CAP4001 : CAPSTONE

A NOVEL APPROACH USING FUZZY LOGIC TO DETECT TRAFFIC CONTROL SYSTEMS

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LET'S TALK ABOUT

- ✓ **Recap**

- ✓ **Fuzzy Logic Control**

- ✓ **Fuzzification Process**

- ✓ **Defuzzification Process**

- ✓ **Timeline**

RECAP

- One of the alternative and potential solutions to traffic congestion can be -

  Fuzzy Logic based Traffic Lights Control System

- A method of reasoning that resembles human reasoning.

- The approach of fuzzy logic imitates the way decision making in humans that involves all intermediate possibilities between digital values YES and NO.

WORKING OF FUZZY LOGIC CONTROL
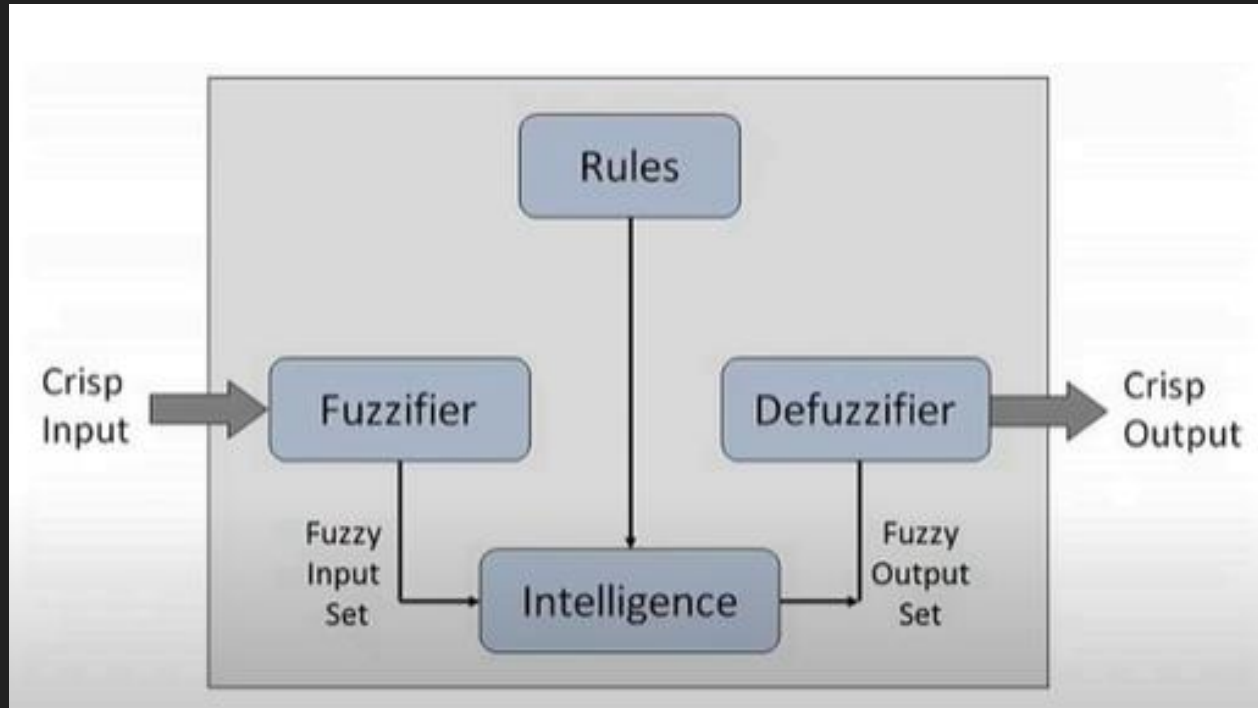
HOW FUZZY LOGIC WORKS FOR TRAFFIC LIGHTS?
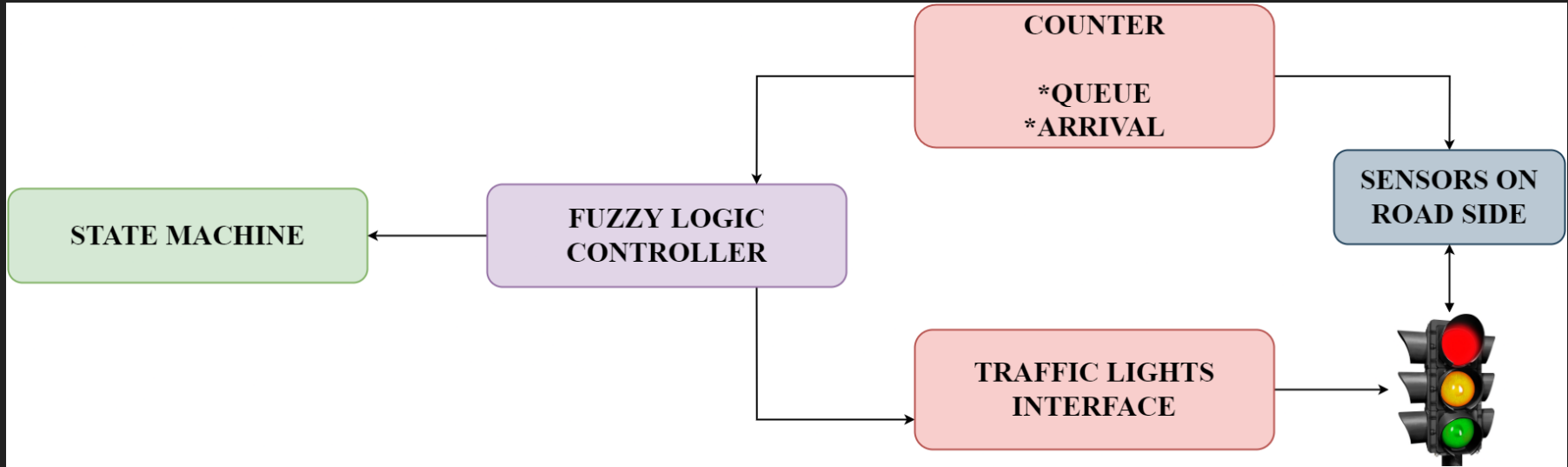
FUZZY RULES

