VEHICLE CONTROL USING RASPBERRYPI AND IMAGE PROCESSING

THESIS

Submitted

By

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Department of ECE

In partial fulfillment of the Requirement For the

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IN

Embedded system

Under the Esteemed Guidance of

MR. DUSHYANT KUMAR SINGH

TOPIC APPROVAL PERFORMA

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Supervisor Name : Dushyant Kumar Singh **UID :** 13367 **Designation :** Assistant Professor

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PROPOSED TOPIC : Vehicle control using Raspberry-pi and image processing

Qualitative Assessment of Proposed Topic by PAC		
Sr.No.	**Parameter**	**Rating (out of 10)**
1	Project Novelty: Potential of the project to create new knowledge	9.00
2	Project Feasibility: Project can be timely carried out in-house with low-cost and available resources in the University by the students.	9.00
3	Project Academic Inputs: Project topic is relevant and makes extensive use of academic inputs in UG program and serves as a culminating effort for core study area of the degree program.	9.00
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6	Future Scope: Project has potential to become basis of future research work, publication or patent.	8.00

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Final Topic Approved by PAC: **Vehicle control using Raspberry-pi and image processing**

Overall Remarks: Approved

PAC CHAIRPERSON Name: 11211::Prof. Bhupinder Verma **Approval Date:** 05 Oct 2016

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CERTIFICATE

This is to certify that Rohit Tiwari have completed objective formulation of his Thesis work titled "VEHICLE CONTROL USING RASPBERRY-PI AND IMAGE PROCESSING" under my guidance and supervision. To the best of my knowledge, the present work is the result of his original study and research. No part of the project has ever been submitted for any other degree at any University.

The project is fine for the submission and fulfilment of the condition for the award of degree of Master of Technology in Electronic and Communication Engineering.

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in this report entitled "VEHICLE CONTROL USING RASPBERRY-PI AND IMAGE PROCESSING" by "ROHIT TIWARI" in partial fulfilment of requirements for the award of degree of M.Tech. (ECE) submitted in the Department of (ECE) at Lovely Professional University Jalandhar Phagwara, is an authentic record of my own work under the supervision of Mr. DUSHYANT KUMAR SINGH. The matter presented in this report has not been submitted by me in any other University / Institute for the award of M.Tech Degree.

Signature of the Student
(ROHIT TIWARI)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Signature of the Guide
(Mr. DUSHYANT KUMAR SINGH)

ACKNOWLEDGMENT

I would like to express my respect to all those who helped me to complete this report.A special gratitude I give to my guide ,Mr. DUSHYANT KUMAR SINGH, Deptt. of Electronics and Communication Engineering, Lovely Professional University, for his excellent support to providing me suggestions and encouragement for doing this research and to complete this report.

ROHIT TIWARI

CHAPTER-1

INTRODUCTION

Road accident is most unwanted thing to happen to a road user**.** Most of the road users are quite well aware of the general rules and safety measures while using roads but it is only the laxity on part of road users, which cause accidents and crashes. Main cause of accidents are human mistakes and some of them are like-drunken driving, over speeding, distractions to the drivers,red light jumping [18]. Driver who fails to obey the traffic signals put not only them but other motorists in dangers of accidents and serious injuries and also become the reason for the death of a person. Individual who have been suffered harm due to accidents caused by disobey traffic lights and signals rules are entitled to the problemslike-

1. Pain and suffering other non-economic based damages.
2. loss of income due to injuries suffered.
3. property damages .

According to a survey more than 90 percent accidents in USA happens due to the driver unawareness of traffic rules like traffic lights,speed limit signs etc.Sometimes drivers are also made a mistake that cause large loss of assets like life as well as money.To overcome this problem a system has to be designed that will automatically take the data from the real world and process it according to the traffic rules that will reduce the accident chances.To design such system there is requirement of some sensors for the detection of obstacles.To get the information about the traffic lights and signs there is need of camera and a controller or processor is required to process the system according to the real world information of the traffic get from the camera and sensors.From last 30 years there are lot of works are going on in designing of autonomous vehicles to avoid the human errors and reduce the lost of very valuable assets like life of human beings.

