International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.03, February 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

A STUDY OF FLC IMPLEMENTATION ON RESIDENTIAL COOLER

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ABSTRACT

This Paper gives review of implementation of Fuzzy Logic Control (FLC) system on residential cooler system. Heating Ventilation and Air Conditioning (HVAC) is very important as energy consumption is concern. Effective utilization of Energy is essential in day to day life. This study will useful to improve the room cooling system using fuzzy logic. In this Matlab simulation is used to check the performance of System. The competency of Fuzzy Logic Control system in automation is much beneficial as compared to conventional PID Controller. Because Fuzzy logic control system has the ability to interact with nonlinearities. Here the proposed FLC model is developed using fuzzy logic tool box of MATLAB.

Key words: FLC, Fuzzification. Matlab, PID

I. INTRODUCTION

The development of control system needs the description of plants, machinery and more important processes of controlling. The key parts of control system are controller and plant. The performance of a control system depends on the interfacing of all the components. The fuzzy logic system is growing technology in the field of Computational Intelligence and it is mostly used in the area of control and processing. This paper focuses on a design of air cooler for residential use using the fuzzy toolbox in MATLAB. [1-5]

In the last decade, fuzzy logic is a growing system in many controlling applications due to its nonlinearities supervision features and independence of the parameters of model. The Fuzzy Logic Controller (FLC) works on a information available about plant or model, fuzzy-based control technique has the capability to handle nonlinearity and its controlling performance is not as much of affected by variations of parameters. Fuzzy techniques uses a if then rule base which is developed by taking advantage of system features and knowledge of working of system. [6-10]

II.FLC SYSTEM

The blocks of Fuzzy Logic Control system are shown in Fig.1.Fuzzy Logic Controller is a system is similar to human-like thinking. A fuzzy logic controller can be designed to follow logical thinking; Fuzzy logic has met a growing interest in different control applications due to its handling features of system non-linearity. The Fuzzy

Logic Controller (FLC) operates in a knowledge-based way, and its knowledge relies on a set of linguistic if-then rules, like a human operative. [10-12]

The first step with Fuzzy Logic Controller is to recognize and describe the system behavior by using our information and experience. Designing of the control algorithm using fuzzy rules is the second step, which define the principles of the controller's regulation in terms of the relationship between its inputs and outputs. The third and last step is to simulate and debug the design. If the system performance is unsatisfactory we only need to modify some fuzzy rules and try again. Fuzzy Logic control mainly applied to the control of processes through fuzzy linguistic descriptions. [11-14]

