Intelligent Turning System for a Smart Car

Darsana.S.Babu
Asst.Professor, Dept.of ECE
Baselios Mathews II College of Engineering
Sasthamcotta, Quilon, Kerala

Pimento Joseph
Dept.of CSE
Baselios Mathews II College of Engineering
Sasthamcotta, Quilon, Kerala

ABSTRACT

Automobiles are changing every day. It gets easier to drive a car when time moves on. The application of Artificial Intelligence results in smart cars which is always smarter than human drivers. Number of experiments done in this field and lot of them gave appreciable results. However a fully autonomous car is still in research. The smart cars at present only give an intelligent assistance to the driver. And we already realized a fully automated transportation is only possible by a combination of intelligent car and an assisting traffic system for it. The path which it use are also to be considered. Modern technologies like GPS must be utilized for achieving this goal. In this paper we tried to solve the difficulties in turning an autonomous vehicle.

Keywords:

Intelligent Transportation, Artificial Intelligence,

Intelligent Car, Collision Sign Board (CSB)

1. INTRODUCTION

There are technologies like Adaptive cruise control, Lane departure warning system, Traffic Sign Recognition, Intelligent Parking Assistant system are used in an intelligent transportation system. They help to identify route and speed of the vehicle. They also help to keep vehicle in lane. But all these are possible in straight roads. Turning a smart car is a problem to be solved since it is invisible for it about the other vehicles coming from the turning and results in collision. Here we are proposing a new device which assists in turning, CSB (Collision Sign Board) for the end of this problem.

2. BASIC CHALLENGE

Basic two challenges[2]

1. Social Challenge
2. Technical Challenge

Since we are in an age where we could control and detonate a sonic nuclear missile, with accuracy from anywhere in the world with the press of a button, we have the potential to develop technique for fully automated car without compromising is safety and performance. And also due to the ever increasing technical advancements of humankind like GPS (Global Positioning System)[3], Motion sensors, advanced computing programs that could solve complicated situations and the logical decisions and their associated computer system we do not have a social challenge for smart cars. And as technical challenge, problems like designing the sensors, the control systems and also navigation from source to destination decisions are exist.

3. AVAILABLE SYSTEMS

The present available systems [2] are-

1. Adaptive cruise control
2. Lane departure warning system
3. Traffic sign recognition
4. Intelligent Parking Assist System

Autonomous cruise control is a system typically uses either radar or laser allowing the vehicle to slow down when approaching another vehicle and vice versa when traffic allows. Laser based systems are lower in cost; it is poor in tracking vehicles in adverse weather condition.

Figure 1: Adaptive Cruise Control (ACC)[2]

Lane departure warning system is designed to warn the driver when the vehicle begins to move out of lane. Unless turn signal on in that direction.

Two types of systems:

1. Lane Departure Warning, LDW
2. Lane Keeping System, LKS

LDW only gives warning to the driver but LKS automatically assures the vehicle in its lane if there is no action.Traffic sign recognition system informs the driver about the traffic sign.Intelligent Parking Assist System or Advanced Parking Guidance System is a system developed by Toyota motor cooperation. With a little input the user via in-dash screen and button control, the car itself can steer into parking space. It works with computer processing tied to sonar and backup camera.The above systems can be utilized in fully automated vehicles.

4. THE BASIC THINGS THAT ARE TO BEAUTONOMOUS

Basic needs that are to be considered for a vehicle to be autonomous[2]:

1. Awareness of surroundings (using sensors)
2. Route analysis.
3. Intelligent Motion Planning.

4. Staring Control.

In the point mentioned above my main concerned topic will be on Intelligent Motion Planning, which is to be the only topic to be precisely solved.

5. TECHNOLOGIES FOR INTELLIGENTMOTION PLANNING

GPS: The Global Positioning System is a space based global navigation satellite system that provides reliable location and time information in all weather and all times and anywhere on or near the earth when and where there is an unobstructed line of site to four or more GPS satellites.

Motion sensors: This one is used for monitoring the speed of car.

LIDAR: A rotating sensor on the roof which scans around 200 feet in all the direction of the car to generate a precise three dimensional map on the car's surrounding.

Position estimator: A sensor mounted on the left rear wheel which measures the small movement made by the car and to accurately locate his position on the map.

Video camera: A camera near the rear view mirror deflects traffic light and helps the car's onboard computer recognize moving obstacle like pedestrian and bicyclists.

Radar: Four standard automotive Radar senses, three in front and on in the rear, help to determine the position of the distant objects.

These technologies have the capability to change a vehicle to a fully automated vehicle. The will help in overcoming navigation. But still motion planning is a challenge.

6. OUR PROPOSAL

Here in this paper we are actually trying to offer a solution in turning the vehicle left or right which needs assistance of a driver. And an Intelligent parking system which is at present only has an assisting system. The technologies at present life:

1. ACC
2. LKS
3. Traffic Sign Recognition

It can be used for a fully autonomous vehicle. Other problems are already solved using motion sensors, LIDAR, Position Estimator, Video Camera, Radar etc.