In this proposed system Raspberrypi is used as the controller and to get the real world information camera and ultrasonic sensors are used .This vehicle control system will help in reducing the accidents happen on the roads.Ultrasonic sensors helps in giving information about obstacles ahead of the vehicle whereas camera is used to give the information of the red light signal,speed limit sign board etc.So if driver make a mistake theb also there will be no accidents because sytem will reduce the speed of the vehicle or if necessary to stop then system will automatically force the vehicle to stop.System will get the information through ultrasonic sensor before 4 metres to the obstacles and it will take the action and also system get the information of the traffic signals before 5 metres and it depend the quality of the camera and according to the vehicle to decrease its speed as well as to time required to stop the wheels of the vehicles.

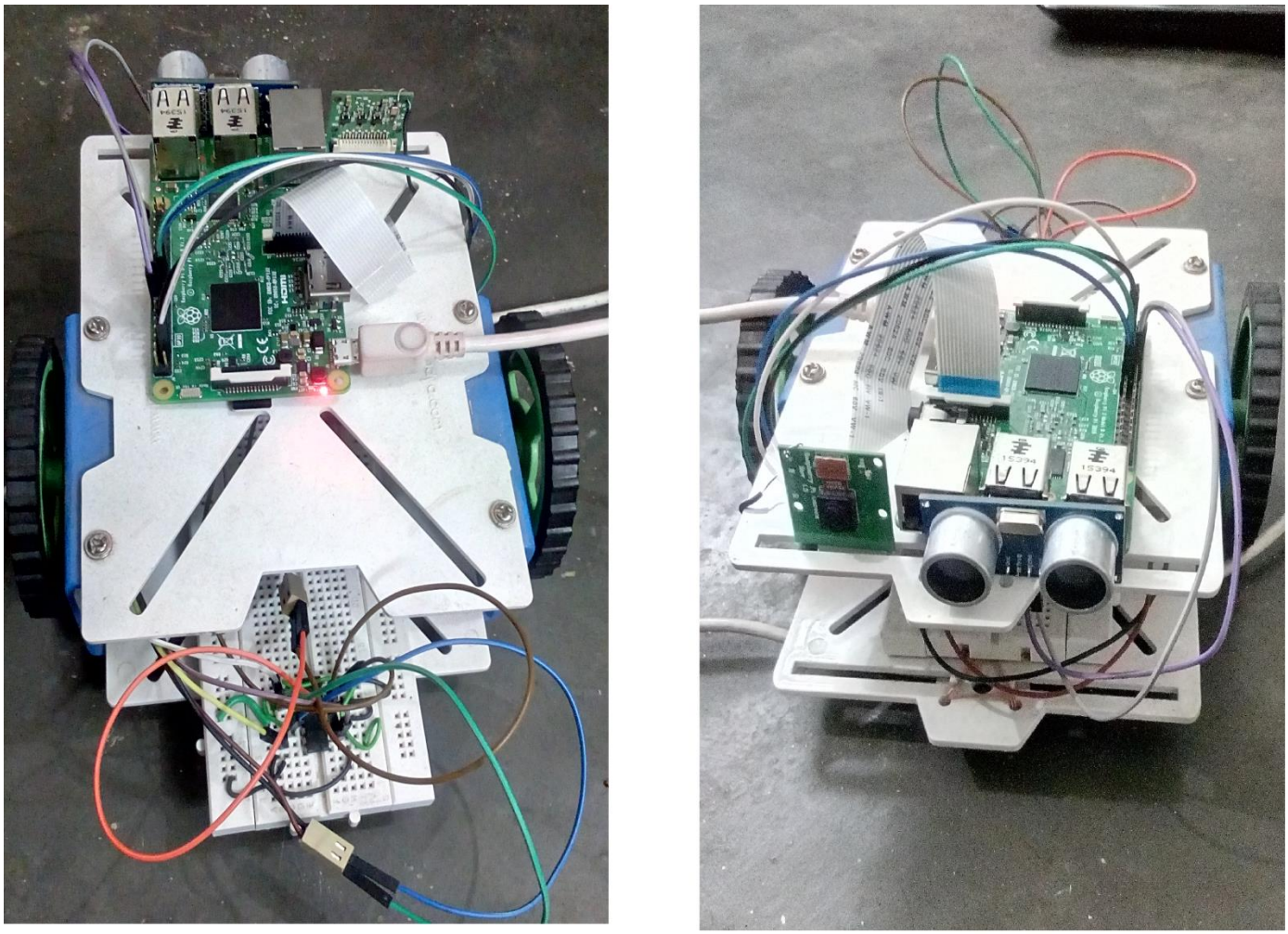

Fig 1.0: Designed system

1.1 Working principle of vehicle controls

Vehicle control systems are basically designed to save the assets of people like money and time and make the vehicle more advance .This system used ultrasonic sensor for the avoidance of the obstacles and camera is used to get the images of the traffic lights and signals from the real world and raspberrypi is used to control the system and take the decision according to the information obtained by the camera and ultrasonic sensors.

1.2 Raspberrypi-3

Raspberry pi3 is the 3rd generation of the raspberry pi.It replaced the pi2 B model of raspberry pi.It has following features inbuilt:

*802.11n wireless LAN

*1.2 Ghz ARMv8 CPU

*Bluetooth

*1Gb RAM

*40 GPIO pins

*Ethernet port

*Full HDMI port

*Camera and Display interface.[12]

The Raspberry Pi 3 has an indistinguishable frame variable to the past Pi 2 (and Pi 1 Model B+) and has finish similarity with Raspberry Pi 1 and 2. We prescribe the Raspberry Pi 3 Model B for use in schools, or for any broad utilize. Those wishing to install their Pi in a venture may incline toward the Pi Zero or Model A+, which are more helpful for inserted activities, and tasks which require low power.[13]

