WASHING MACHINE AUTOMATION USING FUZZY LOGIC TECHNIQUE

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Abstract

The Fuzzy Logic Control technique can be a special type of control technique used in various fields of Industry. It may consider the possible number of Parameters as Input to Provide Specific Expected Output. Due this Process consideration they are mostly preferred by Automation Industry. In this paper we are considering the Five Input Parameters and an Output Parameter to Automate the Washing Machine. In the normal Automatic washing Machine we used to fix the time and it will operate till the fixed time by not considering the amount or type or Quantity of the Cloth. But in the proposed process the Fuzzy logic Technique is Implemented which will consider the Input parameters of Type of Cloth, Type of Dirt, Quantity of Cloth, Amount of Dirt in Cloth, Temperature and by considering these Input Parameters the Time for Wash, Water usage, Detergent usage, Heat of Water and Spin Time have been varied. Due to these process the amount of Time, Electricity and usage of Water have been reduced. The projected mechanism will provide the suitable washing time for the appropriate fabric. The results have been stimulated using the MATLAB software

Keywords: *Fuzzy Logic, Washing Machine, Automation, MATLAB.*

Introduction

In India Washing machine is most commonly used domestic appliances. The Washing Machine can be broadly classified into two types as Semi- Automatic and Fully Automatic Washing. In Semi-automatic washing machine two different tubes were present one is to wash the fabric and other is to rinse and dry the fabric with the help of manual Interruption. In Other side the Fully automated washing machine the entire process will be operated with less manual interruption when compared to Semi- Automatic washing machine. In the Fully Automatic Washing machine the manual intervention is needed only to switch on and off the machine and to put the fabric into the machine and to take the washed fabric from the machine to dry in between that the settings were made in the machine. The washing machine will take the necessary amount of water and detergent to rinse and wash the cloth on the basis time which is manually fixed [12]. Once the Automatic Washing Machine starts to wash it will take the constant amount of water to wash the fabric whatever the fabric may be the amount of water will not consider the dirt or the detergent. The Sensors are the major component used in the washing machine to sense the wash load, water level, fabric type, type of dirt and amount of dirt and the time to wash the cloths can be detected and provide necessary information to the washing machine to operate. The Reliable and Durable sensors are the main component which obtained success for the automatic washing machine [9]. At present most of the people can't able to decide the wash Period for the appropriate Fabric and it is more difficult one. In order to overcome these type of problems Fuzzy Logic Technique can be Introduced with Five Input

parameters and an Output parameter. The Proposed mechanism of Fuzzy Logic Controller operation uses the Fuzzy logic toolbox in MATLAB software. The obtained result shows the fuzzy logic toolbox for the proposed system are compared with the available fuzzy based washing machine [7].

Fuzzy Logic

The Types of operations are different in the Crisp logic sets which can able to check the obtained values are a part of function the if the part of functions can avail the values between 0 and 1. Thus the process of operation can be allowed to avail set of specific information's at the conditions when they are in need of certain process operations. From the figure 1 the crisp logic functions were described where the fuzzy logic functions have been shown in the figure 2. The figure 1 & 2 shows the age group of the certain peoples with their age groups were in the range of 0- 30 year people as first category, 30- 50 year people as second category and the people who were above 50 years as third category[8,11,14].

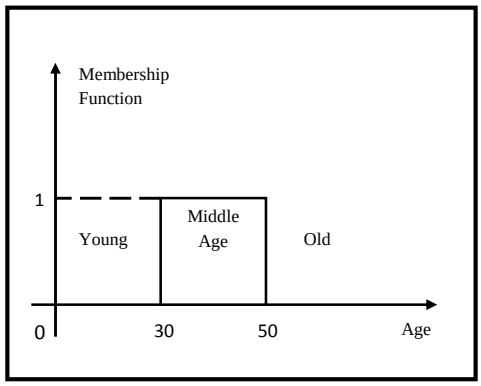

Figure 1 Crisp Logic

According to our classification the First category people belongs to Young age people and the Second Category people belongs to Middle age people and the third category people belongs to Old age. According to crisp set the people with 49 age is considered as middle age and people with 51 years are considered as old age people but there is no longer difference between the middle age and old age but as per the information was obtained by crisp set [2, 4, 15, 18, 19].

