Self-Driving Car using Convolutional Neural Network

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Abstract: To decrease human efforts with increase in safety the vehicles are focused to be automated. Giant tech companies like Tesla and Google have implemented this technology. In this paper we have focused on two application of a self-driving car, one of which is lane detection using Convolutional Neural Networks and other is obstacle avoidance, which is done by using ultrasonic sensor and Infrared sensor. We have also focused on immediate braking system for pedestrian safety. Hence, combination of these two technologies will result in better efficiency of vehicle.

I. INTRODUCTION

In today’s world, automated vehicles are ease for humankind. In this paper we have designed a prototype for lane detection and obstacle avoidance. The most common issue for accidents in automated vehicles is lane detection due to curved lanes and distorted lanes the camera and sensors are not able to detect the lane properly. In this prototype, we have used Pi camera to detect the lanes. The second issue is obstacles avoidance which is faced due to blurred images. This issue is resolved by using ultrasonic sensors on each side of the vehicle. This will detect the neighbor vehicle and helps to maintain the safety distance. We have also used infrared ray sensors which will detect the obstacles in front of the vehicle and apply automated braking system to stop.

II. LITERATURE SURVEY

In 1980s, VaMoR made its autonomous debut and drove on a public highway at speed of about 60mph, by Ernst Dickmanns. The VaMoRs was the world’s first real-deal au4 1.3 System Application and Environment Autonomous car.

In 1990s, Project Prometheus, VaMP and VITA-2 could recognize road markings, its relative position in the lane and presence on other vehicles.

From early 2000s, DARPA has been organizing long distance competitions for autonomous vehicles in different regions which encourage new waves of research and development.

In May 2014, Google presented a new concept for their driverless car that had neither a steering wheel nor pedals and unveiled a fully functioning prototype in December of that year that they planned to test in 2015. Although the progression is gigantic, in 2017, allowed automated cars on public roads are not fully autonomous: each one needs a human driver who notices when it is necessary to take back the control over the vehicle.

In this paper, we have designed two applications of an autonomous vehicle, which can help the driver to relax. This paper presents a concept in which the modified concept of traditional autonomous car is focused. We have made the destination dynamic. Here our destination is provided by giving destination path to vehicle. Our vehicle will follow that path. Another application that we have implemented here is safety of pedestrians with help of immediate braking system.

III. IMPLEMENTATION AND METHODOLOGY

Our Prototype implements both aspects Manual control of vehicle as well as Self driving mode of vehicle. The Centre of Control for prototype vehicle is an Android Application named As CarNNJ Developed for this project. Application uses Bluetooth protocol for communicating vehicle.

In Manual mode vehicle is controlled by Control Interface in Android Application. Operations like moving forward or backward, turning left or right, applying brakes, Lights and Indication System. Android App has Mode Toggle button to switch between Manual and Auto mode.

In Self Driving Mode (Auto) Application interface asks for Path of vehicle. Path is given in encoded format to vehicle like, for paths having 10 meters forward, 20 meters right the encoded Path will be “F10R20”. Such encoded String will be transmitted to vehicle. Same for left, right, backward L, R, B will be used respectively.

Self-Driving Mode of Vehicle mainly focuses on two features, first one is Lane Detection and Lane Keeping of vehicle so it should not go out of the lane. This is achieved by Image Processing and CNN for extracting lane direction or turns. Second feature is Obstacle Detection around vehicle and Collision Avoidance of vehicle this is achieved by ultrasonic sensors. Condition Based Rules are applied on all sensors input to check whether vehicle can be moved or not.
Apart from both features we discussed, our prototype also implements "Immediate Braking System." It works with IR sensor as it has less response time and it is placed at vehicle’s front corners (bumper) to check if any object comes under way of vehicle. It is used for Pedestrians safety. Fig.1 shows Self-Driving Mode Interface of Android Application. Fig.2 shows Manual Driving Mode Interface of Android Application. Fig.3 shows mounting of ultrasonic and infrared sensors. Fig.4 shows prototype model of project. The complete chart of prototype is shown in Fig.4.

Fig.1 Self-Driving Mode Application Interface

Fig.2 Manual Driving Mode Application Interface

Fig.3 Overview of Mounted Sensors
Fig. 4 Flowchart of Prototype Execution
IV. RESULT

The project has been tested in real time and found working smoothly. Lane detection mechanism help vehicle to avoid going out of the lane. Obstacle avoidance feature is used to avoid collision of vehicle with any object. Also, with the help of IR Sensors 'Immediate Braking’ mechanism is achieved. While testing the project, we have found that even if setting the required parameters such as F100R30L20, if the road/lane in between is slightly curve, the vehicle will automatically detect the curve with the help of image processing and travel according. These all will result in roadway safety by avoiding accidents.

V. CONCLUSION

Considering the benefits that Self driving cars have to offer using advanced technologies has the main concern for safety. Automated vehicles have wider fields of vision and are designed to obey all the traffic laws. Automated vehicles will save lives, prevent injuries and makes road safer. This automated vehicle can work together to keep the traffic moving. Developments in autonomous cars is continuing and the software in the vehicle is updated regularly.

REFERENCES


