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# Small model of self driving car

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**Abstract:**

This paper is intended to represent a small version of a Self-driving car with the help of IoT and AI using Raspberry Pi and Arduino UNO. The high-resolution Pi camera provides the necessary information. Raspberry Pi analyses and acquires data samples and will train in Pi using neural networks and machine learning algorithms that will help to detect lanes and traffic lights and cars alternate accordingly. In addition to these features the car will be overtaking with the appropriate LED indications on coming across any obstacles.

**Keywords:** open computer vision, machine learning, artificial intelligence, internet of things.

## INTRODUCTION

The concept of self driving car is discussed since 1920s, however first semi automated car was developed in Japan in 1977.A major landmark self driving car was developed in 1980s with speed limited upto 31 kmph. And after some developments in 2013 Tesla started their self-driving car project. In 2014 they released Tesla S with semi-autopilot mode. And further improvements in the autopilot software are released in following models like Tesla X etc. A survey of opinion from public about self driving cars was conducted by Brandon Schoettle and Michael Sivak in top three major English speaking countries and intial response from the public is positive about upcoming technology in automobile industry. But in comparison of them there was no such development in our country, this project analyzed and took this as base. So with in this background we decided to develop a self-driving car at a low cost that could afforded by many citizens. And with the help of present condition system we included Traffic signal response which is not present many other companies. With this the transportation quality and safety is improved as human errors made will be significantly reduced and road safety will be increased.

**LITERATURE SURVEY:**

1. R. Mohanapriya, L.K. Hema, Dipesh Warkumar Yadav, Vivek KumarVerma's published "GPS-based autonomous vehicles for future public transport". The four-wheeled robot is equipped with a GPS and GSM system. The robot is guided by a GPS system and can move from one place to another without human intervention. In the former case, it promises to report any theft in the GSM system. Vehicle owners can receive SMS notifications notifying them of problems and turn off the ignition. In the latter case, the project was designed that way that the vehicle can only be turned on if an authorized person sent the predefined location to the vehicle.
2. The paper "A Vision-based Method for Improving Safety of Self Driving" by Dong, D., Li, X., and Sun gives details about a simulator that can recognize traffic signs, lanes, and road segmentation.
3. “ Self Driving and Driver Relaxing Vehicle ” entitled paper published by a Qudsia Memon, Muzamil Ahmed, Shahzeb Ali, Azam Rafique Memon, and Wajiha Shah In this study, they had created two self-driving car application that allows drivers torest for a short period of time. It also presents a concept centered around the modified Google car idea, where Google cars needto arrive automatically at static destinations. In this prototype, they created a dynamic target. Here, self-driving cars track vehicles traveling along a given route. This vehicle is followed by this prototype.

**PROPOSED APPROACH:**

Block Diagram

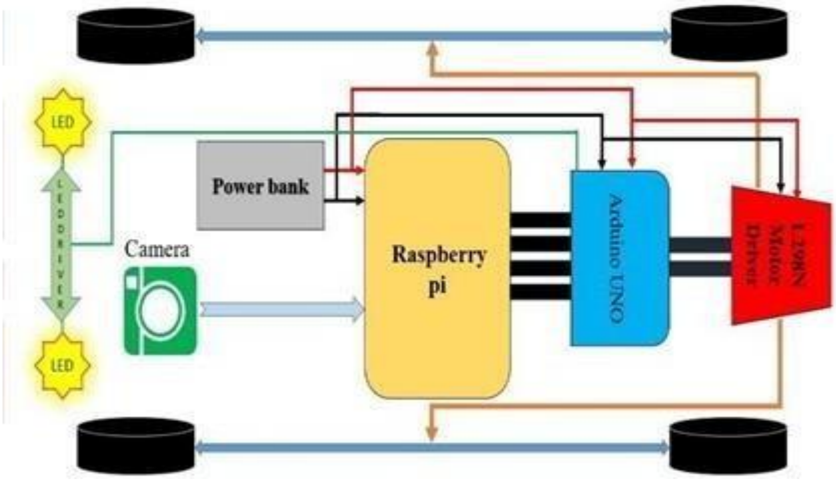


Fig 1: Block diagram

**PROPOSED SYSTEM:**

In our model we have used a matching pattern approach that uses a camera to detect a unique pattern printed on the road. The camera is used to collect this pattern, process it with the help of Raspberry Pi, and then tells car to go in which direction. The is used to collect the images of the surroundings to identify various obstacles in the area. If in any condition the obstacle gets too close to the vehicle then the vehicle will stop and changes the path accordingly. Road signs and special pattern are placed along the route to determine which type of operation need to perform on a vehicle.

