Deakin University

SIG788- OnTrack Submission

Task 2-C

Submitted by

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[Attempt 1]
25/3/2023

Target Grade: Task 2 - C

Task Details –

1. What is the target domain and application?

2. You need to explain how the fuzzy logic can be fitted into the target application. You need to discuss the advantage of using fuzzy system in this domain/ application.

3. You need to provide the flow or pipeline of the system using fuzzy technology.

4. You need to provide the rules that can be extracted from the fuzzy system in the domain/ Application.

Solution

1. **What is the target domain and application?**

Target Domain used for Fuzzy Logic is Ecommerce.
Application used for Fuzzy Logic is Hotel Booking Ratings.

2. **You need to explain how the fuzzy logic can be fitted into the target application. You need to discuss the advantage of using fuzzy system in this domain/ application.**

Target Application used for Fuzzy Logic is Hotel Ratings under E-commerce domain.
Here, for preparing Fuzzy Logic considered Agoda Booking site as example. Once the destination and dates of travels are provided the site provides us a list of hotels based on customer ratings. The customer ratings are scaled on 0 to 10 based on certain criteria.

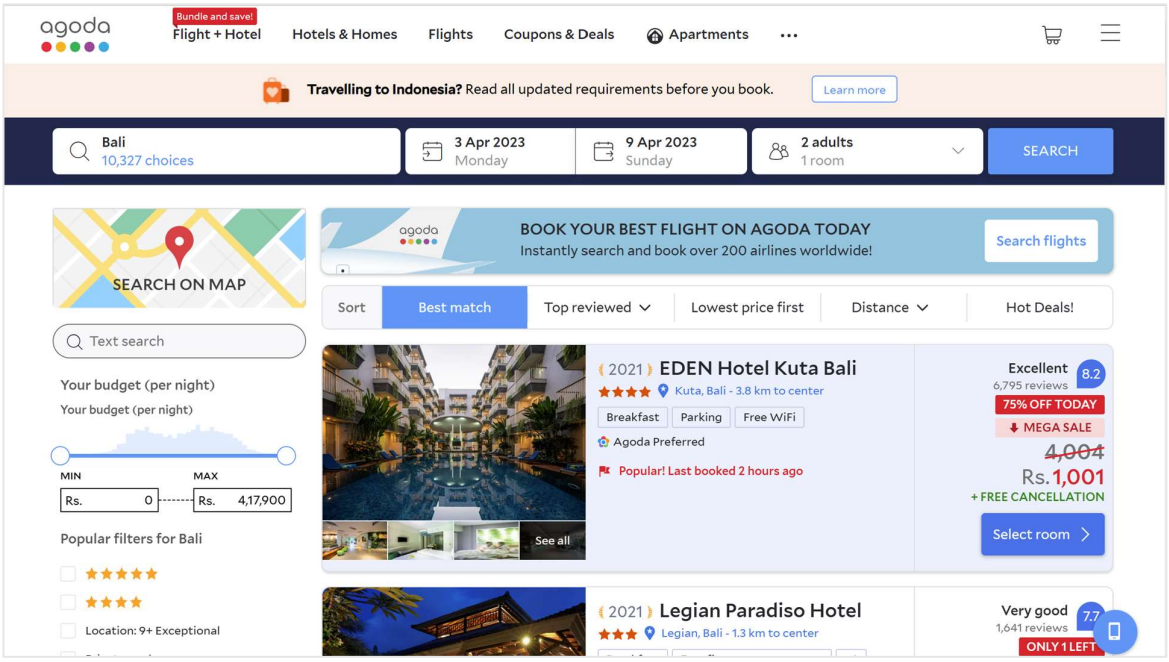


Fig 1 Agoda Webpage-Courtesy

In website, we get different ratings as “Excellent”, “Very Good”, “Good” and “Poor”. “Poor” category rooms will not be highlighted in the sites. The evaluation of ratings is based on the below categories:

- Cleanliness
- Facilities
- Location
- Room comfort and quality
- Service
- Value for money

Based on the mentioned categories the ratings of the hotels are processed under 10-point scale.

Fig 2 Rating Attributes (Agoda Website)

Each hotels ratings are merged from different booking sites like Booking.Com, Agoda Review and Other reviews. Based on mentioned criteria and ratings tourist prefers to book the hotels.