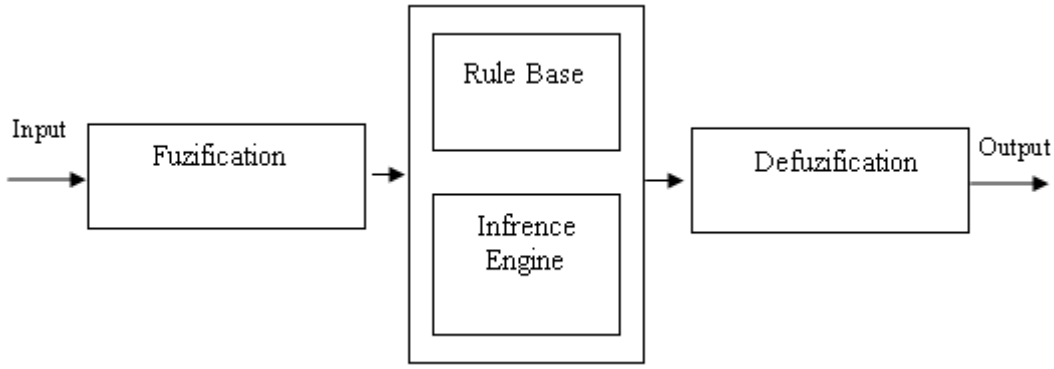

Fig.1 Blocks of Fuzzy Logic Controller

III. BASIC MODEL OF THE PROPOSED SYSTEM

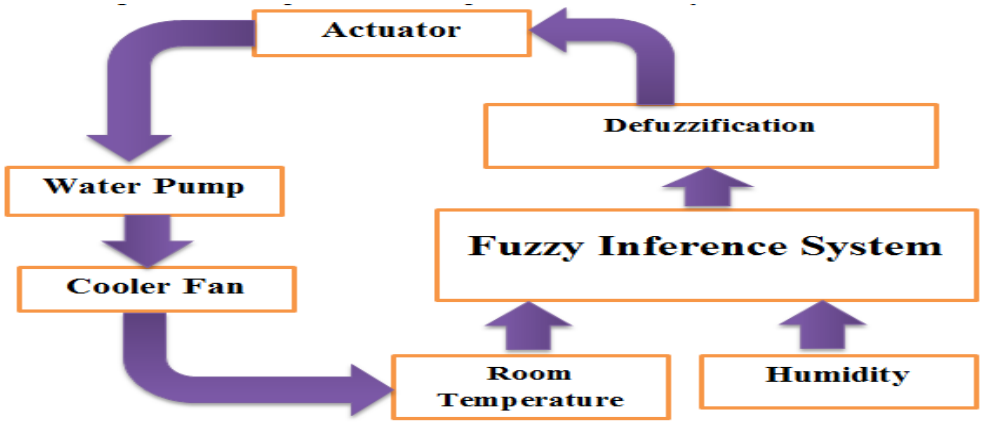

Fig. 2 Blocks Diagram of Proposed Model

The basic model of the proposed residential cooler system using fuzzy logic control is shown in Fig. 2. The residential cooler fixed in a room. It has one cooler fan and one water pump to spread water. Two sensors namely humidity and temperature and one exhaust fan are used to monitor the atmosphere of room. The sensors with electronics circuits are connected with the two fuzzifiers of the fuzzy logic control system. Three outputs of

defuzzifiers, control of water pump speed, control of room exhaust fan speed and control of cooler fan speed are connected using actuators.

IV. IMPLEMENTATION OF FLC

Here we used two crisp input variables

1. Room Temperature (Very hot, Moderately Hot, Mild, Cold, Very Cold)
2. Humidity (Very low, Medium, Very High)

The graphical representation of input crisp variables room temperature and humidity are shown Fig.3 and Fig.4.

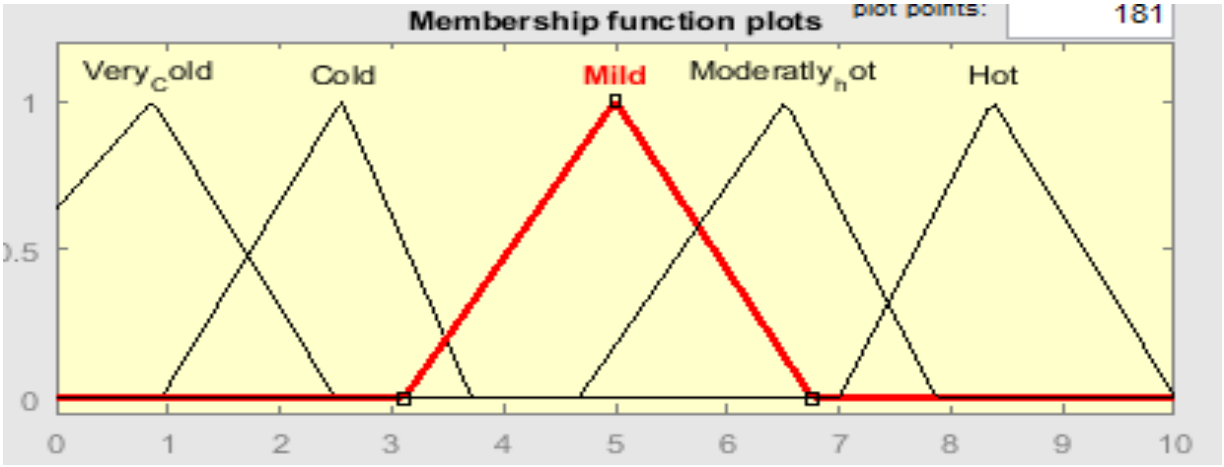

Fig. 3 Membership function for input variable Room Temperature

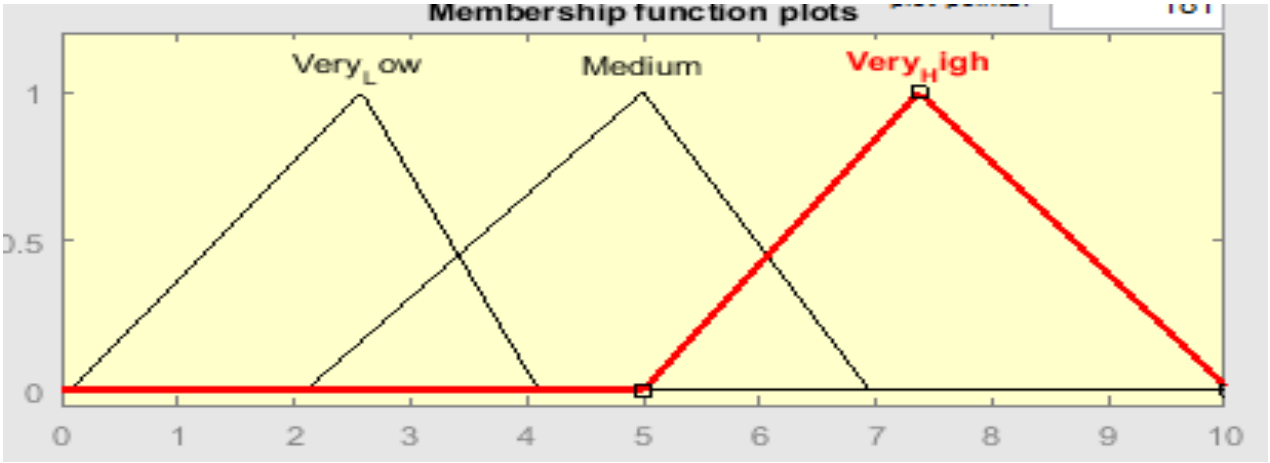

Fig. 4 Membership function for input variable Humidity

V. SIMULATION RESULTS OF PROPOSED SYSTEM

Fig.5 shows surface view of proposed system. The relation of input crisp values with output crisp values was shown in MATLAB simulations the result. In Fig. 6 the input variables, Temperature is at mild and Humidity is at medium are shown.