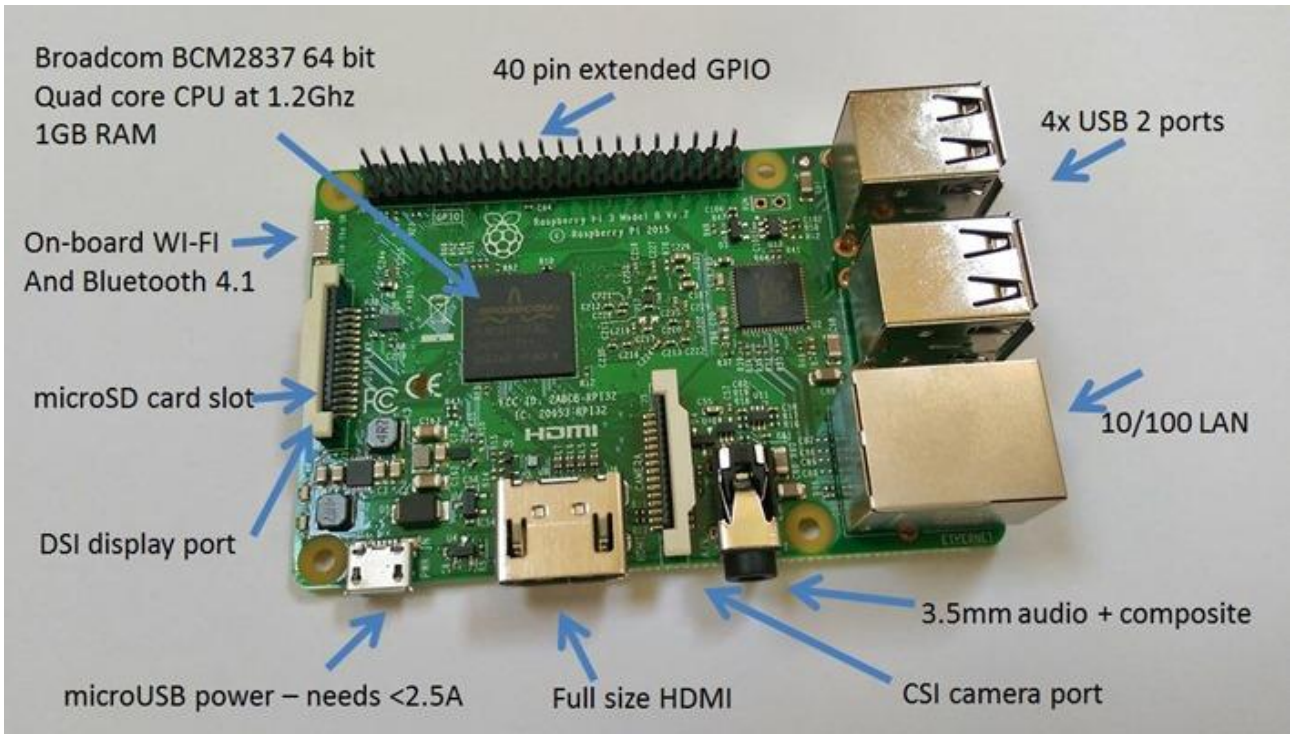

Fig 1.1: Raspberry pi3

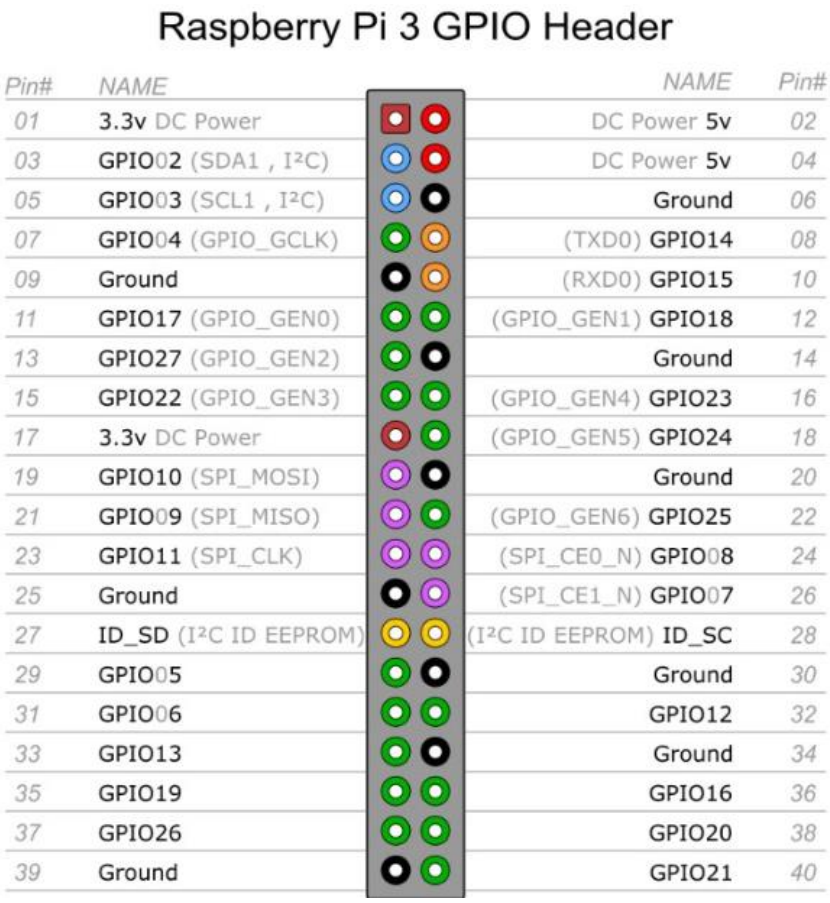

Fig 1.2 : GPIO pin description of Pi3.[14]

1.3 Camera

The camera module is used to take videos as well as it is used to take the photographs or images.It is easy to interface with Raspberry pi.Since this is usb camera so we can easily interface it through the raspberry pi where 4 usb ports are available.There are multiple libraries available for camera interface to make it easy to use.The camera module works with all model of the Raspberry pi.camera is basically used in this system to take the real world images and helps in determining the red signal and sign boards. .