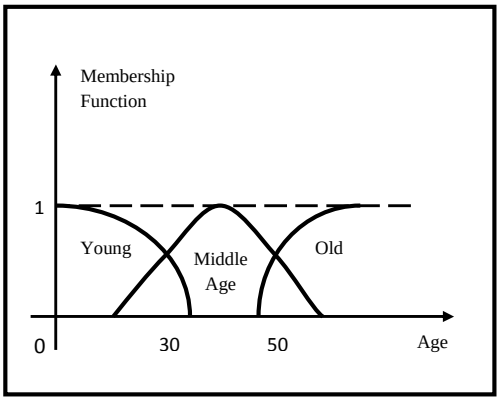

Figure 2 Fuzzy Logic

But the fuzzy logic will provide the information through the basic elements obtained in them as s hown in figure 3, they are Fuzzy I/O, Fuzzy set rules and the defuzzification block. It can able to obtain the fuzzy values as the membership functions called as the small, smaller, smallest and so on the fuzzy values will be obtained. The obtained values through the fuzzy values are been most wanted by the real time applications and the obtained outputs shows that they were all mostly needed by all [1,3,6, 13].

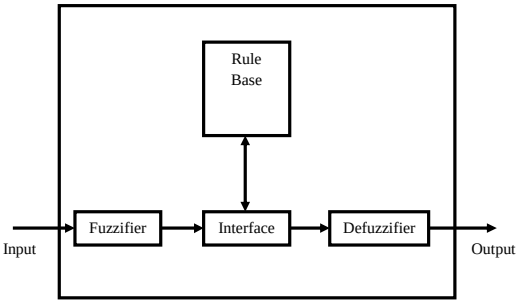

Figure 3. Fuzzy Logic structure

Proposed Fuzzy Logic Modeling

The Proposed fuzzy logic modeling system for washing machine involves several steps. The first step is to determine the various Input and Output parameters which have been taken into consideration. The main objective of the washing machine is to remove the dirt present in the fabric without causing any damage to them. So as per the first step the considered I/O parameters are shown in figure 4.

Based on the Proposed Input and Output consideration the fuzzy logic system can obtain certain modeling parameters and with the help of those obtained parameters as in Table I the system can frame certain rules as listed in the forthcoming table II

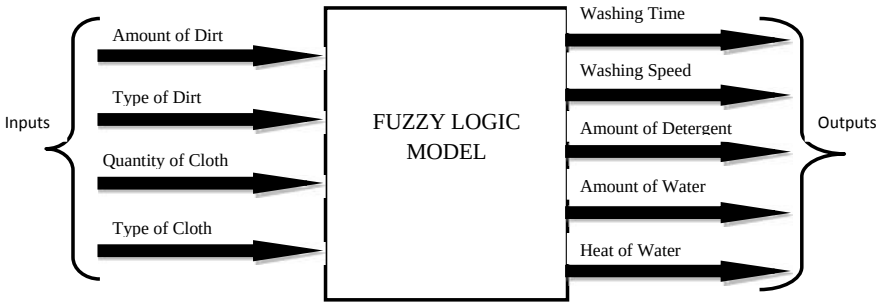

Figure 4 Inputs and Outputs of Proposed System

Table I Inputs and Outputs of Fuzzy Logic Control

Input Parameters	Output Parameters
Amount of Dirt Type of Dirt Quantity of Cloth Type of Cloth	Washing Time Washing Speed Amount of Detergent Amount of Water Heat of Water