Reference: (Anon., 2023)

Advantages of Using Fuzzy Logic in Hotel Booking:

- The proposed fuzzy logic system can evaluate the efficiency of hotels.
- Fuzzy Logic system is useful for dealing with psychological reasoning and decision making of booking.
- The process involves in ambiguity, accuracy, exactness, uncertainty or sources of impression that are non-statistical.
- By applying fuzzy logic, we can quantify the contribution of a set of information to various parameters in terms of fuzzy membership.

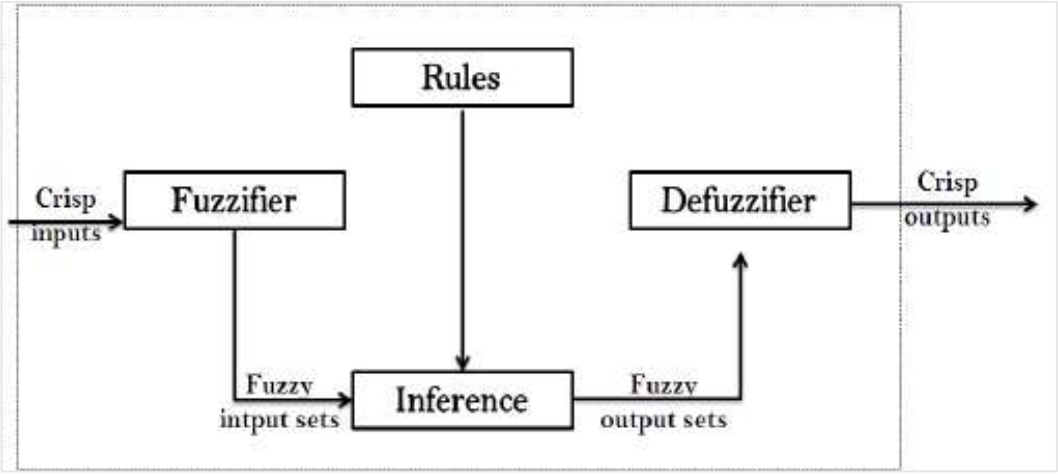


Fig 3: Fuzzy Logic Architecture

Reference : (Anon., 2023)

3. **You need to provide the flow or pipeline of the system using fuzzy technology.**

Let's picturise the Fuzzy logic data with 5 level fuzzy logic system. The website filters the ratings for hotels by comparing the various inputs.

