INT

Machine Learning

LOVELY
PROFESSIONAL
UNIVERSITY

Section : KM107

Name: Bishnu prasad nayak
Roll no : A15
Regis no :11803586

Name :Abhishek Jaiswal
Rollno : B54
Regis no : 11811221

Fuzzy logic

Fuzzy logic is an approach to computing based on "degrees of truth" rather than the usual "true or false" (1 or 0) Boolean logic on which the modern computer is based.

Fuzzy logic seems closer to the way our brains work. We aggregate data and form a number of partial truths which we aggregate further into higher truths which in turn, when certain thresholds are exceeded, cause certain further results such as motor reaction. A similar kind of process is used in neural networks, expert systems and other artificial intelligence applications. Fuzzy logic is essential to the development of human-like capabilities for AI, sometimes referred to as artificial general intelligence: the representation of generalized human cognitive abilities in software so that, faced with an unfamiliar task, the AI system could find a solution.

ARCHITECTURE

Its Architecture contains four parts:

- RULE BASE: It contains the set of rules and the IF-THEN conditions provided by the experts to govern the decision-making system, on the basis of linguistic information. Recent developments in fuzzy theory offer several effective methods for the design and tuning of fuzzy controllers. Most of these developments reduce the number of fuzzy rules.
- FUZZIFICATION: It is used to convert inputs i.e., crisp numbers into fuzzy sets. Crisp inputs are basically the exact inputs measured by sensors and passed into the control system for processing, such as temperature, pressure, rpm’s, etc.
- INFERENCE ENGINE: It determines the matching degree of the current fuzzy input with respect to each rule and decides which rules are to be fired according to the input field. Next, the fired rules are combined to form the control actions.

- DEFUZZIFICATION: It is used to convert the fuzzy sets obtained by inference engines into a crisp value. There are several defuzzification methods available and the best suited one is used with a specific expert system to reduce the error.

Advantages of Fuzzy Logic System

- This system can work with any type of inputs whether it is imprecise, distorted or noisy input information.
- The construction of Fuzzy Logic Systems is easy and understandable.
- Fuzzy logic comes with mathematical concepts of set theory and the reasoning of that is quite simple.
- It provides a very efficient solution to complex problems in all fields of life as it resembles human reasoning and decision making.
- The algorithms can be described with little data, so little memory is required.

Disadvantages of Fuzzy Logic Systems

- Many researchers proposed different ways to solve a given problem through fuzzy logic which led to ambiguity. There is no systematic approach to solve a given problem through fuzzy logic.
- Proof of its characteristics is difficult or impossible in most cases because every time we do not get mathematical description of our approach.
- As fuzzy logic works on precise as well as imprecise data so most of the time accuracy is compromised.

Application

- It is used in the aerospace field for altitude control of spacecraft and satellite.
- It has used in the automotive system for speed control, **Traffic control.**
- It is used for decision making support systems and personal evaluation in the large company business.
- It has application in chemical industry for controlling the pH, drying, chemical distillation process.
- Fuzzy logic is used in Natural language processing and various intensive applications in Artificial Intelligence.
- Fuzzy logic is extensively used in modern control systems such as expert systems.
- Fuzzy Logic is used with Neural Networks as it mimics how a person would make decisions, only much faster. It is done by Aggregation of data and changing into more meaningful data by forming partial truths as Fuzzy sets.

About Intelligent traffic control system using fuzzy logic :

We have completed project, Intelligent traffic control system using fuzzy logic and we have applied some rules at which program gives appropriate traffic percentage with graphs

