Fuzzy Logic Inference Engine in Expert System

S.Mohan[1], R.Suganya[2]
[1]*Asst Professor in Computer Science and Engineering, V.S.B.College of Engineering Technical Campus, Kinathukadavu- Coimbatore-642109*
[2]*Asst Professor in Department of Mathametics, V.S.B.College of Engineering Technical Campus, Kinathukadavu-Coimbatore-642109, Tamil Nadu. India*

***Abstract*—In this paper we will discuss about fuzzy logic inference engine in expert system. The expert system means ,which one is familiar or expert that in valued to the knowledge-based decision . it is also human mimic of the activities . what inferences engine? This in valued to the fuzzy logic crisp set of the theoretical. Which applies in practical . that is inference engine. The crisp set is either 0 or 1-true/false exact. But in fuzzy logic means in between 0 or 1.that fuzzy logic set is the inference. Which is also used in the inference engine(IF-THEN) rule based. Finally applies to the knowledge-based rules (fact)selected by the crisp set .in inference engine in between degree of members .this is not hot and cold . that is crisp set .this is in between degree of hot or degree of cold. Very high- medium –low. This type then expertise person – or expert to the knowledge can give the input information . which get the output via through the inference engine. Because inference engine is the BRAIN of the expert system.**

***Index Terms*—Fuzzy, De fuzzy, inference**

I. INTRODUCTION

The fuzzy logic inference system (FIS)act as a BRAIN with in the expert system. The traditional system that needs exact value making it ideal for decision making in complex, uncertain environment by converting fuzzy input (via fuzzification, inference rule application and defuzzification)stored the expert knowledge on IF-THEN rules looking fuzzy input and fuzzy output.

Interpret the fuzzy input against the rule ,determining the degree to which each rules applies and aggregated the fuzzy output,convert the combine fuzzy output back in the single ,clear ,crisps numerical value for practical action.

Capturing subjective knowledge, the traditional system struggle with make decision based on the degree of truth rather than strict true/false for diagnosis or control. Applies the rules defined by the expert to simulate their decision-making process.

Fuzzy inference system provides the reasoning mechanism for an expert system to understand the ac an imprecise, real-world information much like a human expert.

II. EXPERT SYSTEM

An expert system is an artificial intelligence computer program that mimics the human expert decision making in a specific, complex field by using stored knowledge (fact and rules) to solve the problem, provide by the advice and explain it reasoning, find the area like, medical diagnosis or financial planning. the key component includes

Knowledge based (fact/rules)
Inference engine (Reasoning)
User inter face (helping non-expert access specialized knowledge)
Human expt provided the domain specific fact and IF_THEN rules
(IF patient has fever AND cough THEN consider flu)
This information stored in the database, the inference engine uses the rule to process used quiries and data appling logic to react conclusion allow the user (non-exoert) to input problem and receive the solution.momocking hman reasoning through the method like.

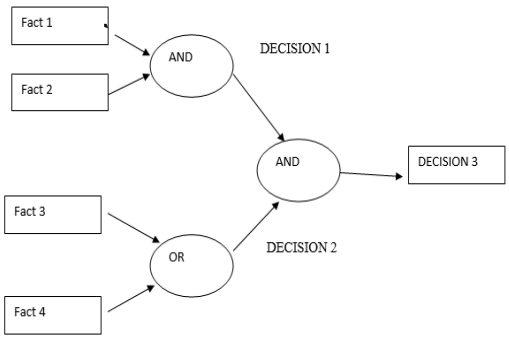
Forward chaining (data collexction)
Backward chaininh (goal to fact)
To drive the solution ,diagnosis problem and provide the recomentation in specific domain acting as the system BRAIN.

III. FORWARD CHAINING (DATA DRIVEN)

Strat with the known fact and applies the rules step-by step to find the solution

Example

IF patient has fever (fact)AND cough (fact)THEN they might have FLU(conclusion).



