Assignment 10 RBS

Aims:

To develop a RBS in uncertain environments.

Task:

Specify, design and deploy an application in python that solves your assigned problem with a Ruled Based System in uncertain environments (fuzzy). The applications should follow the following conditions:

1. it must have a nice layered architecture of MCV type
2. the input data for the problem (if need it) will be in a text file ‘problem.in’ (will contain the parameters for the fuzzy classes),
3. the input data for the system will be in ‘input.in’ and the output in the file ‘output.out’ also the inputs and the results will be printed on console
4. a short description of the chosen method will be in the file ‘description.txt’, this file will describe the algorithm and the chosen model (Mamdani or Sugeno), and other specific info, as well as the validation for the results (for 2 inputs a CLEAR calculation for the result going through ALL the steps of the method)

Points:

- 65 points - the algorithm.
- 10 points for the architecture and for the quality of your application.
- 25 points the description

Time:

The deadline is at the beginning of the 12 laboratory.

Problems:

1. The sprinkler

Consider a system to control a sprinkler. The purpose of this system is to adjust the operating time of the sprinkler (short, medium, long). The outside sensors give information about the air temperature (very cold, cold, normal, warm, hot) and the humidity of the soil (dry, normal, wet). Compute the necessary operating time of the sprinkler according to the input data.

For the system’s design use the data from the charts found in Figure 1, Figure 2, and Figure 3. The rule base is in Table 1.

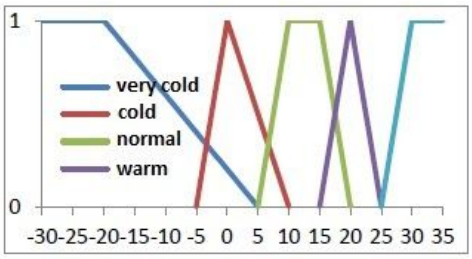

Fig.1: temperature

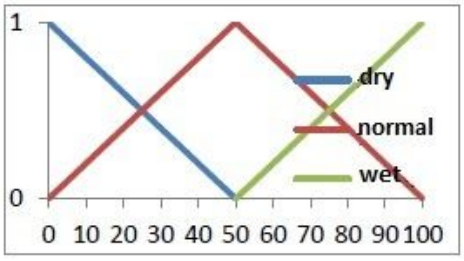

Fig. 2: humidity

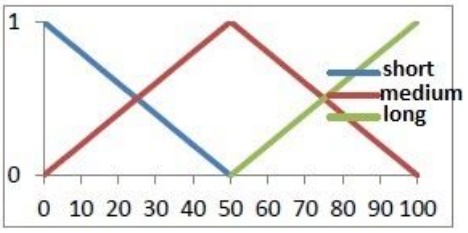

Fig. 3: time

humidity/ temperature	very cold	cold	normal	warm	hot
wet	short	short	short	short	medium
norma	short	medium	medium	medium	long
dry	medium	long	long	long	long

Table 1

2. The furnace

Design and implement a control module to control power of a furnace in order to increase the production efficiency. The power (small, medium, high) will depend on the temperature inside the furnace (cold, cool, moderate, hot, very hot) and of the capacity of the furnace (small, medium, high) - see Figure 4, Figure 5, Figure 6. The rules are given in Table 2.

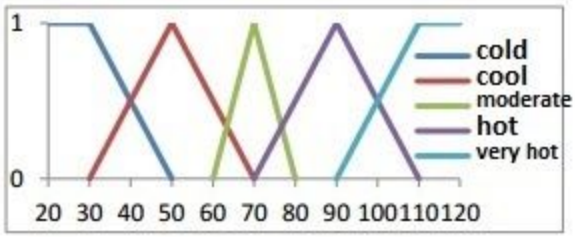

Fig. 4: temperature

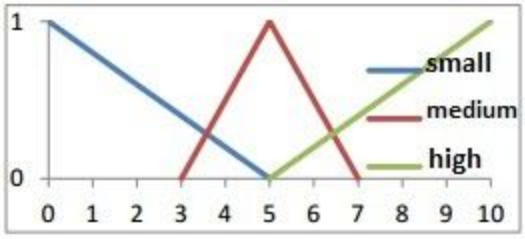

Fig.5: capacity

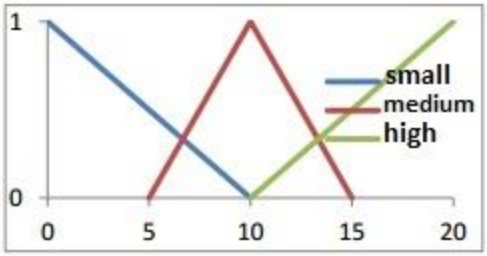

Fig. 6: the power

temperature/ capacity	small	medium	high
cold	small	medium	high
cool	small	medium	high
moderate	small	small	small
hot	small	small	small
very hot	small	small	small

Table 2

3. The washing machine

Design and implement a control module to adjust the washing cycle for a washing machine. The wash cycle (delicate, easy, normal, intense) depends on the texture of clothes (very soft, soft, normal, resistant) and the amount of clothes loaded in the car (small, medium, high) - see Figure 7, Figure 8, Figure 9 and Table 3.

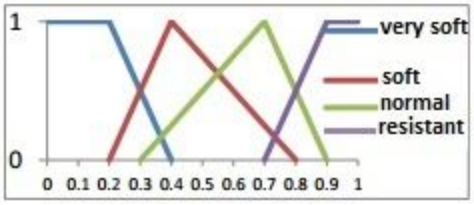

Fig. 7: texture

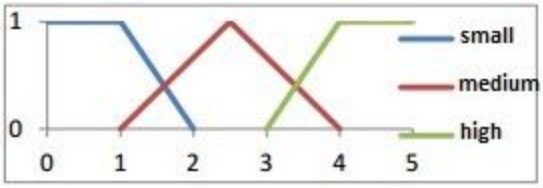

Fig.8: capacity

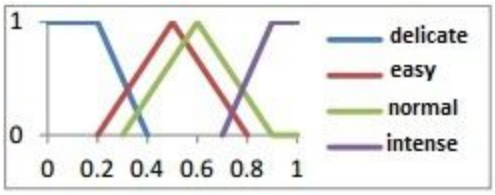

Fig.9: cycle type

Texture / capacity	small	medium	high
very soft	delicate	easy	normal
soft	easy	normal	normal
normal	easy	normal	intense
resistant	easy	normal	intense

Table 3