Table II Rules of Fuzzy Logic Control

Rule No.	Input Parameters				Output Parameters				
	Type of Cloth	Type of Dirt	Quantity of Cloth	Amount of Dirt	Washing Time	Washing Speed	Amount of Detergent	Amount of Water	Heat of Water
1	Silk	Small	Small	Low	Low	Low	Low	Low	Cool
2	Silk	High	Small	High	High	Medium	Medium	Medium	Warm
3	Silk	High	Large	High	High	High	High	High	Hot
4	Silk	Very High	Large	High	Very High	Very High	Very High	Very High	Very Hot
5	Woolen	Small	Small	Low	High	Medium	Medium	Medium	Warm
6	Woolen	High	Small	High	High	High	High	High	Hot
7	Woolen	High	Large	High	Very High	Very High	Very High	Very High	Very Hot
8	Woolen	Very High	Very Large	Very High	Very High	Very High	Very High	Very High	Very Hot
9	Cotton	Small	Small	Low	Low	Low	Low	Low	Cool

10	Cotton	High	Small	High	High	Medium	Medium	Medium	Warm
11	Cotton	High	Large	High	High	High	High	High	Hot
12	Cotton	Very High	Large	High	Very High	Very High	Very High	Very High	Very Hot
13	Cotton	High	Large	High	Very High	Very High	Very High	Very High	Very Hot
14	Cotton	Very High	Very Large	Very High	Very High	Very High	Very High	Very High	Very Hot

Results

The Results obtained during the MAT Lab Software was obtained in order to provide some of specific rules. The Sensors were used at this process in order to sense the Input variables during the process of operation. The Process of operation involved in this technique is the If - then rules of the fuzzy logic process operation. They can also been allowed to obtain some of the specific function which has been allowed to check the obtained output from the process of operation.

