SELF DRIVING CAR PROTOTYPE

Dr. S.U.Kadam, Krishna Agrawal , Ojas Chaudhari, Naveen Jangir, Shivani Bhagade,
Professor and Head of Department, Student.
Department of Computer Engineering

TSSM's Bhivarabai Sawant College of Engineering and Research, Narhe Pune, India.

Abstract : In the Modern era, the field of automobile have been considered various aspects which makes a vehicle automated. Self Driving car is also known as driver less car, autonomous car or robotic car. Autonomous car is a vehicle that is capable to sensing environment and navigating without any human interface. Tech Giants like Google, Tesla, Waymo and many more are working on the same with common goals to reduce accidents and save lives. Self driving car combine variety of techniques to perceive their surroundings using sensors like Radar, GPS and Computer Vision to take action based on the data. The functionality of the entire system is divided into obstacle detection, locomotion, traffic light detection, stop sign recognition. Ultimately one step forward towards building a fully functional self driving car which can avoid accidents and thus making driving much safe.

IndexTerms **:navigate, interface, autonomous, vision, detection.**

I. Introduction

Autonomous Cars popularly known as Self Driving Cars or Driver less Cars are future of how driving is going to be. A system that drives a car on its own without much human intervention. It sense the environment with the help of different types of sensors like Distance Sensor, Radar, LiDar and based on experiences it makes calculated decisions. Tech Giants like Google ,Tesla ,Waymo and many more working on the same with common goals to reduce accidents and saves lives. Our idea is to build self driving car which will simulate behavior of actual car. Machine learning model can be trained and tested on car replica. After the model is working as expected , the same machine learning model can be used on actual car by mounting different sensors and configuring them. Ultimately one step forward towards building a fully functional self driving car which can avoid accidents and thus making driving much safe.

According to the World Health Organization, more than 1million people lose their lives on the road due to car accidents, and C2ES (Center for Climate and Energy Solutions) states that about 60 percent of total energy consumed by transportation is from automobiles. These numbers show that cars cause serious casualties and are major source of greenhouse gas emission. There have been attempts to solve these problems, but none of the solutions have been particularly effective. However, Self driving technology has potential to handle these problems. Self-driving cars makes it safer and
much more efficient, it could save valuable lives and preserve the environment.

II. RELATED WORK

Lane Detection

The road lane detector consists of four main parts: warping, filtering, detecting the road lane, and dewarping. In the warping part, we set the Region of Interest (RoI) of the road lane and change its perspective into new images. The process of setting and warping into new images. In this way, it will be much easier for us to visualize and to analyze road lane in detail.

Real time steering prediction

The computer vision data is sent to them machine learning model for classification. The machine learning model classifies the path in front of the car to be a clear, straight road. The Raspberry pi in response, runs the motors at their full speed, accelerating the car to its full speed.

Obstacle Detection

Mapping the environment is crucial to enable path planning and obstacle detection for self-driving vehicles.

Sign Recognition

There is a "STOP" sign board in front of the car. If a STOP sign is encountered, the car will stop for 5 seconds, then move forward until a new stimulus is introduced in the environment.

Traffic Signal Recognition

The computer vision data received post-processing results in alerting the Raspberry Pi of the presence of a flashing red signal. The Raspberry Pi instructs the Arduino to halt the car's motion. The Raspberry Pi waits for a fixed timeout, before instructing the Arduino to accelerate and waits for the next stimulus.

III. MOTIVATION

Self-driving technology is perhaps the most debated technology in the automotive industry right now and many companies are developing autonomous driving features to be added on to their production cars. The motivation behind this technology showdown is to improve efficiency and many more companies working on the same automation technology with common goals to reduce accidents and saves lives. The proposed self driving car model after being trained on small vehicle can be implemented on an actual car after scaling up the hardware components like actuators and sensors.

IV. METHODOLOGY

Methodology approach is illustrate the purpose and complete declaration for the development of system. It will also explain system constraints, interface and interactions with environment. In this system we are using the machine learning model

which contains openCV that is open source computer vision library which is used for image processing and another one is TensorFlow it is open source software for machine learning model. Also GPS(Global Positioning System) and pi camera is used in this system.