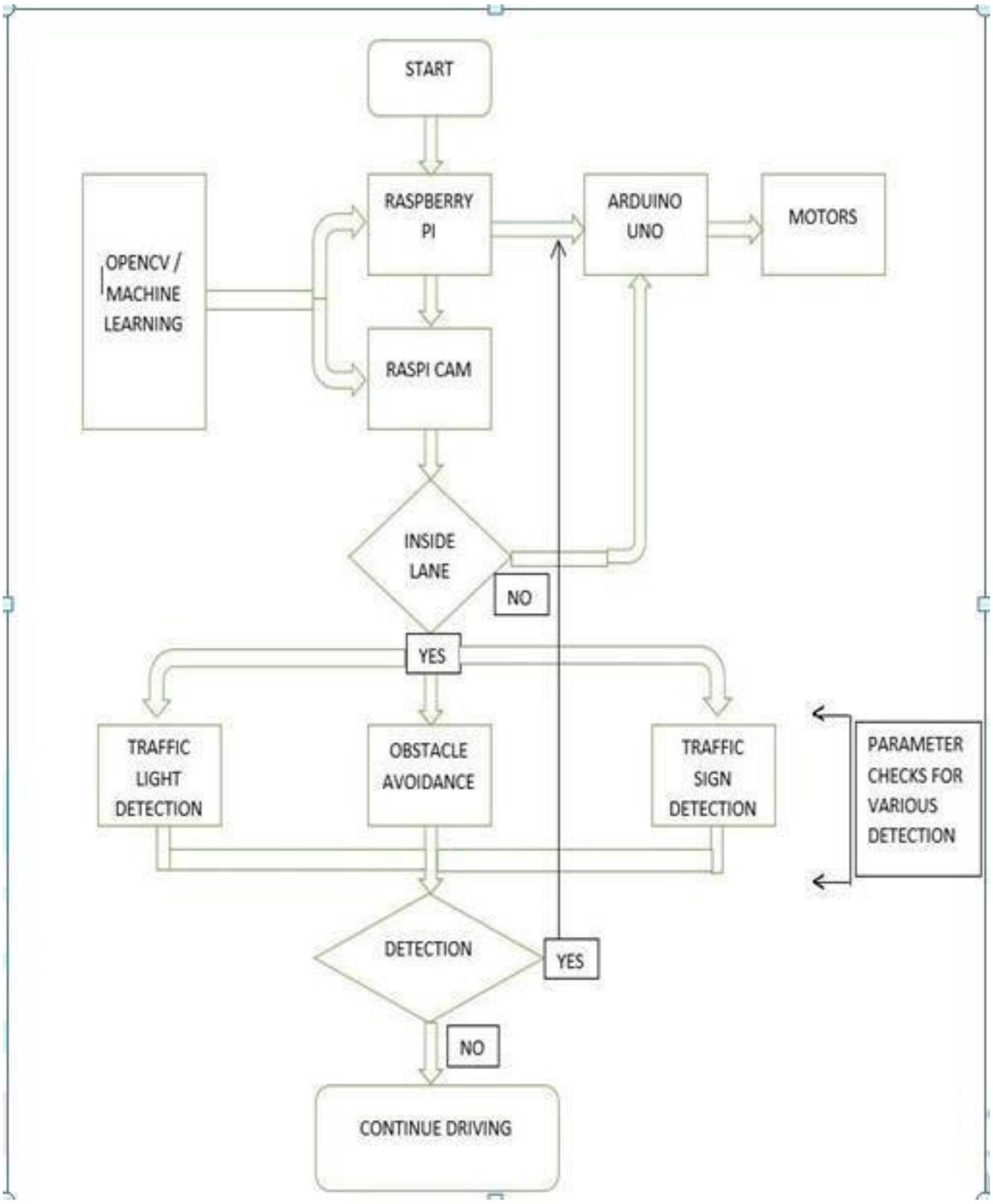


Fig 2: Our proposed model

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## METHODOLOGY:

### Lane Detection:-

Lane detection is an important technique that is needed for building a smart driving car. It is crucial to control the car movement according to the road lane that the car is on. Research work discusses the implementation of an algorithm combined with different techniques. Hough Transformation for feature extraction, SVM for machine learning along with line, edge, and region selection. They came up with a percentage of 90%. Also, they introduce the problem of different lighting affecting the system. On the other hand, Satzoda et al. Improved the Hough transform algorithm in lane detection and introduced the hierarchical additive Hough transform (HAHT) to achieve an accuracy of 99%. The usage of YOLO and CNN algorithms were introduced by , the system was able to detect road lanes, objects and provide suggestions to the driver. However, the system was highly recommended on highways only and not on urban roads. Moreover, Daigavane et al. Proposed a lane detection technique using Canny edges and Ant colony algorithm along with Hough transform, the system was able to be applied on painted and straight roads, but they pointedout that ant colony algorithm requires more research for such a domain.