Rules are:

```
Rule1=ctrl.Rule(carsWaiting['Very low']|carsIncoming['Very low'],Traffic['Very low'])
Rule2=ctrl.Rule(carsWaiting['Very low']|carsIncoming['low'],Traffic['low'])
Rule3=ctrl.Rule(carsWaiting['Very low']|carsIncoming['medium'],Traffic['medium'])
Rule4=ctrl.Rule(carsWaiting['Very low']|carsIncoming['high'],Traffic['medium'])
Rule5=ctrl.Rule(carsWaiting['Very low']|carsIncoming['Very high'],Traffic['Very high'])


Rule6=ctrl.Rule(carsWaiting['low']|carsIncoming['Very low'],Traffic['Very low'])
Rule7=ctrl.Rule(carsWaiting['low']|carsIncoming['low'],Traffic['low'])
Rule8=ctrl.Rule(carsWaiting['low']|carsIncoming['medium'],Traffic['medium'])
Rule9=ctrl.Rule(carsWaiting['low']|carsIncoming['high'],Traffic['medium'])
Rule10=ctrl.Rule(carsWaiting['low']|carsIncoming['Very high'],Traffic['Very high'])

Rule11=ctrl.Rule(carsWaiting['medium']|carsIncoming['Very low'],Traffic['low'])
Rule12=ctrl.Rule(carsWaiting['medium']|carsIncoming['low'],Traffic['low'])
Rule13=ctrl.Rule(carsWaiting['medium']|carsIncoming['medium'],Traffic['high'])
Rule14=ctrl.Rule(carsWaiting['medium']|carsIncoming['high'],Traffic['high'])
Rule15=ctrl.Rule(carsWaiting['medium']|carsIncoming['Very high'],Traffic['Very high'])

Rule16=ctrl.Rule(carsWaiting['high']|carsIncoming['Very low'],Traffic['low'])
Rule17=ctrl.Rule(carsWaiting['high']|carsIncoming['low'],Traffic['low'])
Rule18=ctrl.Rule(carsWaiting['high']|carsIncoming['medium'],Traffic['high'])
Rule19=ctrl.Rule(carsWaiting['high']|carsIncoming['high'],Traffic['high'])
Rule20=ctrl.Rule(carsWaiting['high']|carsIncoming['Very high'],Traffic['Very high'])
```

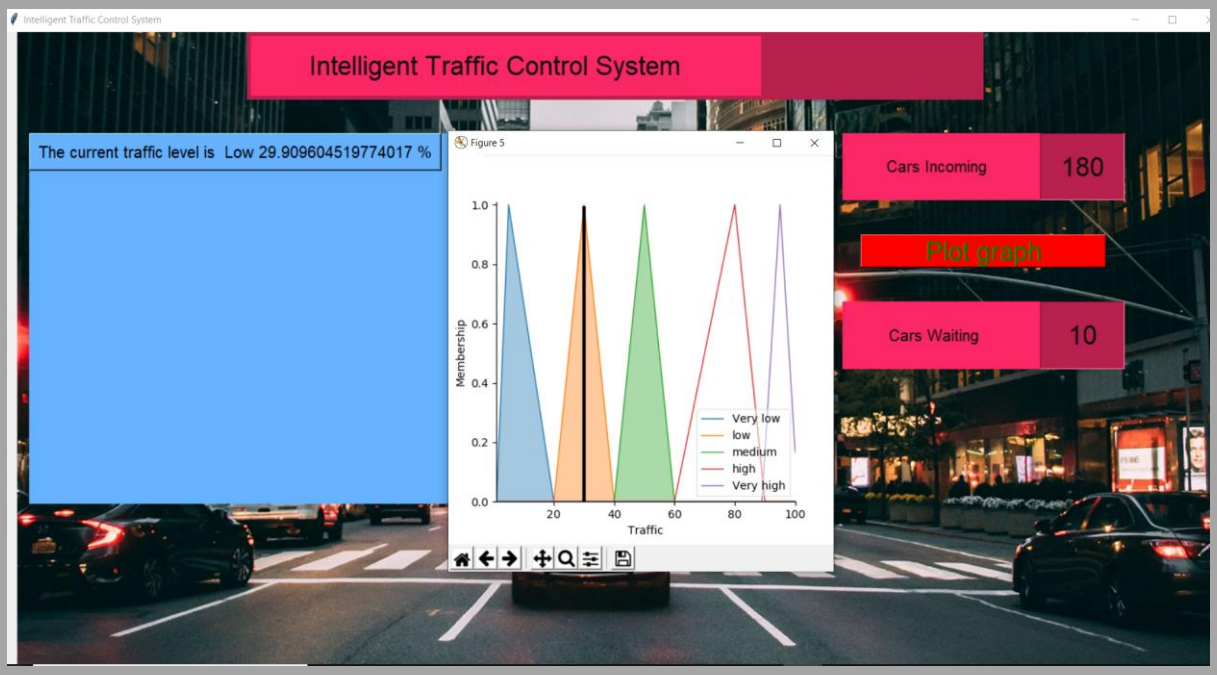
Rule21=ctrl.Rule(carsWaiting['Very high']|carsIncoming['Very low'],Traffic['medium'])

Rule22=ctrl.Rule(carsWaiting['Very high']|carsIncoming['low'],Traffic['medium'])

Rule23=ctrl.Rule(carsWaiting['Very high']|carsIncoming['medium'],Traffic['high'])

Rule24=ctrl.Rule(carsWaiting['Very high']|carsIncoming['high'],Traffic['Very high'])

Rule25=ctrl.Rule(carsWaiting['Very high']|carsIncoming['Very high'],Traffic['Very high'])



At every input, (after giving inputs click on plot graph button) program gives you the appropriate graph and percentage.