V. SYSTEM ARCHITECTURE

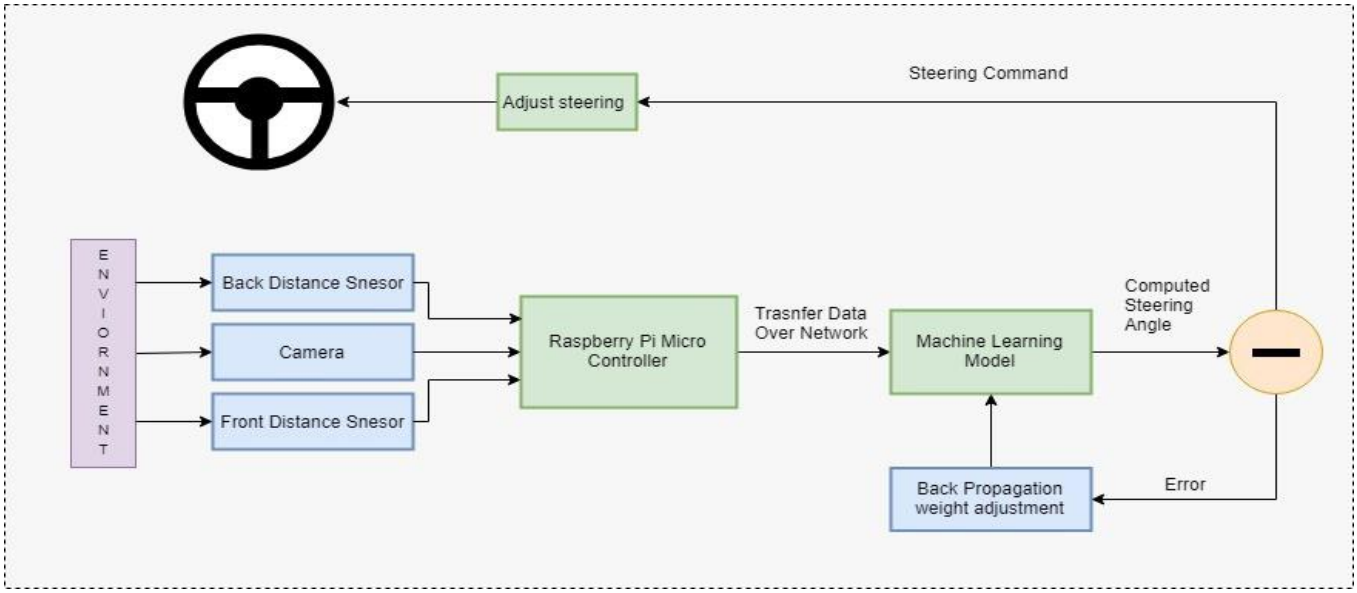

fig 5.1: System Architecture of Self Driving Car Prototype

Description:

The working of self driving car model is divided in three sections: sense, compute and actuate. In the first section camera and the sensors sense the environment. Camera captures the images and ultrasonic sensors give the information about the distance of obstacles in front and back of the car. The data from sensors is sensed by raspberry pie and is sent to local server. The local server does the computation work. Machine learning model is built using the data from the sensors. After the model passes various performance measures, the same model is used for prediction. In order to achieve this goal, we need to perform various tasks like lane detection, object detection etc. The architecture is divided in following components :

Environment:

Environment represents the outside world. It consists of various objects like Other vehicles, People, Sign boards, Traffic Lights and Lanes on the road.

Sensors:

The Sensors are used to perceive the data from surrounding environment like Distance Sensor for measuring distance form object in from and behind, and camera for computer vision.

Raspberry pi:

To control the sensor we need micro-controller to convert the electric signals to digital data. Raspberry pi does the work in this scenario, it is connected to ultrasonic sensor and the camera using GPIO and Non Parallel Socket for the camera.

Machine Learning Model:

The Machine learning model represent the deep learning CNN with does the work of mapping the data from sensor to actions. Image Recognition is best job for CNN There are two phases in ML model building training the model on labeled data and testing its accuracy.

Back propagation System :

During the training we need to update the parameter of the model to generalize it. It start with calculating the Error with various methods like Mean Square Error and calculate the small change to weight and bias of the model i.e delta using One of the many techniques like Gradient Descent, Adam.

Actuators:

We need to adjust the steering angle of the car as per the predicted value from the model, here actuators comes into pictures. Actuators does the work of adjusting by servo motor.

VI. RESULTS

Function Name	Distance Stop(cm)	Detected Distance(cm)	Error
Stop Sign	60	55	
	55	50	
	45	41	
	61	52	
	42	37	
	62	57	
	Avg: 54.1	Avg: 48.6	Avg: 5.3
Obstacle Detection		28	
		8	
		35	
		20	
		33	
		35	
		15	
		10	
		37	
		Avg:32.5	

Table 1: Results

VII. CONCLUSION

This paper presents the working of self-driving car model. How the machine learning algorithms are used for driving the vehicle, how the sensors information are sensed and used for the machine learning model, how the decisions about the driving angle, keeping vehicle in lane, stopping of vehicle, speeding the vehicle are taken from the sensors input. The entire system is divided obstacle sensing, traffic light detection and movement of car accordingly and also the navigation of car. This model will help in reducing the accidents in large amount as the traffic rules will be followed.

REFERENCES

[1] Qudsia Memon, Shahzeb Ali, Wajiha Shah. 2016. Self Driving And Driver Relaxing Vehicle From IEEE.
[2] Giuseppe Lugano, 2016. Virtual Assistants And Self Driving Cars: 978-1-5090-4059-9/16 from IEEE.
[3] Jeremy Straub, Karanam Ravichandran, Dayananda, 2017. An Interenetworked Self-Driving Car System-of-System from IEEE.
[4] T.Banerjee, S.Bose, A.Chakraborty, 2017 Self-Driving Cars: A Peep Into The Future: 978-1-5386-2215-5/17 from IEEE.
[5] Brilian Tafjira, Nugraha, Shun-Feng Su, 2017. Towards Self-Driving Car Using CNN: 978-1-5386-0510-3/17 from IEEE.
[6] Nicolas Gallardo, Nicholas Gamez, Paul Rad, Mo Jamshidi Fellow, 2017. Autonomous Decision Making For Driverless Car from IEEE.
[7] Daniel L. Rosenband, 2017. Inside Waymo's Self-driving Car: My Favorite Transistors: 978-4-86348-606-5 © from IEEE.
[8] Jainfeng Zhao, Bodong Liang, 2018. The Key Technology Towards The Self-Driving Car from IEEE.
[9] Tzun-Hseng S.Li, Ming-Han Lee, Chia-Wei Lin, Guan-Hong Liou, and Wei-Chung Chen, 2015. Design of Autonomous and Manual Driving System for 4WIS4WID Vehicle: from IEEE conference 2169-3536 (c).
[10] Pascale-L-Blyth, Norman M.Su, 2017. Driving The Self Driving Vehicle from IEEE