Fig 1.3 : Camera

1.4 Ultrasonic sensor

A Ultrasonic sensor is a gadget that can gauge the separation to a question by utilizing sound waves. It allots separate by sending a sound wave at a particular recurrence and tuning in for that sound wave to bob back. By recording the slipped by time between the sound wave being created and the sound wave ricocheting back, it is conceivable to figure the separation between the sonar sensor and the protest. Since it is realized that sound goes through air at around 344 m/s (1129 ft/s), you can set aside the ideal opportunity for the sound wave to return and duplicate it by 344 meters (or 1129 feet) to locate the aggregate round-trek separation of the sound wave. Round-outing implies that the sound wave voyaged 2 times the separation to the question before it was distinguished by the sensor; it incorporates the "trip" from the sonar sensor to the protest AND the "trip" from the question the Ultrasonic sensor (after the sound wave ricocheted off the question). To discover the separation to the protest, essentially isolate the round-trek remove into equal parts.

Features:

- Operating Voltage: 5V DC
- Operating Current: 15mA
- Measure Angle: 15°
- Ranging Distance: 2cm - 4m

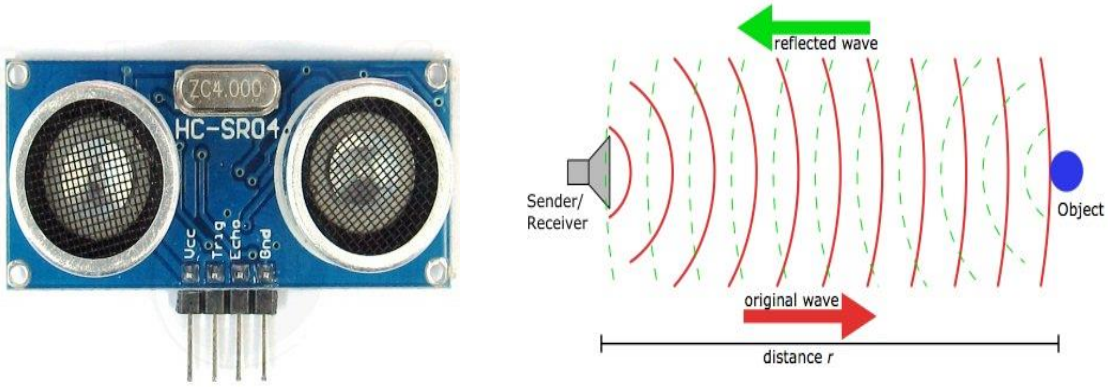

Fig 1.4: Ultrasonic sensor and it`s working

Four pins of ultrasonic sensor HC-SR04 are:

*vcc- 5v,input power

*trig- trigger input

*echo- echo output

*gnd- ground.[16]

1.5 Motor driver IC:

L293D contains two inbuilt H-connect driver circuits. In its basic method of operation, two DC engines can be driven all the while, both in forward and switch heading. The engine operations of two engines can be controlled by information rationale at pins 2 and 7 and 10 and 15. Input rationale 00 or 11 will stop the relating engine. Rationale 01 and 10 will pivot it in clockwise and anticlockwise bearings, separately.

Empower pins 1 and 9 (comparing to the two engines) must be high for engines to begin working. At the point when an empower information is high, the related driver gets empowered. Accordingly, the yields wind up noticeably dynamic and work in stage with their information sources. Additionally, when the empower info is low, that driver is crippled, and their yields are off and in the high-impedance state.[17]

