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"Intelligent car system: A Review"

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Abstract: *Intelligence is incorporated in the non-living things to make life easy. The intelligence in car system was first done by Google and hence named it as Google car. The Google car is a driverless car system where all the functions are automated based on the sensors. This paper presents a framework where a fuzzy system is used for the implementation of an intelligent car system. In particular, the prototype of the intelligent car system will show how the robot reaches from source to destination with the shortest path by detecting and avoiding obstacle. This paper highlights the key factor like choosing destination and the shortest path using GPS module, camera is interfaced for the image processing of the obstacles detection and avoidance.*
Keywords: *Fuzzy logic, fuzzification, defuzzification ,lane detection,forward collusion avoidance.*

I. Introduction

In modern automotive industry, the easy of human being is taken care of.An effort has been made by us in order to make the driving easy where in the driver may rest for some time with effective driverless car system. In some circumstances the vehicle may require to drive and reach the destination on its own. The Google car requires more number of resources from the outside world to take its decision and it turns out to be far expensive a thing. Now a day's many industries trying to develop an intelligent car system. Like Google, apple industry also developeddriver free car system. Apart from Google and Apple, Toyota is also developing driverless car system. The Google car is sensor based system where all the system is automated using sensors. The Google car is very much costly and it is difficult for a common man to own it.

1.1 Background

1.1.1Toyota Driverless car

The technology we're showing today is at the level where all the operation for driving is possible by itself The concept car taken for test drives Tuesday was equipped with more sophisticated autonomous-driving features than at a similar event Toyota hosted two years ago. At that time, the automaker highlighted a system for tracing lanes and keeping the car centered. The vehicle had radar that detected vehicles or pedestrians up ahead, automatically decelerating or triggering steering assistance to avoid collision. Those are the sorts of features now becoming more widely available in showrooms.

1.1.2 Apple Driverless Car

Apple is building a self-driving car in Silicon Valley, and is scouting for secure locations in the San Francisco Bay area to test it, the Guardian has learned. Documents show the oft-rumored Apple car project appears to be further along than many suspected.

Tesla, Volkswagen, Mercedes-Benz and several other carmakers have been issued permits by the California department of motor vehicles to test self-driving cars on the state's public roads. But that process requires disclosing technical and commercial details, something that the notoriously secretive Apple might not want.

1.1.3 Google Driverless Car

Google's self-driving car taking a spin around a car park. It is the first truly driverless electric car prototype built by Google to test the next stage of its five-year-old self-driving car project. It looks like a cross between a Smart car and a Nissan Micra, with two seats and room enough for a small amount of luggage.

It is the first real physical incarnation of Google's vision of what a self-driving car of the near future could be it operates in and around California, primarily around the Mountain View area where Google has its headquarters. It ferries two people from one place to another without any user interaction.

The car is summoned by a smartphone for pick up at the user's location with the destination set. There is no steering wheel or manual control, simply a start button and a big red emergency stop button. In front of the passengers there is a small screen showing the weather, the current speed and a small countdown animation to launch. Once the journey is done, the small screen displays a message to remind you to take your personal belongings – reinforcing that this is not aiming to be a substitute for your personal car at the moment, but more as a replacement for the taxi without the human driver.

II. Literature Survey

2.1.1 Alessandro Saffiotti , Kurt Konolige, Enrique H. Ruspini [14]They proposed the multivalued logic approach to integrating planning and control Intelligent agents embedded in a dynamic, uncertain environment should incorporate capabilities for both planned and reactive behavior. Many current solutions to this dual need focus on one aspect, and treat the other one as secondary. They proposed an approach for integrating planning and control based on behavior schemes**,** which link physical movements to abstract action descriptions. Behavior schemas describe behaviors of an agent, expressed as trajectories of control actions in an environment, and goals can be defined as predicates on these trajectories.

2.1.2Chuenchien lee[13] Fuzzy control has emerged as one of the most active and fruitful areas for research in the applications of fuzzy set theory, especially in the realm of industrial processes, which do not lend themselves to control by conventional methods because of alack of quantitative data regarding the input-output relations. Fuzzy control is based on fuzzy logic-a logical system that is much closer inspirit to human thinking and natural language than traditional logicalsystems. The fuzzy logic controller (FLC) based on fuzzy logic provides means of converting a linguistic control strategy based on expert knowledge into an automatic control strategy.

2.1.3AlessandroSaffiotti[12] Most current architectures for autonomous robots are based on a decomposition of the control problem into small units of control, or behaviors. While this decomposition has a number of advantages, it brings about the problem of having to coordinate the execution of different units in order to obtain a globally coherent behavior. In this paper, they have discussed how fuzzy logic can be used, and has been used, to address this problem.