6.1 INTELLIGENT TURNING SYSTEM USING CSB

Collision Sign Board (CSB) is radar based system that we are proposing. It consist of a radar which collects information about the vehicles coming from two sides and transmits the collected information like speed, lane etc. The signal will receive by smart car and an onboard computer will analyze these signals and make appropriate decisions. Collision Sign Board (CSB) also transmits the signals including information like the curve of road and nearby infrastructures like bridges, fuel pump, hospitals, hotels etc.

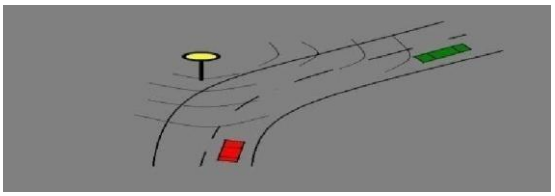

Figure 2: Collision Sign Board (CSB)

6.2. NETWORKED COLLISION SIGN BOARD(NCSB)

When there is multiple turning one after the other, Networked Collision Sign Board (NCSB) is used in this situation. More than one CSB is used as a network. When the car approaches, the first Collision Sign Board (CSB) informs about the multiple turnings. And the all details of vehicles from the other end of the network. This is because each CSB in the network shares the information it collects. The smart car will receive all the useful information at the very first. If anyone of the Collision Sign Board (CSB) fails it will not affect the system fully

6.3.TRAFFIC SIGN RECOGNITION SYSTEM

Traffics Sign Recognition System can be used in intelligent turning system. Since it is possible to recognize the various symbols on the side of roads, we can implement sign boards that give information about the curve of road as symbols. For example a symbol consisting of 'C' followed by an angle which helps to calculate the curve of roads. The utilization of this system is economic and this can be implemented easily. Human readable symbols can be used in this.The above proposals can be implemented successfully only if the smart car which it uses should obey traffic rules, including strict non-overtaking, while turnings, protocols for it which is programmed in it.

7. ADVANTAGES AND DISADVANTAGES

The main advantage is it would be full autonomous system is possible without human interaction. And avoids collision in turnings.The main drawback of this proposal is its costs. The devices proposed here for Collision Sign Board (CSB) make cost increase. This proposal of a fully automated car will be only on the drawing board unless a visionary implemented without considering its cost. Another drawback is that if power failure occurs the Collision Sign Board (CSB) also fails. To overcome this problem either we can use solar power supply or implementing Traffic Sign Recognition System along with Collision Sign Board (CSB). The cheapest and technically easier way is Traffic Sign recognition System. This is simple in implementing.

8. CONCLUSION

Further works should be done to find faults in Collision Sign Board (CSB) and traffic Sign recognition System and to solve them. Since it gives a view to a fully autonomous vehicle, We believe Collision Sign Board (CSB) solves the problem in turning vehicle. In spite the cost a lot of human hours can be saved as well as safe, easy and comfortable driving ensured. Utilization of Traffic Sign Recognition System helps to reduce cost and it can be easily

implemented technically.

REFERENCES

[1] ISA: the Best Collision Avoidance System?, Proceedings of 17th conference on the enhanced Safety of Vehicles, Netherlands.

[2] Intelligent Car Control for a Smart Car, International Journal of Computer application (0975 – 8887), Volume 14 – No. 3, January 2011.

[3] Basnayake C; Mezentsev O; Lachapelle G; Cannon M (2004): "A Portable Vehicular Navigation System Using High Sensitivity GPS Augmented with Inertial Sensors and Map-Matching", SAE Paper 2004-01-0748.

[4] CarstenO ; Tate F (2005): "Intelligent Speed Adaptation: Accident Savings and Cost-Benefit Analysis", Accident Analysis and Prevention 37, pp.407-416.

[5] ETSC (2006): "Intelligent Speed Assistance Myths and Reality: ETSC Position on ISA", European Transport Safety Council, May 2006

[6] Regan M; Triggs T; Young K; Tomasevic N; Mitsopoulos E; Stephan K ; Tingvall C (2006) :"On-road Evaluation of ISA, Following Distance Warning and Seat Belt Reminder Systems: Final Results of the TAC Safecar Project", Monash University Accident Research Centre, September 2006.

[7] Carsten O (2001) : "ISA: the Best Collision Avoidance System?", Proceedings of 17th Conference on the Enhanced Safety of Vehicles, Netherlands.

[8] Perspectives on Intelligent Transportation Systems (ITS) by Joseph Martin Sussman.

[9] Intelligent Transport System: Cases and policies by Roger Stough.

[10] Human factors in Intelligent Transportation Systems by Woodrow Barfield, Thomas A. Dingus.

[11] Artificial Intelligence applications to traffic engineering by Maurizio Bielli, Giorgio Ambrosino, Marco Boero.Fundamentals of intelligent transportation systems planning by Mashrur A. Chowdhury, Adel WadidSadek.