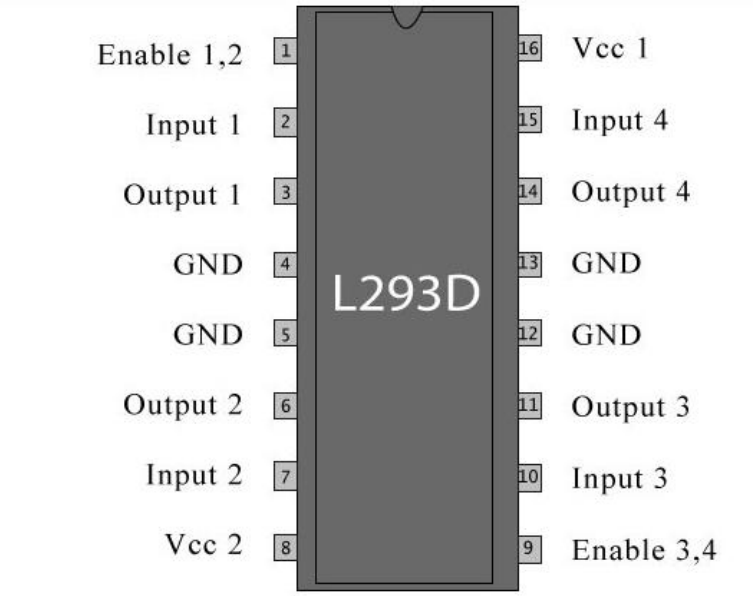

Fig 1.5 : Pin diagram of l293d

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc_2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc_1

Fig 1.6 : Pin description of l293d IC.

1.6 Python

Python is a broadly utilized abnormal state programming dialect for universally useful programming, made by Guido van Rossum and first discharged in 1991. A translated dialect, Python has an outline theory which underlines code coherence (quite utilizing whitespace space to delimit code squares as opposed to wavy props or catchphrases), and a sentence structure which enables developers to express ideas in less lines of code than conceivable in dialects, for example, C++ or Java.[22][23] The dialect gives builds planned to empower composing clear projects on both a little and expansive scale.[19]

1.7 Opencv

OpenCV (Open Source Computer Vision) is a library of programming capacities for the most part gone for ongoing PC vision.[2] Originally created by Intel's exploration focus in Nizhny Novgorod (Russia), it was later upheld by Willow Garage and is presently kept up by Itseez. The library is cross-stage and free for use under the open-source BSD permit.[20]

CHAPTER-2

LITERATURE REVIEW

INTRODUCTION

In this chapter ,results of various literature research in the field of control system enhancement for the use VEHICLE CONTROL SYSTEM are presented.This chapter described about the various projects undertaken by different scientists and engineers in the field of controlling vehicle automatically.The survey and this review show the various theoreticall as well as practically implemented projects to control vehicle for the safety of the drivers and other people inside the vehicle or outside the vehicle

2.1 Research Papers

Chong Han et. Al [IEEE 2008]: In this exploration paper Chong had chip away at the Vehicle discovery by camcorders is a standout amongst the most encouraging new advances for remote largescale information gathering and execution of cutting edge movement control and administration plans, for example, vehicle direction/route. In this paper we propose a way to deal with identify and include vehicles at a crossing point continuous, utilizing a settled camera. In the wake of distinguishing moving items pictures by means of foundation casing differencing, edge location, disintegration and widening operations are performed to smother clamor. Isolated and pivoted appropriately, the denoised double picture is then used to produce a vertical projection histogram from which data about the size and facilitates of every part is used to figure the quantity of vehicles. This identification calculation gives an estimated number of vehicles. A versatile activity flag control system controls the movement stream. The recreating comes about demonstrate an extraordinary productivity of activity control and administration plot by and by.[1]

