

FUZZY LOGIC CONTROL ON WASH MACHINE

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Abstract - Fuzzy logic system and fuzzy logic controller provides innovative way to solve real world problem. Fuzzy controller discuss basically about fuzzy reasoning which is applied to solve specific problem. Fuzzy controller is used in Artificial Intelligence, Machine learning, and in various other advance technologies. Report holds some fundamental rules of mathematics based on fuzzy system much relevant for fuzzy control. Fuzzy reasoning rules are described using an example Washing machine. This paper provides basic and advance knowledge of fuzzy logic, fuzzy set, and fuzzy controller.

Summary: Paper discuss how's fuzzy controller is implemented to the modern devices like washing machine to calculate wash time according to the given dirt and grease percentage

Key Words: FUZZY CONTROLLER, KNOWLEDGE BASE, LIGUISTIC, FUZZY SET, INFERENCE MODULE

1. INTRODUCTION

L.A. Zadeh introduced Phenomena of fuzzy logic. There is a conventional method of the representation of the data that is Boolean logic which represents discrete value, where fuzzy logic is a superset of Boolean that's represents continuous value. It represents uncertainty, degree and belongingness. This paper discusses about the aptness of fuzzy controller, since fuzzy theory used in various applications as in fuzzy reasoning, fuzzy clustering and fuzzy programming. Sometimes we have to apply some reasoning in any specific device where applying artificial intelligence, Machine learning etc. on the device that's fuzzy reasoning is fuzzy controller. It utilized arrangement of IF Then rules, at that point rules and arrangement is then applied to the particular work. There is scarcely any circumstance where definite scientific detailing of the issue isn't accessible or it is troublesome. Along these lines, the worth is extremely unusual at once. In this circumstance we ought to follow the fuzzy framework to create and tackle these kind of issues.

Summary: -Paper defines application of fuzzy logic controller on a specific device.

1.1 Fuzzy Logic: Fuzzy Logic is a type of information portrayal appropriate for thought that can't be characterized absolutely yet which relies on the unique situation. Fuzzy logic is the huge underline inexact rather precise method of reasoning. It is an expansion of multivalued logic everything including truth involves degree. It contains explicit cases not just traditional to esteem logic and multivalued logic framework yet in addition probabilistic.

1.2 Fuzzy Set: In fuzzy set member and degree of membership is defined as a collection of ordered pair.

Fuzzy set is exemplified as:-

If X is a universal set x is a particular element of then fuzzy Set A

$$A = \{(x, \mu(x)), x \in X\}$$

Where:

x - Component has a place with set A

$\mu(x)$ -Is membership function (Which returns membership value)

Membership is just a value which tells you that you are a member of particular fuzzy set.

2. Fuzzy logic controller:

Where we have not any exact mathematical formulation of any given problem this specific logic is applied that's called fuzzy reasoning or fuzzy logic controller.

Working of fuzzy logic controller is following:

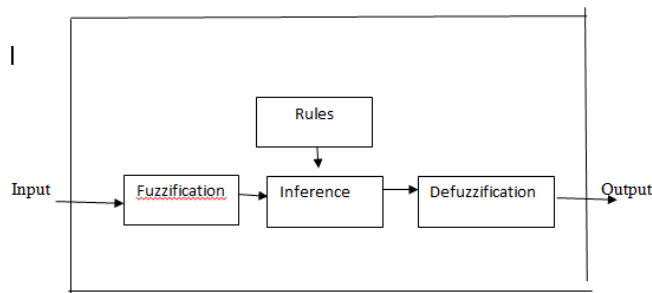


Figure 1:- This is working structure of fuzzy logic controller.

Input: Given to the fuzzy logic controller.

Fuzzification: Fuzzy module converts the crisp data into fuzzy data.

Inferences: Fuzzy data sent to the inference module controlled by rule base (knowledge base) which have if then rule, applied some logic on data and provides fuzzy output and output is sent to the defuzzification module.

Defuzzification: After applying some defuzzification rule fuzzy output is converted into crisp output.

Implementation of fuzzy controller: In this section we will discuss about the implementation of fuzzy logic controller on Washing Machine using Mamdani approach.

According to the condition, if Dirt and Grease are on the clothes.

Since Mamdani approach follows linguistic fuzzy modeling with using following steps this approach can be applied to any inference system.

- ❖ Recognize Input and output yield, variable and choose descriptor (Linguistic variable for the equivalent).
- ❖ Characterize membership function for every I/O variable.
- ❖ Rule evaluation.
- ❖ Defuzzification.

Here,

A controller is designed to calculate wash time of a washing machine.

For a washing machine:

Input variable: Dirt and Grease

Descriptor:

Dirt: - high dirt, Medium dirt, Low dirt

Grease: - High grease, Medium grease, Low grease

Output variable: - Wash time

Descriptor:

Wash time: - Very short, Short, Medium short, High, Very high

For dirt:-

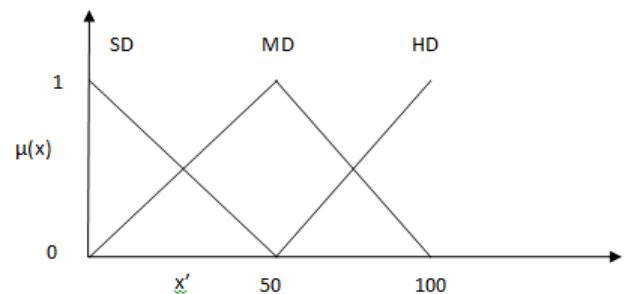


Figure 2:- Representation of linguistic values for Dirt on clothes.

For grease:-

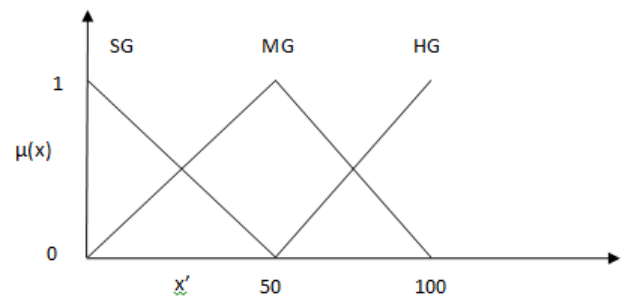


Figure 3:- Representation of linguistic value of grease on clothes.

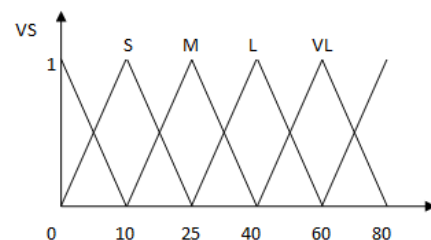


Figure 4:- Representation of linguistic output regarding wash time of machine.

On applying a specific reasoning (forward to backward subtraction) we find the membership function and range of linguistic variable for input and output. Then form a Rule base.

Table 1:- Representation of Knowledge Base

	Small grease	Medium grease	High grease
Small dirt	Very Short	Medium	Large
Medium dirt	Small	Medium	Large
High dirt	Medium	Large	Very Large

* One of the chance dirt and grease is small then wash time is very short.

* One of the chance dirt is moderate and grease is small for that wash time small.

For a given percentage of dirt and grease: After using reasoning / controller we find out fuzzy value and for defuzzification Min max method of defuzzification is applied to find out wash time of machine

3. CONCLUSION

This paper deals with applicational implementation of fuzzy logic controller /reasoning. It also deals with fuzzy logic, fuzzy set and mathematical rules of fuzzification and defuzzification. It defines how fuzzy reasoning is applied to the advance devices like Washing machine to calculate wash time according to the dirt and grease percentage on the clothes.

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