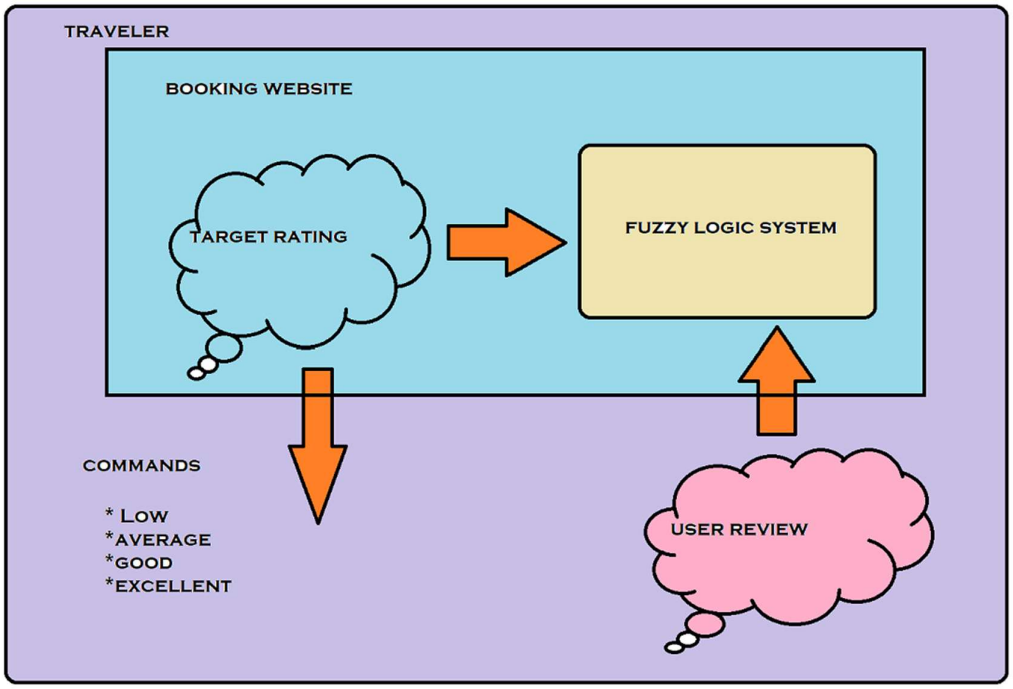


Fig 4 Fuzzy Logic System

Algorithm

- Define linguistic Variables and terms (start)
- Construct membership functions for them. (start)
- Construct knowledge base of rules (start)
- Convert crisp data into fuzzy data sets using membership functions. (fuzzification)
- Evaluate rules in the rule base. (Inference Engine)
- Combine results from each rule. (Inference Engine)
- Convert output data into non-fuzzy values. (defuzzification)

Development

Step 1: Defining the linguistic variables and terms

Linguistic variables are input and output variables in the form of simple words or sentences. For rating, excellent, good, average and low are considered as linguistic variables.

Rating (r) = {low, average, good, very good, excellent}

Step 2: Construct Membership Function

The membership of the variables is as given below:

1) Service

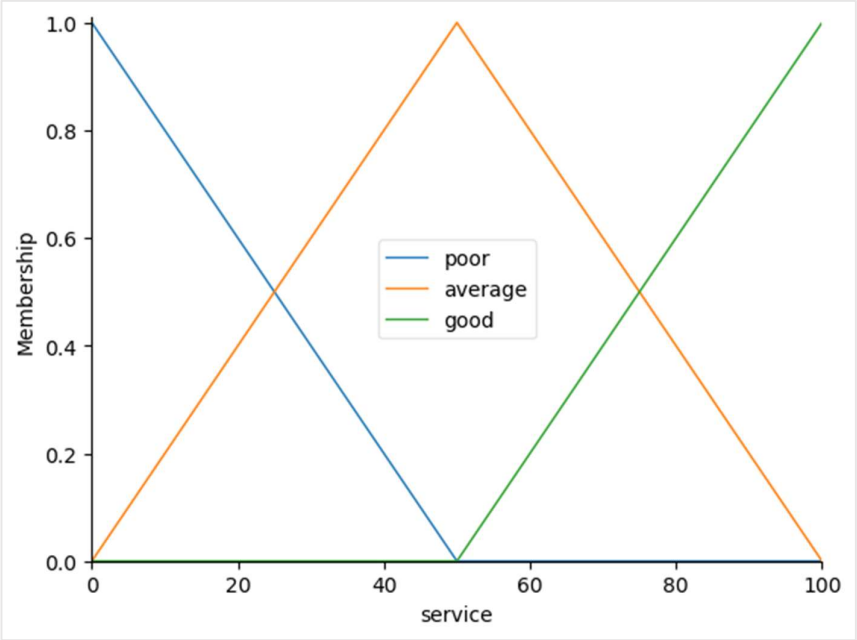


Fig 5 Membership of Service

2) Cleanliness

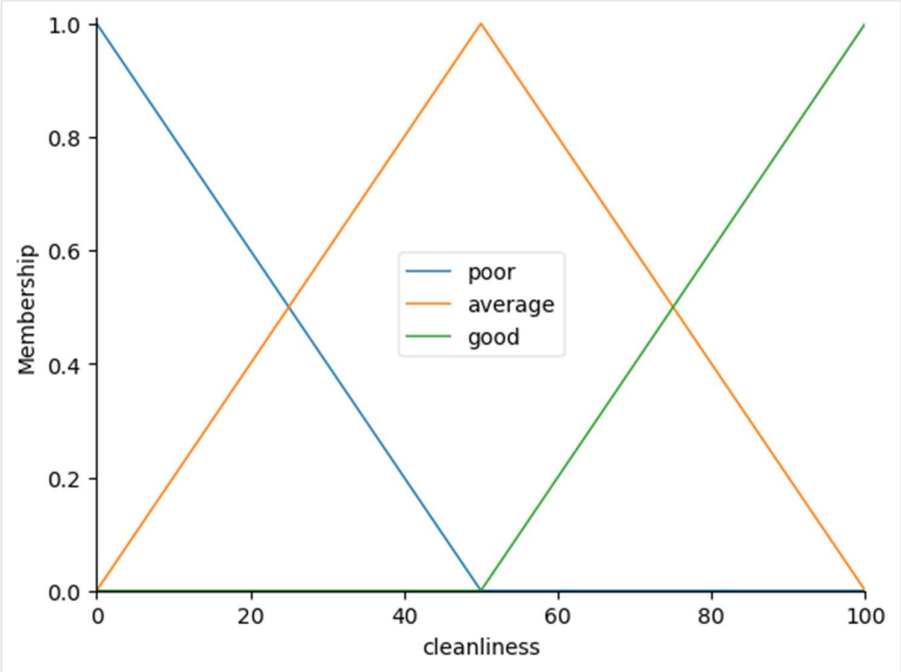


Fig 6 Membership of Cleanliness

3) Facilities

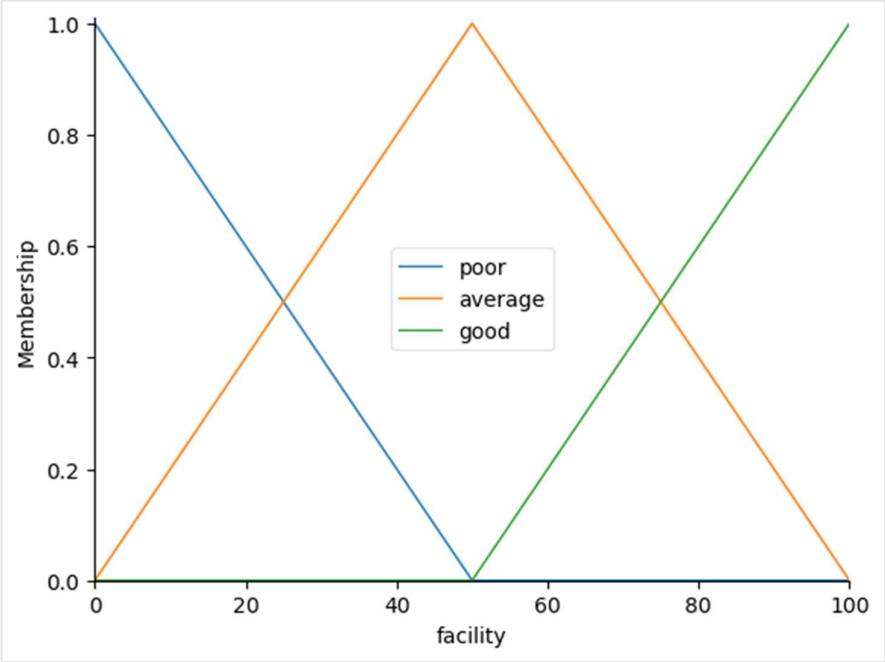


Fig 7 Membership of Facilities

4) Location

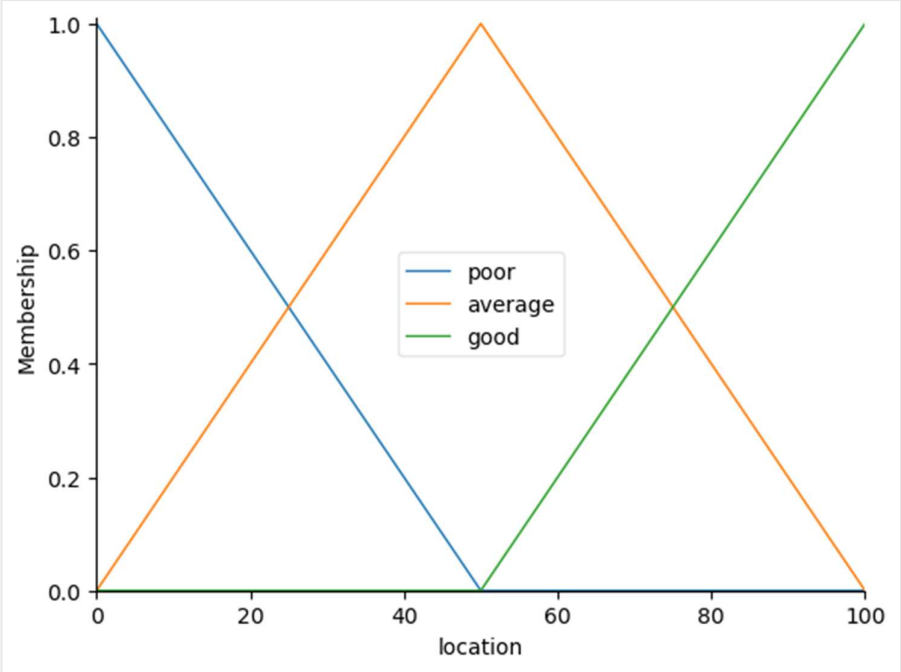


Fig 8 Membership of Location

5) Value for Money

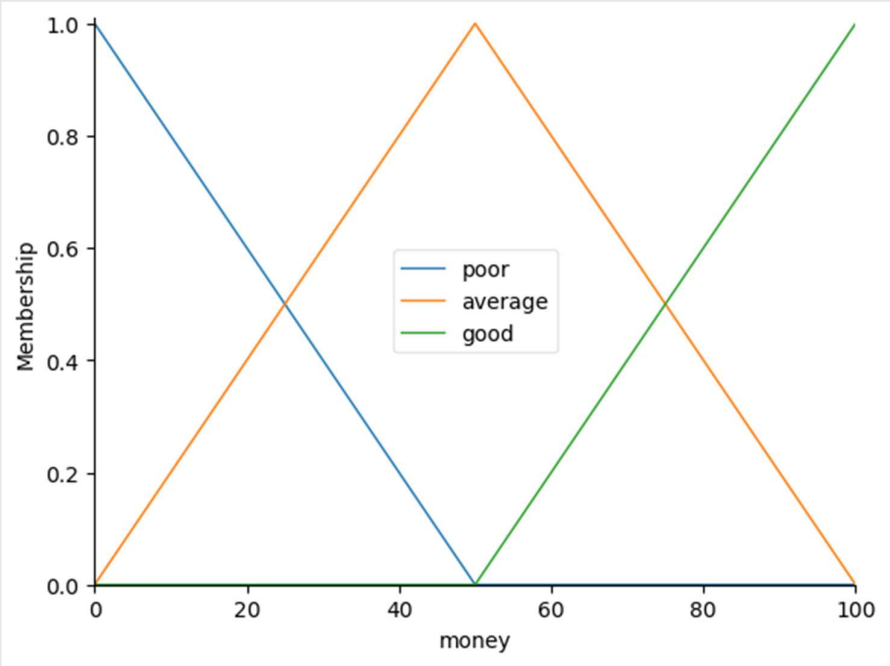


Fig 9 Membership of Value for Money

Step 3: Construct Knowledge base rule:

Creating a matrix based on the crisp input parameters.

Rule	Crisp Input					Target
	Service	Cleanliness	Facilities	Location	Money	Rating
1	Poor	Poor	Poor	Poor	Poor	Low
2	Average	Poor	Poor	Poor	Poor	Low
3	Average	Average	Poor	Poor	Poor	Low
4	Average	Average	Average	Poor	Poor	Average
5	Average	Average	Average	Average	Poor	Average
6	Average	Average	Average	Average	Average	Good
7	Good	Poor	Poor	Poor	Poor	Low
8	Good	Good	Poor	Poor	Poor	Average
9	Good	Good	Good	Poor	Poor	Good
10	Good	Good	Good	Good	Poor	Very Good
11	Good	Good	Good	Good	Good	Excellent
12	Poor	Average	Poor	Poor	Poor	Low
13	Poor	Average	Average	Poor	Poor	Low