IV. BACKWARD CHAINING (GOAL DRIVEN)

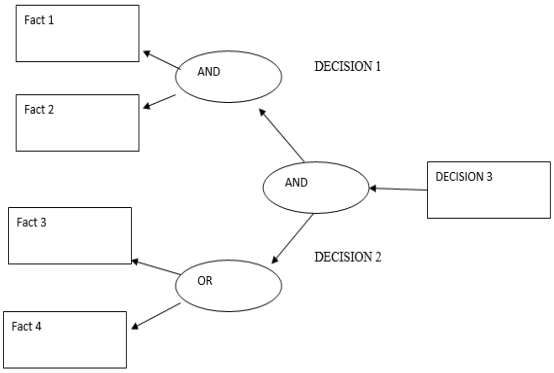
Dstrat with potential goal

Example:

“Does the patient have flu?” and work backward to find the supporting facts

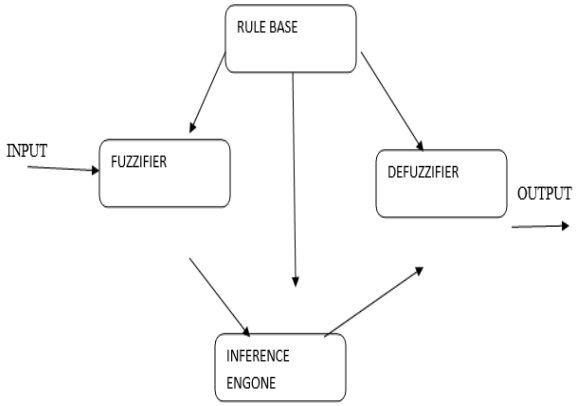
To prove flu ,the engine ask “ Does the patient have fever and cough?”

Ensure the uniform decision by Appling the same expert logic every time . the inference engine the active reasoning compute that the rule static knowledge in to dynamic intelligent decision,



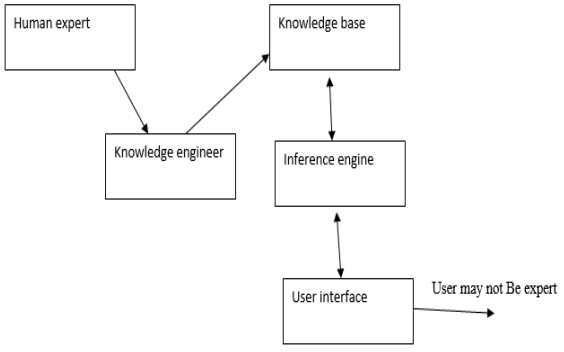
Fuzzy logic:

A fuzzy logic in expert system combines expert system rule with fuzzy logic to mimic human like reasoning handling impress or uncertain data (like hot or cold) instead of true and false making it great for complex decision making in the area like control system, finance health care where clear cut answer are not always possible .it works by fuzzy crisp input (temperature) in to fuzzy set, Appling fuzzy rules (IF temperature is warm AND rising THEN increase the fan speed). And then de fuzzification the result in to a clear action.



INFERENCE ENGINE:

An inference engine is BRAIN of an expert system using set of rules and fact from the knowledge base to reason draw conclusion and make decision or recommendation mimicking human expert thought by appling logical states given like forward or backward further data in to insights. if cycle through the matching rules to the data , selecting the best rule and executing them to generate the new knowledge , explain it is reasoning or solve the problem



CORE functions:

Simulate reasoning applies logic to data to mimic human expert thinking

GENERATE insight convert the raw data in to meaningful conclusion r recommendation,

PROVIDE the explanation can show the step-by-step reasoning behind its decision(explaination model)

V. CONCLUSION

In an expert system ,the fuzzy logic inference engine combines precise input with fuzzy (IF-THEN) rules from knowledge base using the fuzzy reasoning to calculate the potential rule strength. Aggregate output from the multiple rules into single fuzzy set and finally defuzzy this set into precise , actionable , conclusion or decision ,mimicking human-like reasoning for complex, uncertain problems

Fuzzification crisp (exact) input (sensor data are connected in to linguistic term(fuzzy ser) like low, medium, high , using membership function.

RULE EVALUATION:

Fuzzy reasoning the inference engine apply fuzzy logic operators (AND,OR) to the fuzzified input against the rule. IF the temperature is HIGH and humidity is low then the fan speed is fast,

RULE STRENGTH CALCULATION:

Each rules firing the strength (degree of truth) is determine by the how well the input match its rule condition .

Comparison /aggregation :

The conclusion is not a single true/false but agraded precise output based on the weighted condition of all application fuzzy rules allowing the expert system to provide the numerical recommendation or take action in uncertain scenario . it deel with vague or incomplete data effectively, the rule-based structure under the system logic understand.

The fuzzy logic means applies zero/one either true/ false in between theoretically but in inference engine means that is by the computer practically. the fuzzy logic in-between low, medium, high of the process, that processes are applied to the practically in the system . that is inference engine. in expert system,

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