Stereo Vision

Stereo vision cameras capture from two vantage points. They capture two images, one for the image itself and theother for depth map. The stereo vision approach was introduced in many fields other than robotics as human-computer interaction. Oniga et al. Had two phases while using stereo vision cameras. The first phase was to detect obstacles. The second phase was to improve the output result. In this system, they have used individual pixels that can be affected by the low quality of images and also consume more time. According to , they have implemented a method that detects easy and complex obstacles in the U disparity map on long-distance. They also pointed out that users of such a system would make a great difference in the field of smart cars as they have reached high accuracy with their method. Moreover, in research , they have discussed the effect of computation cost, aggregation cost, and disparity map algorithm from the stereo vision on the system. They suggested that in the case of unneeded high-resolution images, it is preferred to use normal cameras for not consuming much time.

**HARDWARE:**

Fig 3: Model of car

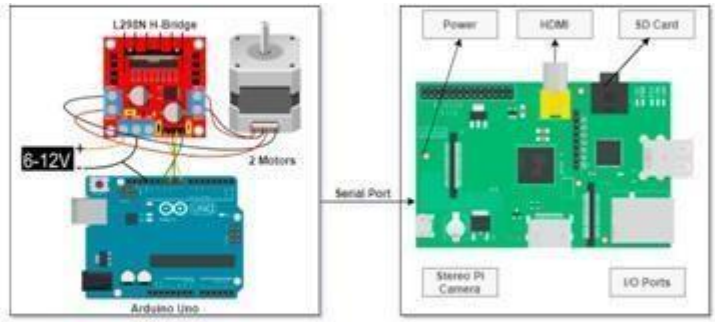


Fig 4:Hardware used in model

The car consists of two motors, L298N H-Bridge which is a motor driver that allows a full control of the two car motors at the same time, and Arduino UNO that simulate the car movement. The main component of the system is the raspberry pi that is connected to the MPU unit, Wi-Fi dongle, and stereo vision cameras. By all of these hardware components connected together, the system is able to accurately recognize its whole surrounding environment. The two motorsare being controlled by L298N motor driver based on the received signals from Arduino that is powered by an external nine-volt battery, and Arduino sends these signals based on the serials received from the raspberry pi. These serials are being transmitted on a serial path that is connected between Arduino and raspberry pi. Moreover, the algorithms take their input either as video frames or data readings from the cameras and sensors connected with the raspberry pi. TheSD card is also a part of stereo pi as it has the Raspbian operating system of the raspberry pi.

Dataset

To gather our data set, the car was manually driven on our customized road to collect the data from the sensors using Bluetooth with the help of mobile to collect the data of road anomalies. The data was gathered based on eighty-six trails as our environment made it easier to collect the data without any difficulties. Collected data contains three thousand records of Accelerometer data merged with Gyroscope data as it was mentioned by Fazeen et al. That when they used multiple axis classifications of their sensor data, they achieved higher accuracy.

**DISCUSSION:**

The project was evaluated and tested. The model can identify the specific pattern and can also detect barriers in the environment, as seen in the preceding photographs. As a result, the model is capable of doing all of the aforementioned tasks.

Detections: In this time span of the project, we experimented with various types of detections on our trained model which makes it work in autonomous mode. These detections are as follows.

