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Determining the Gear Position of Car Using Fuzzy Logic Control System

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Abstract: This research Paper describes the design and implementation of determining the gear position of car Using Fuzzy Logic Control System. The rules base receives two input values Speed; and Road condition, fires the rule, and gives the output in terms of speed as defuzzifiers. This research paper work will increases the capability of fuzzy logic control system to determining the gear position of car with potential benefits. In this paper, we represented a new designed to determining the gear position of car depends on the range of speed and road condition. It is only theoretical study; no practical work is done in this regard.
Keywords: Fuzzy logic control, Road condition, Speed, Defuzzifier

1. INTRODUCTION

Modern processing systems are heavily dependent on automatic control systems. The control automation has become essential for machines and processes to run successfully for the achievement of consistent operation, better quality, reduced operating costs, and greater safety.

The control system design, development and implementation need the specification of plants, machines or processes to be controlled. A control system consists of controller and plant, and requires an actuator to interface the plant and controller. The behaviour and performance of a control system depend on the interaction of all the elements. The dynamical control systems design, modeling and simulation in local of intelligent data analysis and system modeling [3]. The elements of fuzzy sets belong to varying degrees of membership or belongingness. Fuzzy sets offer an important and unique feature of information granules. A membership function quantifies different degrees of membership. The higher the degree of membership A (x), the stronger is the level of belongingness of this element to A. Fuzzy sets provide an ultimate mechanism of communication between humans and computing environment [4].

The fuzzy logic and fuzzy set theory deal with non-probabilistic uncertainties issues. The fuzzcontrolsystem is based on the theory of fuzzy sets and fuzzy logic [5]. Previously a large number of fuzzy inference systems and defuzzification techniques were reported. These and distributed environment need to express the behavior of quantitative control system of multi-input and multi-output variables control environment to establish the relation between actions and consequences of the control strategies [1]. Computational Intelligence (CI) is a field of intelligent information processing related with different branches of computer sciences and engineering. The fuzzy systems are one paradigm of CI. The contemporary technologies in the area of control and autonomous processing are benefited using fuzzy sets [2]. The user based processing capability is an important aspect of fuzzy systems taken into account in any design consideration of human centric computing systems. The human centricity plays a vital role in the areas

systems/techniques with less computational overhead are useful to obtain crisp output. The crisp output values are based on linguistic rules applied in inference engine and defuzzification techniques [6]-[7].

The efficient industrial control with new techniques of fuzzy algorithm based on active rule selection mechanism to achieve less sampling time ranging from milliseconds in pressure control, and higher sampling time in case of temperature control of larger installations of industrial furnaces has been proposed [8]. This proposed design work of determining the Gear position of Car is the application of fuzzy logic control system consisting of two input variables: Speed and Road Condition, and One output variables: Gear. The basic structure of the proposed model is described in Section

II. Section III gives the simplified design algorithm of fuzzy logic to determining the Gear position of the car. Result and Conclusion is given in Section IV.

2. BASIC STRUCTURE OF PROPOSED MODEL

The basic structure of the proposed model of car system consists of sensor panels with fuzzy logic control system. Two sensors are used. One is used to measure the Speed and second is used for Road Condition. The sensors with amplification and voltage adjustment unit are connected with the two fuzzifiers of the fuzzy logic control system. One outputs of defuzzifiers: Gear is connected through actuators.

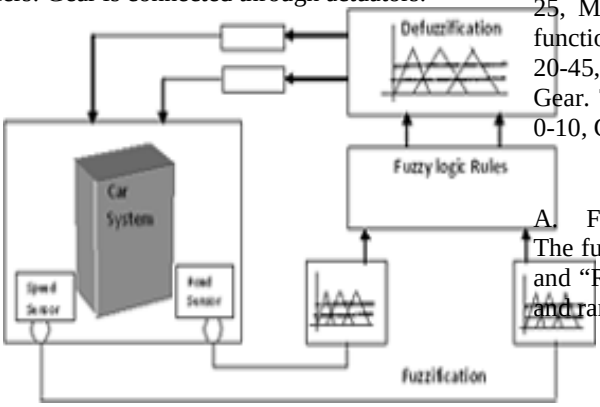

Fig. 1 Structure of Proposed Model

Table 1: Membership function, occupied region and range of input variable Speed

For each input variable, four membership functions are used as shown in Fig. 2 and Fig. 3

3. SIMPLIFIED DESIGN ALGORITHM OF FUZZY LOGIC FOR SOLAR PANEL SYSTEM

This simplified design algorithm is used to design the fuzzifier, rules, defuzzifier for the autonomous gear position of the car according to the control strategy of the processing plant to achieve speed of the car.

