50, 70) - Aggressive - trapezoidal(60, 80, 100, 100)	

Fuzzy Rules (same as before)

- IF Dust_Level is Low AND Floor_Type is Hard THEN Power is Gentle
- IF Dust_Level is Low AND Floor_Type is Carpet THEN Power is Moderate
- IF Dust_Level is Medium AND Floor_Type is Hard THEN Power is Moderate
- IF Dust_Level is Medium AND Floor_Type is Carpet THEN Power is Aggressive
- IF Dust_Level is High THEN Power is Aggressive (regardless of floor)

Your Task For: Dust_Level = 25, Floor_Type = 3 Give the intensity of the vacuum

Exercise 2: A smart camera uses fuzzy logic to determine its focus adjustment speed. Based on subject distance and lighting conditions, the system decides:

Output Variable: Focus_Speed (0-100%)

The controller uses two input variables with trapezoidal and triangular membership functions, and one output variable.

Subject_Distance (0.1-20 meters) - Close - trapezoidal(0.1, 0.1, 1, 3) - Medium - triangular(2, 5, 8) - Far - trapezoidal(7, 10, 20, 20)	Focus_Speed (0-100%) - Slow - trapezoidal(0, 0, 20, 40) - Medium - triangular(30, 50, 70) - Fast - trapezoidal(60, 80, 100, 100)
. Lighting (0-1000 lux) - Dark - trapezoidal(0, 0, 100, 300) - Normal - triangular(200, 500, 800) - Bright - trapezoidal(700, 800, 1000, 1000)	Fuzzy Rules IF Subject_Distance is Close AND Lighting is Bright THEN Speed is Fast IF Subject_Distance is Close AND Lighting is Dark THEN Speed is Medium IF Subject_Distance is Medium AND Lighting is Bright THEN Speed is Fast IF Subject_Distance is Medium AND Lighting is Dark THEN Speed is Slow IF Subject_Distance is Far THEN Speed is Slow (regardless of lighting)

Your Task Subject_Distance = 4 meters, Lighting = 600 lux