Fig 2.1: Background image

Fig 2.2: Current image

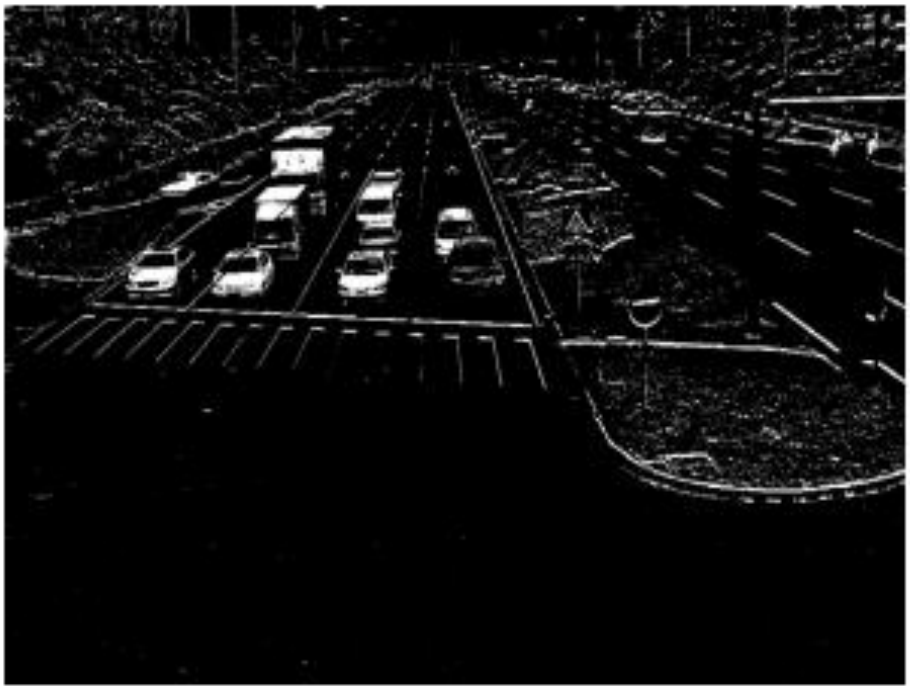

Fig 2.3: The binary variation image.

Ray-Shine Run et. Al [IEEE 2010]: The utilization of GPS is developing quick as of late. In military and science purposes, as well as in common utilize, GPS assumes a critical part in numerous electronic frameworks. For instance the electronic route of vehicle, the electronic guide of PDA, and so on. To convey an examination on this subject, we exhort a minimal effort vehicle GPS direction framework controlled by a 8-bit MCU (MCS-51), in which capacities, for

example, GPS managing, impediment evasion, movement control and remote correspondence are incorporated. Because of spending point of confinement, we just proficient the model on a "toy auto". In any case, the experience of this venture urged us to continue for the following stride. We would like to exchange the related innovation to viable vehicle sooner rather than Later.[2]

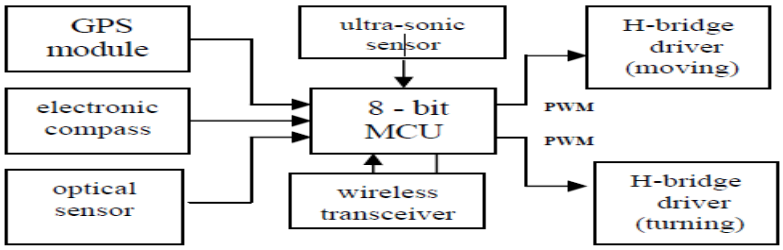

Fig 2.4: System block diagram of a guidance system

Fig 2.5: Perspective and inside views of the toy car

Fig 2.6: Front view of the car and ultra-sonic sensors.

Julian Balcerek [IEEE 2014]: In this paper they have they used camera to get the red and green light changes from red to green so the vehicle start moving when traffic light turns from red to

green without any delay.They also used camera to get the information to change the lane from one lane to another lane.That system helps in save time and avoid the accident on changing from one lane to another.[3]