Fig 5: Traffic light detection

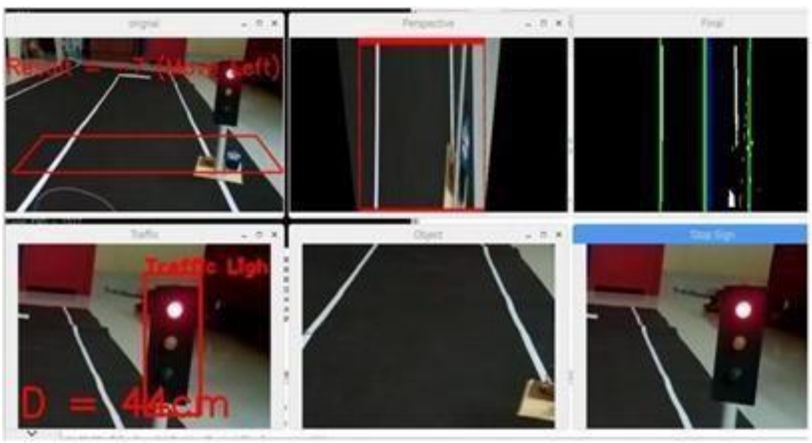

Fig 6:Traffic light

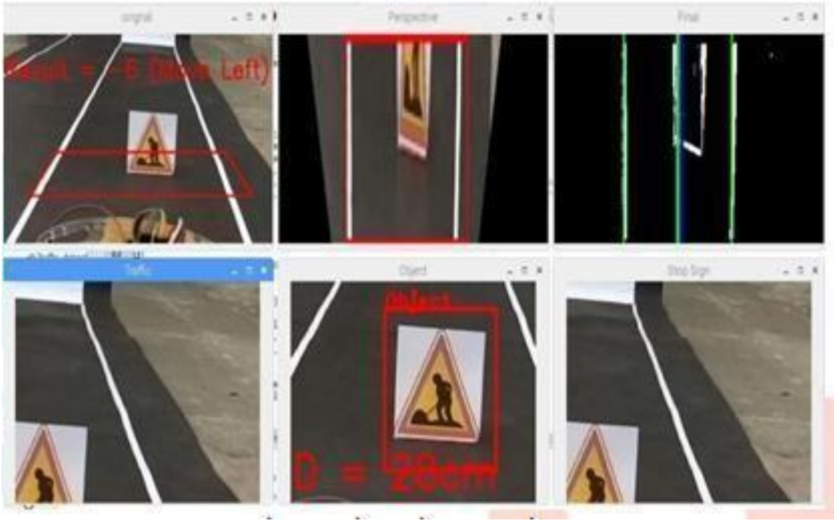

Fig 7:obstacle detection

Fig 8: Lane detection

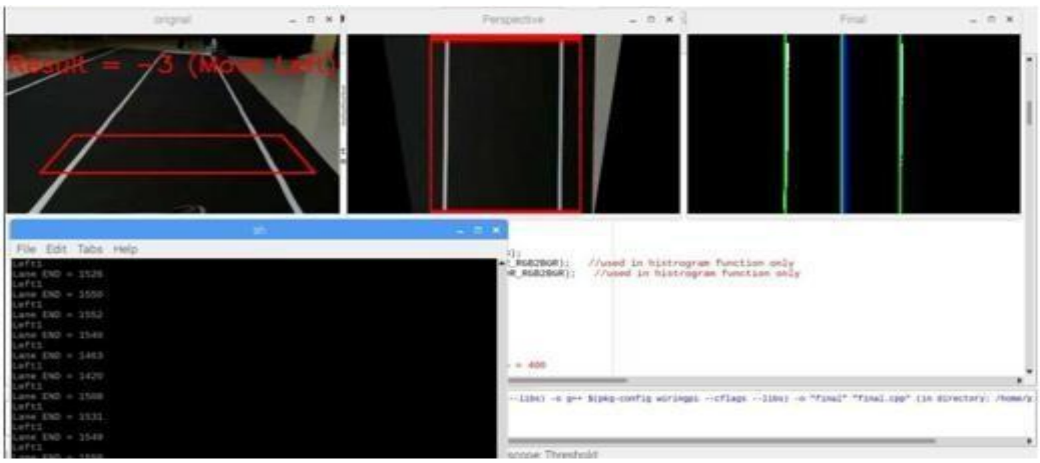

Fig 9: lane information


Fig 10: stop sign detection

## APPLICATION

1. Parking Lots for Self-Driving Cars

Private self-driving cars will park elsewhere without driver intervention. Owners of these cars can send their cars to nearby locations with additional vacant parking spaces.

2. Avoid Accidents

It is estimated that human error accounts for 94% of all accidents. Self-driving cars are much safer because they eliminate the risk of human error, and road accidents can become obsolete. Eliminating road accidents will boost our economy and ease our health care system.

3. Managing Traffic Jam

The root cause of traffic congestion is essentially human-related. The response time of the system is faster than humans with predictive emergency braking, radar technology, cameras and sensors for better traffic management . The need for traffic police canalso be reduced.

## CONCLUSION:

Self-driving cars are a cost-effective and environmentally friendly means of transportation that can reduce accidents and make commuting more comfortable. Self-driving cars are no longer science fiction novels and will soon become commonplace. We are living in a new era of transportation where human-powered transport vehicles are being replaced by computerized self-driving cars.There are many possibilities for self-driving cars in the future. Some car companies are rapidly developing self-driving cars to make them more accurate and safe. Self-driving cars are a major advance in the automated realm of the future. This project focuses on making changes in road safety and commuting through continuous learning of the system, and significantly reducing accidents and human error.

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