14	Poor	Average	Average	Average	Poor	Average
15	Poor	Average	Average	Average	Average	Good
16	Poor	Poor	Average	Poor	Poor	Low
17	Poor	Poor	Average	Average	Poor	Low

18	Poor	Poor	Average	Average	Average	Average
19	Good	Poor	Average	Average	Average	Average
20	Good	Good	Average	Average	Good	Good
21	Good	Good	Average	Good	Good	Very Good

Create Rule based on IF – THEN -ELSE Structure

Sr.No.	IF					THEN
	Service	Cleanliness	Facilities	Location	Money	Ratings
1	Poor	Poor	Poor	Poor	Poor	Low
4	Average	Average	Average	Poor	Poor	Average
6	Average	Average	Average	Average	Average	Good
10	Good	Good	Good	Good	Poor	Very Good
11	Good	Good	Good	Good	Good	Excellent
20	Good	Good	Average	Average	Good	Good
21	Good	Good	Average	Good	Good	Very Good
13	Poor	Average	Average	Poor	Poor	Low

Step 4: Obtain Fuzzy Value

Fuzzy set operations perform evaluation of rules. The operations used for OR and AND are Max and Min respectively. Combine all results of evaluation to form a final result. This result is a fuzzy value.

Step 5: Perform defuzzification

Defuzzification is then performed according to membership function for output variable.