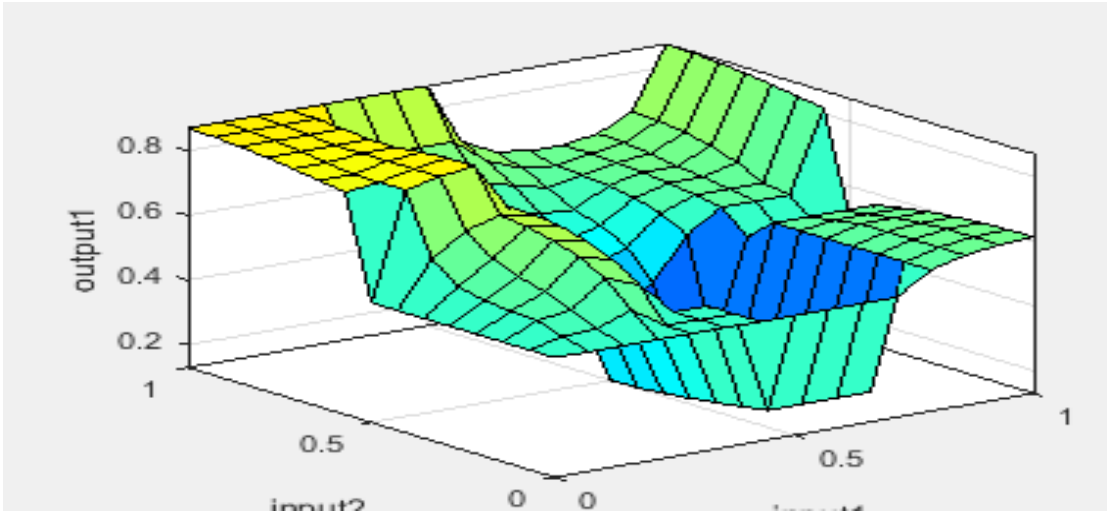

Fig. 5 Surface Viewer from Matlab

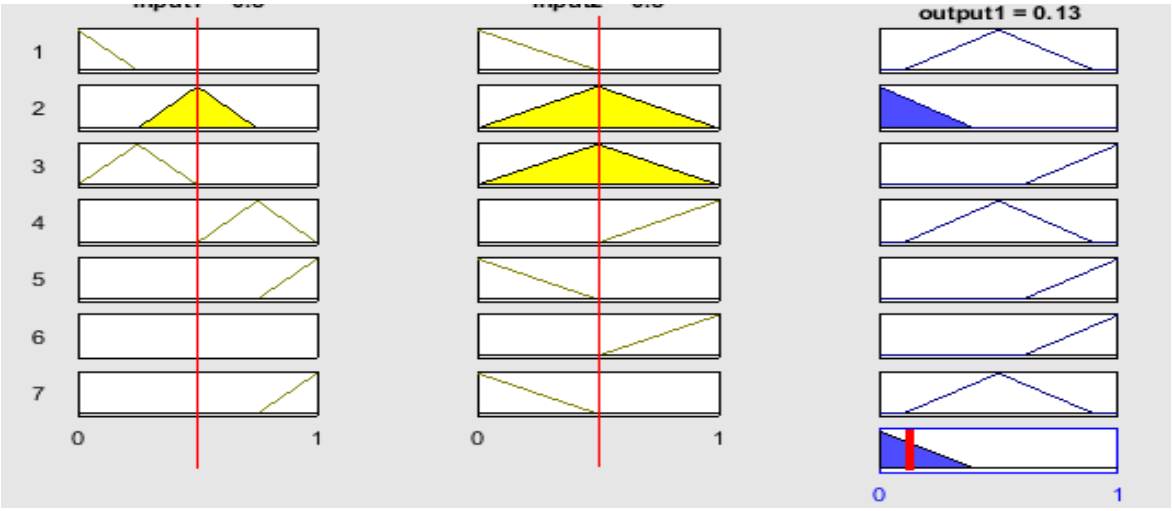

Fig. 6 Rule Viewer from Matlab

VI. CONCLUSION

The proposed fuzzy logic residential cooler system is a simplified design which reduces Memory-space requirements. It demonstrated that the proposed method achieved better results by controlling Fan Speed and water pump. Thus, the proposed fuzzy-control system is an acceptable, where a high dynamic and precise response is not required.

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