2.1.4 Nilesh N. Karnik, Jerry M. Mendel,Qilian Liang[11]The implementation of this type-2 FLS involves the operations of fuzzification, inference, and output processing. They have focus on “output processing,” which consists of type reduction and defuzzification. Type-reduction methods are extended versions of type-1 defuzzification methods. Type reduction captures more information about rule uncertainties than does the defused value (a crisp number), however, it is computationally intensive, except for interval type-2 fuzzy sets for which we provide a simple type-reduction computation procedure. They also apply a type-2 FLS to time-varying channel equalization and demonstrate that it provides better performance than a type-1 FLS and nearest neighbor classifier *Index Terms*—Channel equalization, fuzzy logic systems, interval sets, type reduction, type-2 fuzzy sets, uncertainties.

2.1.5 Qilian Liang and Jerry M. Mendel[10] In this paper, they have present the theory and design of interval type-2 fuzzy logic systems (FLSs). They have proposed an efficient and simplified method to compute the input and antecedent operations for interval type-2 FLSs, that is based on a general inference formula for them. They have introduced the concept of upper and lower membership functions (MFs) and illustrate our efficient inference method for the case of Gaussian primary MFs. They have also propose a method for designing an interval type-2 FLS in whichwe tune its parameters. Finally, we design type-2 FLSs to perform time-series forecasting when a no stationary time-series is corrupted by additive noise where SNR is uncertain and demonstrate improved performance over type-1 FLSs .*Index Terms*—Interval type-2 fuzzy sets, non-singleton fuzzy logic systems, time-series forecasting, tuning of parameters, type-2 fuzzy logic systems, upper and lower membership functions.

III. Review Outcome

The paper[14] gives a brief information about logic approach to integrating planning and control Intelligent agents embedded in a dynamic, uncertain environment that incorporate capabilities for both planned and reactive behavior. Fuzzy system is much related to the natural language and human thinking unlike other logical languages as stated in paper [13]. It also gives brief explanation of fuzzy logic controller (FLC). The papers [10] introduced the concept of upper and lower membership functions (MFs) and illustrate efficient inference method.

3.2.1 Features

3.2.1.1 Forward Collision Avoidance

In January the NHTSA announced that it would begin to factor crash-preventing braking systems into its car-safety ratings. The systems use forward-facing sensors which can be radar, camera or laser base to detect imminent collisions and either apply or increase braking force to compensate for slow or insufficient driver reactions. Honda was first to introduce such a system in 2003; since then, nearly every automaker has rolled out similar features on high- and mid-range models.

3.2.1.2 Backup Cameras

Every new car sold after May 1, 2018, must have a backup camera, per a safety regulation issued by the NHTSA in 2014. The rear-facing cameras, available now on dozens of models, provide drivers with a full rear field of view and help to detect obstacles in blind spots. The NHTSA estimates that improving visibility in this way could save 69 lives every year.

3.2.1.3 Vehicle-to-Vehicle Communication

For self-driving cars to navigate roads en masse, each must have the position, speed and trajectory of nearby automobiles. Last summer the NHTSA announced that it would explore how to standardize such vehicle-to-vehicle communication. The feature could improve coordination for human and machine alike during accident-prone maneuvers, such as left-hand turns.

3.2.1.4Lane Detection

In 2013 the NHTSA established how to test the effectiveness of camera systems that watch existing painted lane markers and alert drivers if they drift. Some cars, such as the Toyota Prius, now even take over steering if a driver does not respond quickly enough to warning signals. And new 2015 models from Mercedes-Benz and Volkswagen go further, using cameras and sensors to monitor surroundings and autonomously steer, change lanes and swerve to avoid accidents.

IV. Challenges Identified

Developing more intelligent system using less number of resources is the challenging part of this project. The camera interfaced is giving the images of obstacles and to process it using programming codes is one of the tedious jobs. The real life difficulty arised in this vehicle is that the GPS system cannot work in tunnels and it may mislead the vehicle or else it may stop as there is no input provided to the vehicle through GPS.

V. Conclusion

The Google car is capable to work without the driver. Several intelligent systems have been proposed in order to work on dedicated road and urban environment. It is based on several sensors to automate the system which is making it very complex and costly. In this paper we are presenting our first contribution towards making a driverless car which is cost effective.

The proposed system prototype is designed with less resource which is independent to function on its own. The complexity of sensors and the automation in the vehicle will be reduced with the help of programming using fuzzy logic. It also helps the user to detect the sign boards which reduce the problem of road crash.The proposed work also incorporate some extra features like it can detect blind spots to avoid congestion, Edge detection which will enable the user to keep the vehicle on the road as it will detect the white edges of the road.

As future work, the car will be driven on the real roads in the real traffic to evaluate how the system works with more vehicles in vicinity.

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