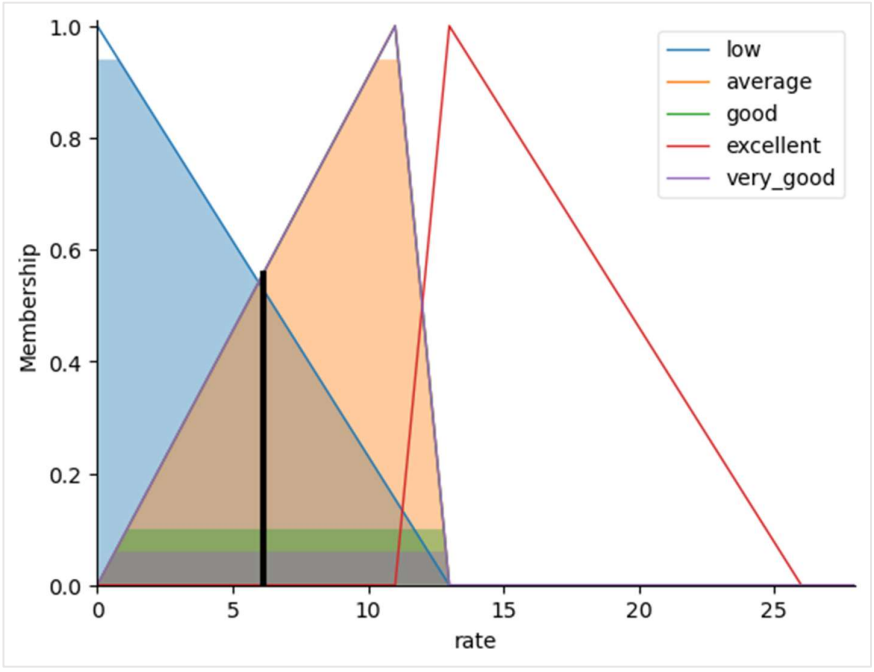
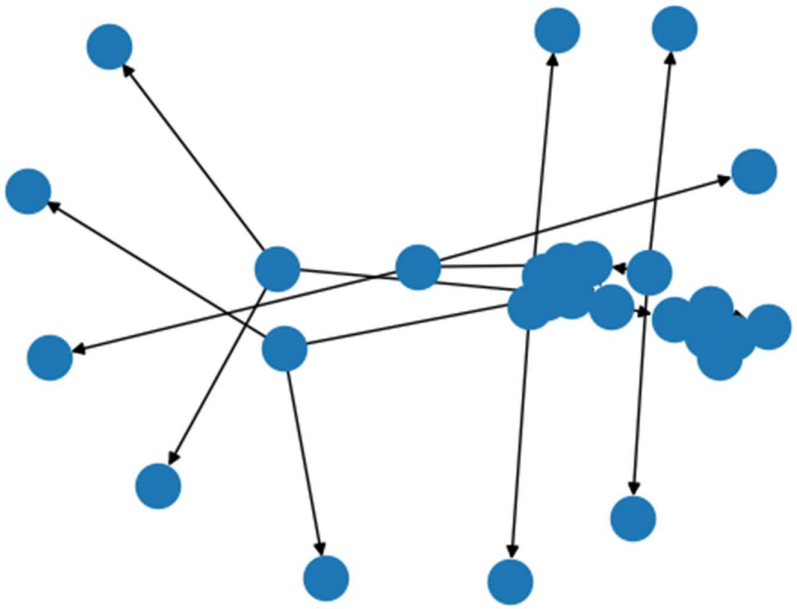


Fig 10 Defuzzification

4. **You need to provide the rules that can be extracted from the fuzzy system in the domain/ Application.**

Fuzzy rules Now, to make these triangles useful, we define the fuzzy relationship between input and output variables. For the purposes of our example, consider three simple rules.



The below rules are extracted from the fuzzy system in hotel ratings when traveller rates on each hotel according to the stay.

- If Service is poor or Cleanliness is poor or Location is poor, then the rating would be low.
- If Service is average or Cleanliness is average or value for money is average or facility is poor or location is poor then the rating would be average.
- If service is good or cleanliness is good or value for money is average then rating will be good
- If service is good or cleanliness is good or value for money is good or cleanliness is good or location is average then rating will be very good.
- If service is good or location is good or value for money is good or facility is good or cleanliness is good then rating is excellent.

References

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