

ECE 6397 Computer Assignment 8

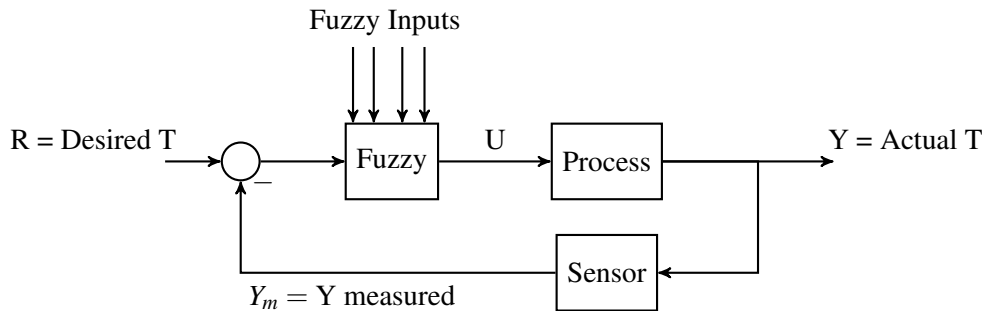
1 Statement

When designing a thermostat controller for an air conditioner, a fuzzy logic approach can be used to determine the ideal temperature for the room. Rather than relying on a binary on/off system, fuzzy logic can take into account multiple factors such as the outside temperature, the desired temperature, and the humidity level in the room.

For example, if the outside temperature is very hot, but the humidity level is also high, the fuzzy logic controller may adjust the temperature to a slightly lower level than if the humidity were lower. Additionally, if the desired temperature is set to 72°F, the controller may adjust the temperature up or down slightly depending on whether the room is occupied, and how many people are in the room. In this scenario, fuzzy logic is used to analyze the different factors and adjust the temperature setting accordingly, creating a more comfortable environment for the occupants of the room

2 Assignment

Construct a fuzzy controller that uses multiple fuzzy variables (outside temperature, room humidity, room occupancy, desired temperature), as well as, the crisp temperature difference between desired and measured to control the temperature of a room. Use the following model:



where the **Process** is defined by, $y(k) = d_1 y(k-1) + n_1 u(k-1)$, for $d_1 = 1.58, n_1 = 0.08$,
and the **Sensor** is defined by, $y_m(k) = \frac{d_0}{n_1} y(k-1)$, for $d_0 = 0.65$.

3 Operation and Output

Design the script to accept variable inputs of i) outside temperature (0 - 100 F) ii) room humidity (0 - 100%) iii) room occupancy(empty to fully occupied) and iv) desired temperature (60-72 F) in the shell. Display to the screen the fuzzy membership of each input and the corresponding effort into the system.

The output should be a table, such that each row is a sample with four displayed columns: sample k, desired temp, actual temp, control effort $u(k)$.

Where the k samples only taken every 30.

The script should stop running once the desired temperature has reached steady state for 2 minutes . . . the control effort should likewise be at zero.

4 Grading

Based on i) pylint ii) fuzzification process iii) fuzzy rule operations iv) defuzzification v) performance, and vi) readability and code logic.