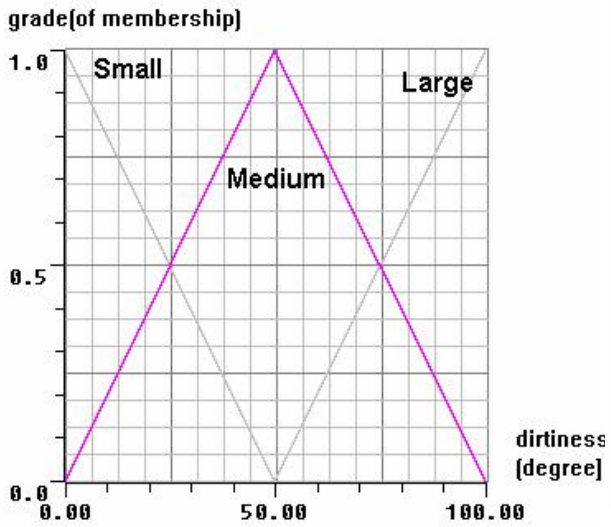

Figure 5. Membership function for Dirtness _ of _ clothes

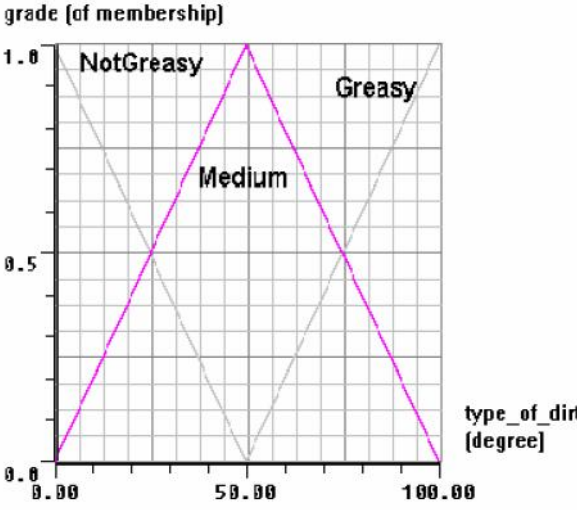

Figure 6. Membership Function of type _ of _ dirt

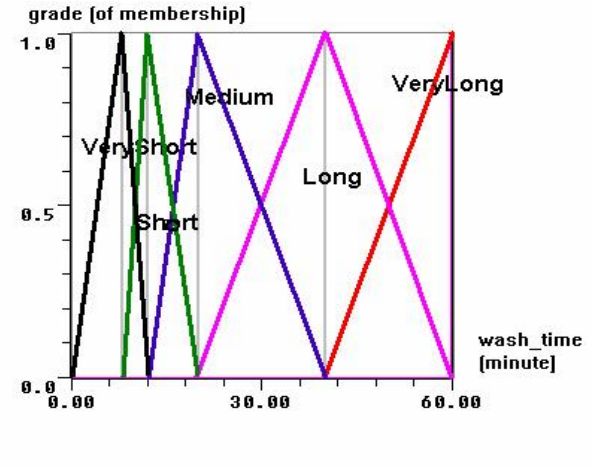

Figure 7. Labels and Membership Functions for Output Variable Wash _ Time

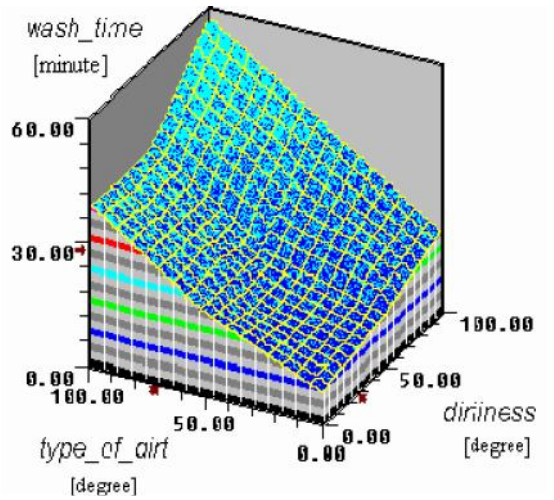

Figure 8. Input / Output Response Surfaces

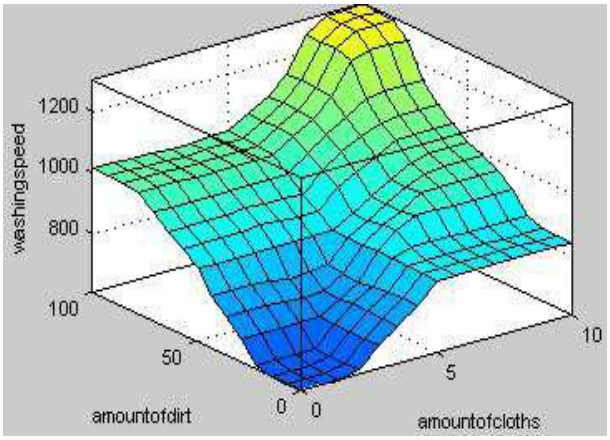

Figure 9. Amount of Cloths and Amount of Dirt Affects the Washing Speed

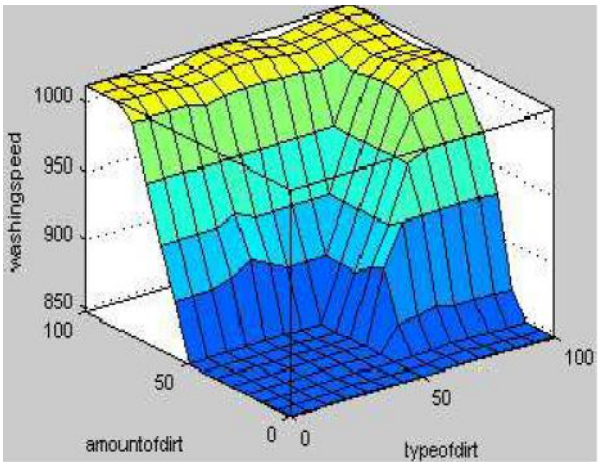

Figure 10. Type of Dirt and Amount of Dirt Affects the Washing Speed

Conclusion

The Proposed Fuzzy Logic System will provide the process regarding the various parameters such as the Type and Amount of Dirt, Type and Amount of Cloth were considered and provide the exact results and which have allowed to take its decision by their Own. When compared to the Existing method it will provide the Far better results and it can be a most considerable parameter which could be allowed to Obtained the execute the needed output. By this Proposed process the washing machine can able to provide the Clean cloth without any damage in it within a Short span of time Through the MATLAB software which could been able to provide the better results without any distortion and in real time application it is possible by Interfacing with suitable Mechanical and apt electrical components has been interfaced with them.

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