Rule 1:   If Arrival is few then Extension is zero.

Rule 2:   If Arrival is small AND Queue is (few OR small) then Extension is short.

Rule 3:   If Arrival is small AND Queue is (medium OR many) then Extension is zero.

Rule 4:   If Arrival is medium AND Queue is (few OR small) then Extension is medium.

Rule 5:   If Arrival is medium AND Queue is (medium OR many) then Extension is short.

Rule 6:   If Arrival is many AND Queue is few then Extension is long.

Rule 7:   If Arrival is many AND Queue is (small OR medium) then Extension is medium.

Rule 8:   If Arrival is few AND Queue is many then Extension is short.
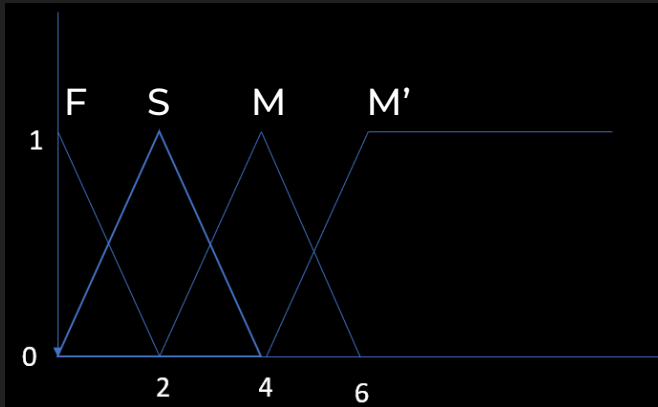
INTELLIGENCE

Input Variables

1. Arrival   --------→   { Few , Small , Medium , Many }

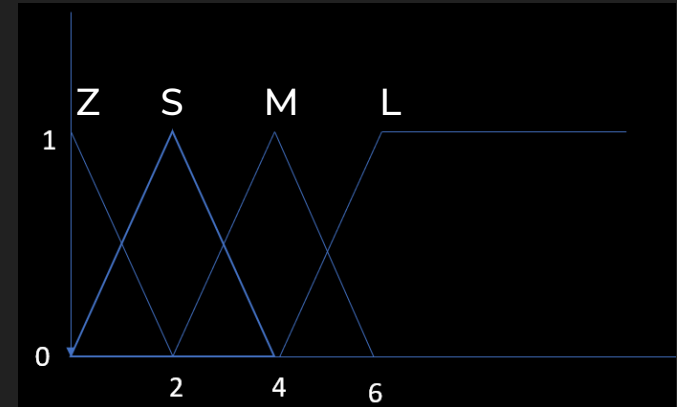2. Queue ---------→   { Zero , Short ,Medium , Long }

For both Vertical and Horizontal Lanes

Membership functions

Input Fuzzy Variable-1 (**Arrival**)

Input Fuzzy Variable-2 (**Queue**)

DEFUZZIFICATION PROCESS

- This method returns a precise value depending on the fuzzy set's center of gravity. The overall area of the membership function distribution used to describe the combined control action is divided into several sub-areas (such as triangle, trapezoidal etc.).

- Area and center of gravity, or centroid, of each sub regions are calculated. Then the sum of all these sub-areas is used to determine the defuzzified value for a discrete fuzzy set

```
import skfuzzy as fuzz

return fuzz.defuzz(self.x_extension, aggregated, 'centroid')
```

PROJECT PROGRESS

NAME OF THE TASK	PROGRESS						
Working on Project Backend and parallel testing of the same							
Install necessary dependencies and Python requirements - Numpy, scikit_fuzzy, Scipy libraries, etc.				✓			
Study of some research papers and look up Fuzzy Logic documentation and make references			✓				
Work on Frontend design according to the Idea proposed using Pygame	✓						
TIMELINE	Oct 3rd week	Oct 4th week	Nov 1st week	Nov 2nd week	Nov 3rd week	Nov 4th week	Dec 1st week