The design uses three membership functions equally divided over a scale range of 0 to 90 for the speed of car and 5 to 70 for Road. The three membership function for Speed are termed as: LOW 0-25, MEDIUM 20-50, HIGH 45-90, and membership function are termed for Road as: Dam 5-25, More Dam 20-45, Flat 40-70. The output of this proposed system is Gear. The membership function for Gear as: LOW GN 0-10, G1 5-20, G2 15-30, G3 25-55, G4 50-80.

A. FUZIFIER

The fuzzifier use the data of two input variable, "Speed" and "Road". The membership function, occupied region and range are given in the table.

Membership function	Range
Low	0-25
Medium	20-50
High	45-90

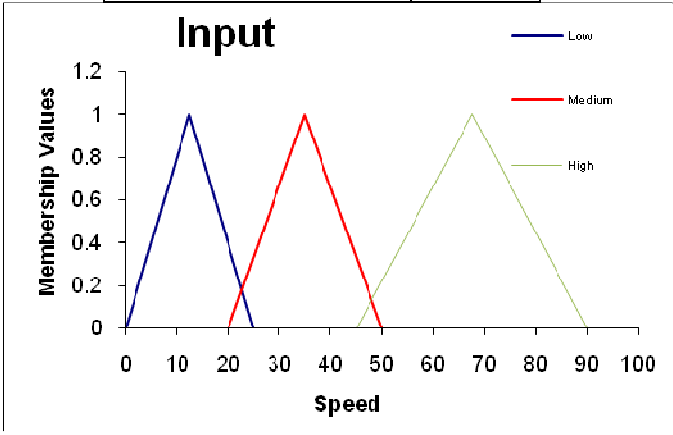

Fig. 2 Plot of membership function for input variable "Speed"

Membership function	Range
Dam	5-25

More Dam	20-45
Flat	40-70

Table 2: Membership function, occupied region and range of input variable Road

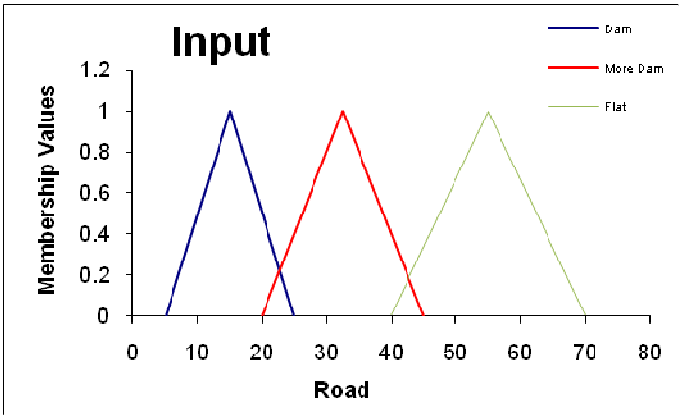

Fig. 3 Plot of membership function for input variable "Road"

B. RULES AND ITS SELECTION

INPUTS		**OUTPUT**
Speed	**Road**	**Gear**
Low	Dam	G2
Low	More Dam	G1
Low	Flat	G3
Medium	Dam	G2
Medium	More Dam	G1
Medium	Flat	G4
High	Dam	G2
High	More Dam	G1
High	Flat	G4

Table 3: Rules applicable for speed of the car.

The rule selector receives two crisp values of Speed and Road, distributed the universe of discourse into regions with each containing two fuzzy variable, fires the rules, and gives the outputs values corresponding to each variable.

C. DEFUZZIFIER

In this system, defuzzifier control the speed of the car. The membership function of the output variable is shown below:

Membership function	Range
GN	0-10
G1	5-20
G2	15-30
G3	25-55
G4	50-80

Table 4: Membership function, occupied region and range of Output variable Gear

4. RESULT AND CONCLUSION

The value for Gear of Car is calculated using Centroid of Gravity method[6]: The utility of the proposed system is to help to determining the Gear position of the car. As In future it will help to design the advanced control system for the Car and other various automobile applications.

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