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Fuzzy Logic in Automative Electronics

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***Abstract*: The context of this paper is the control of autonomous vehicles using fuzzy logic. The development of the autonomous vehicles using fuzzy logic is considered to be one of the greatest challenges. In this paper, we present the opportunities offered by the fuzzy logic to control the autonomous vehicles. Real world experiments will validate the approach. In building the fuzzy hierarchical control of Autonomous Vehicles we use the language known as FDTL (Fuzzy Decision Tree Language. Having said that, it will be an important aspect in the era of automation.**

***Keywords*: characteristics, Fuzzy logic, fuzzy controller, real world**

1. Introduction

Fuzzy logic is a powerful way to put engineering methodology into products in a short amount of time. It's very useful in automotive engineering, where many system designs involve the experience of design engineers as well as test drivers. The automotive engineering is competitive on a huge scale in various areas. In this article, We point out various methods to make automatic using fuzzy logic .We show how superior performance is achieved via fuzzy-logic and neural-fuzzy design techniques. We also initiate various techniques, tools, and code speed/size requirements. A Smart Car includes modern technology like GPS detection, car positioning system, speed control, obstruction detection, and many more but the speed control is the most important and challenging aspect of a Smart Car. In this paper, we reviewed the following ways to use fuzzy logic in automative electronics:

- Anti-braking system
- A controller which can direct the vehicle safely
- Smart car

2. Study of application of adaptive control in automobiles

An anti-lock braking system or ABS is a safety system which prevents the wheels on a motor vehicle from locking up (or ceasing to rotate) while braking. The aim of an ABS is to abate brake distance while steer ability is retained even under hard braking. Fuzzy logic in ABS: Fuzzy logic is a form of multi-constraint logic derived from fuzzy set theory to deal with reasoning that is approximate rather than precise. In contrast with "crisp logic", where binary sets have binary logic, fuzzy logic variables may have a truth value that between 0 and 1 and is not constrained. Furthermore, when linguistic variables are used, these degrees may be managed by specific functions. The control of car and truck engines is becoming increasingly more complex with more stringent emission standards and constant effort to gain higher fuel efficiency. Twenty years ago, control systems were mechanical (i.e., carburetor, distributor, and breaker contact). Now, microcontroller-based systems control fuel injection and ignition. The fuzzy ABS controller uses the microprocessor together with the fuzzy coprocessor. Due to the implementation of Fuzzy algorithms into the hardware of the coprocessor, the calculation speed of the host processor increased significantly. This offers facilities for implementation of extended vehicle dynamics control.

The flexibility of the coprocessor is considerable, up to 64 rule bases are possible, each of them having up to 256 inputs and rules. In addition, an interface to most commonly used microprocessors are available. Arbitrary shapes of membership functions, different de-fuzzification modes, an enormous rule engine with up to 10 million rule calculations per second makes this device a very interesting product in the field of real time fuzzy control.

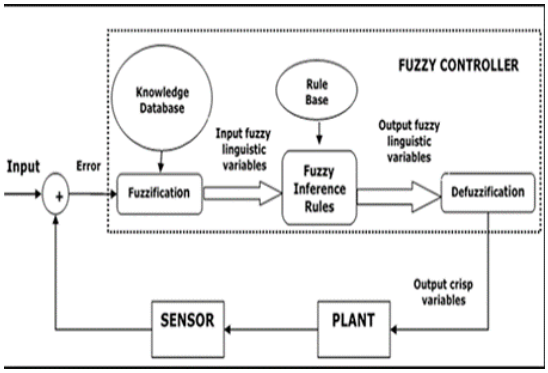

Fig. 1. Fuzzy controller architecture

Thus the concluding statement for the ABS fuzzy controller system is basis of the controlling algorithm consists of a nonlinear characteristic surface, which was created by fuzzy logic. The convincing advantage of fuzzy logic is the ability to modify and tune certain parts of this characteristic surface easily and carefully. In this, linguistic rules or variables need to be varied. This simplifies the development. This also shortens the development time considerable. The deceleration level and steer ability is comparable to commercially available systems. Thus the ABS with FUZZY logic will help the driver to steer while braking heavily and could prove to be lifesaving.

Fuzziness is a notion that makes the form of the rules closer to the institutions of expert operations to whom the system developer must turn. The cases often to develop the dynamic predictive model which is very difficult. The proposed controller comprises of the steering controller and the speed controller. A good range of results are obtained for the following real time systems.

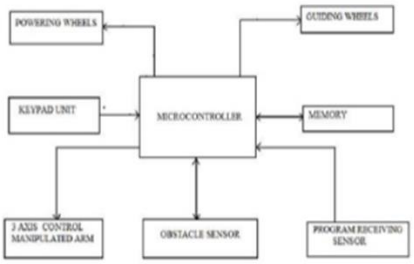

Fig. 2. Obstacle avoidance in smart car

Here we consider an example, where the obstacle is placed right after the curve, so the Ultra Sound sensors of the car detect the obstacle too late. To not hit the obstacle, the car has to decide for a very rapid turn. To optimize the steering effect, the anti-skid controller must reduce the desired steering angle to the maximum the road can take, avoiding both sliding and hitting the obstacle. It can be represented with a diagram.

Fig. 3. Sensors in the car guide the vehicle on the road through fuzzy

The proposed design for this method is an Autonomous vehicle always needs a navigation system to determine the suitable paths to its target and a sensory system .This is basically to acquire knowledge about the crossed environment. To achieve most tasks of an automated vehicle the controller must be able to adjust the steering angle and the velocity of the vehicle simultaneously.

Traditional fuzzy systems allow output only the fuzzy variables thereby restricting their context to low level systems. The steering controller has the many objectives like as steering the vehicle towards a specified target or steering the vehicle around any obstacle and to stop at a desired location. The velocity controller should depict the human behaviour as slowing a vehicle when it comes near or over. The fuzzy decision tree is used to express mapping from attribute values to classes and consists of attribute nodes. It helps to visualize the solution.

Thus in this way we can help analyze a particular solution. The further implementations can be fabricated using various changes.

3. Conclusion

Thus, we referred to several papers based on fuzzy logic. We determined and reviewed the use of fuzzy logic in various sections of Automative electronics. We have incorporated various controllers, smart car and the use of anti-brake locking system .This will help us in a long run. The fuzzy logic used can be more precised and can achieve best moderations using suitable variations.

References

[1] U. Anand, “Fuzzy Logic Vision And Control of Autonomous Vehicles,” in *IPASJ International Journal of Computer Science (IIJCS)*, vol. 4, no. 16, pp. 1-7, January 2016.

[2] A. Senapati, A. Maitra, S. Mondal, B. Bhattacharya, B. Kishore Mondal,, and A. K. Kashyap, “Speed Control of Smart Car using Fuzzy Logic Controller,” in *International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering*, vol. 7, no. 3, pp. 1121-1129, March 2018.