

CO542 – Neural Networks and Fuzzy Systems

Lab 1 – Fuzzy Logic

Scenario – One Input One Output

Suppose you need to control the speed of a motor by changing the input voltage. When a set point is defined, if for some reason, the motor runs faster, we need to slow it down by reducing the input voltage. If the motor slows below the set point, the input voltage must be increased so that the motor speed reaches the set point.

Use the following as input and output action words:

Input:	Output:
Too slow	Less voltage (Slow down)
Just right	No change
Too fast	More voltage (Speed up)

Lab Tasks

1. Define the rule-base for the scenario (Refer Figure 1).
2. Suppose, the speed increases from the set point of 2420 to 2437.4 rpm. This is depicted on the membership function as shown in Figure 2. Calculate required voltage to maintain an rpm at **set speed**.
 - Use Mamdani model and maximum defuzzification method

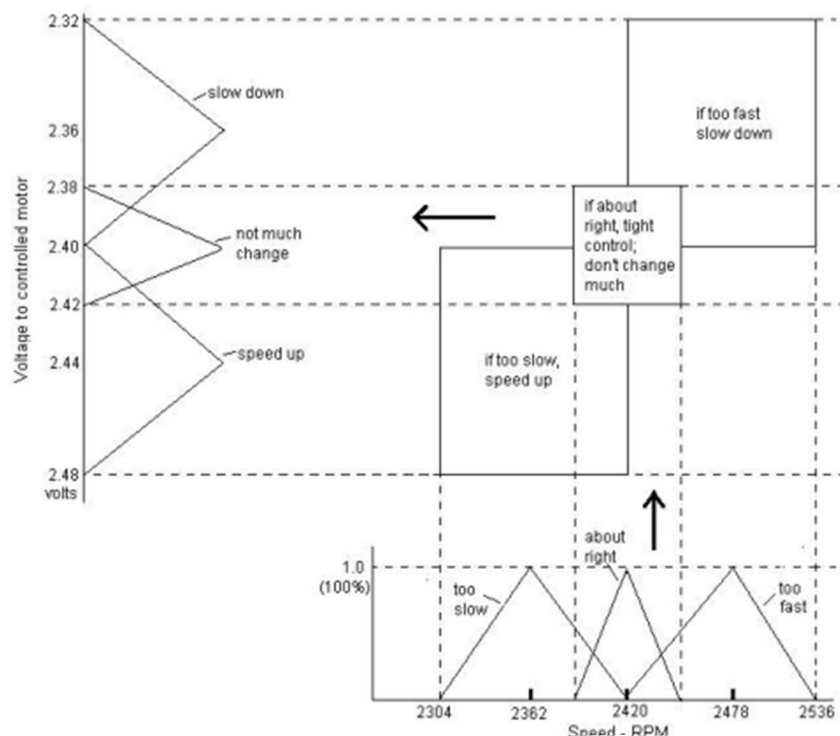


Figure 1. Membership Functions (I/P: Speed O/P: Voltage)

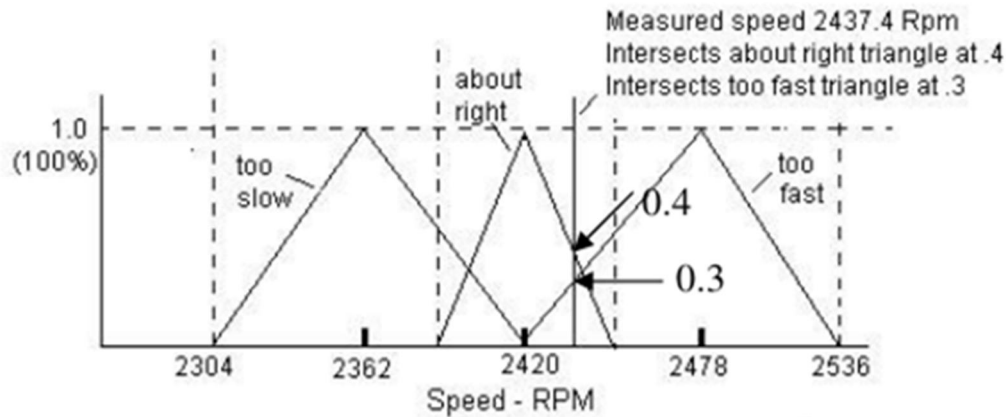


Figure 2: Speed above set point (set point=2420rpm)

3. Solve the same using Fuzzy Logic tool box in Matlab.

- Steps
 1. Draw the appropriate membership functions using “Membership Function Editor”
 - ~ Start the Matlab and type “Fuzzy” in command Prompt to open Fuzzy Interference System (FIS) Editor window
 - ~ Input: Speed
 - ~ Output: Voltage
 2. Use “Rule Editor” to create rules(Hints: three rules)
 - ~ Select New “FIS -> Mamdani” from the File Menu
 3. Save the file as “FZ_Motor.fis” and run following commands to calculate appropriate input voltage
 - » `fis = readfis('FZ_Motor')`
 - » `out=evalfis(2437.4,fis)`

Note: You have to submit Matlab files along with snapshots of each below.

- ~ Input Membership Function
- ~ Output Membership Function
- ~ Rule Editor

Submission

You can submit a single ZIP file as e16XXXlab01.zip including all:

- ~ A PDF file with rule base, tables, numerical calculations, graphical calculations, results, and snapshots of Matlab simulation as indicated in the labs, any descriptions, etc.
- ~ MatLab Files
- ~ All images (graphical calculations and outputs from MatLab)

Note: XXX indicates your registration number in all cases. **Those who have plagiarized content will be heavily penalized.**