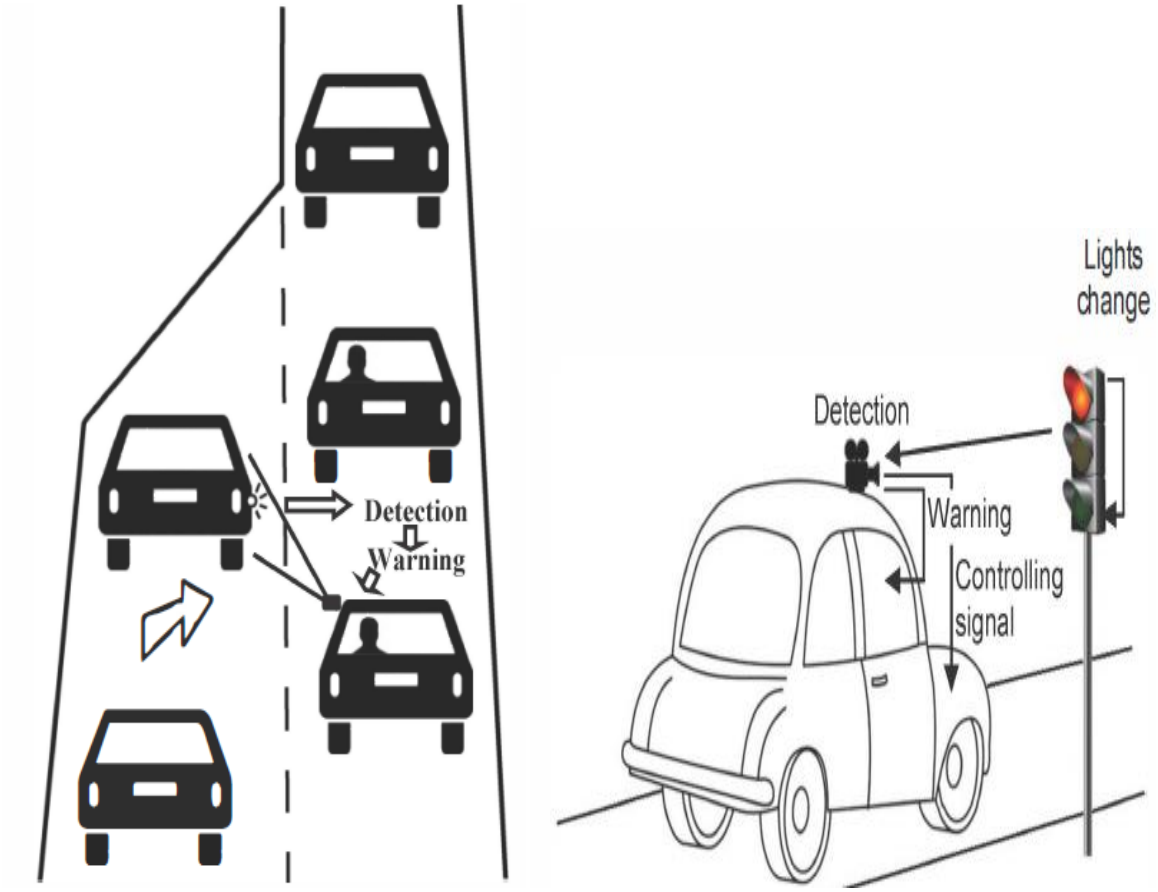

Fig 2.7: Proposed system work

Stephen M. Erlien et. Al [IEEE 2015] : In thi paper, Direct by-wire innovation empowers vehicle security frameworks to impart control to a driver through increase of the driver's controlling summons. Propels in detecting innovations engage these frameworks assist with constant data about the encompassing condition. Utilizing these progressions in vehicle incitation and detecting, the creators introduce a mutual control structure for obstruction evasion and soundness control utilizing two safe driving envelopes. One of these envelopes is characterized by the vehicle taking care of points of confinement, while the other is characterized by spatial restrictions forced by path limits and hindrances. A model prescient control (MPC) plot decides at each time step if the ebb and flow driver summon takes into consideration a sheltered vehicle direction inside these two envelopes, mediating just when such a direction does not exist. Along these lines, the controller offers control with the driver in an insignificantly intrusive way while staying away from hindrances and averting loss of control. The ideal control issue fundamental the controller is characteristically nonconvex however is explained as an arrangement of curved

issues taking into account solid ongoing usage. This approach is approved on an investigation vehicle working with human drivers to arrange snags in a low grating condition.[4]

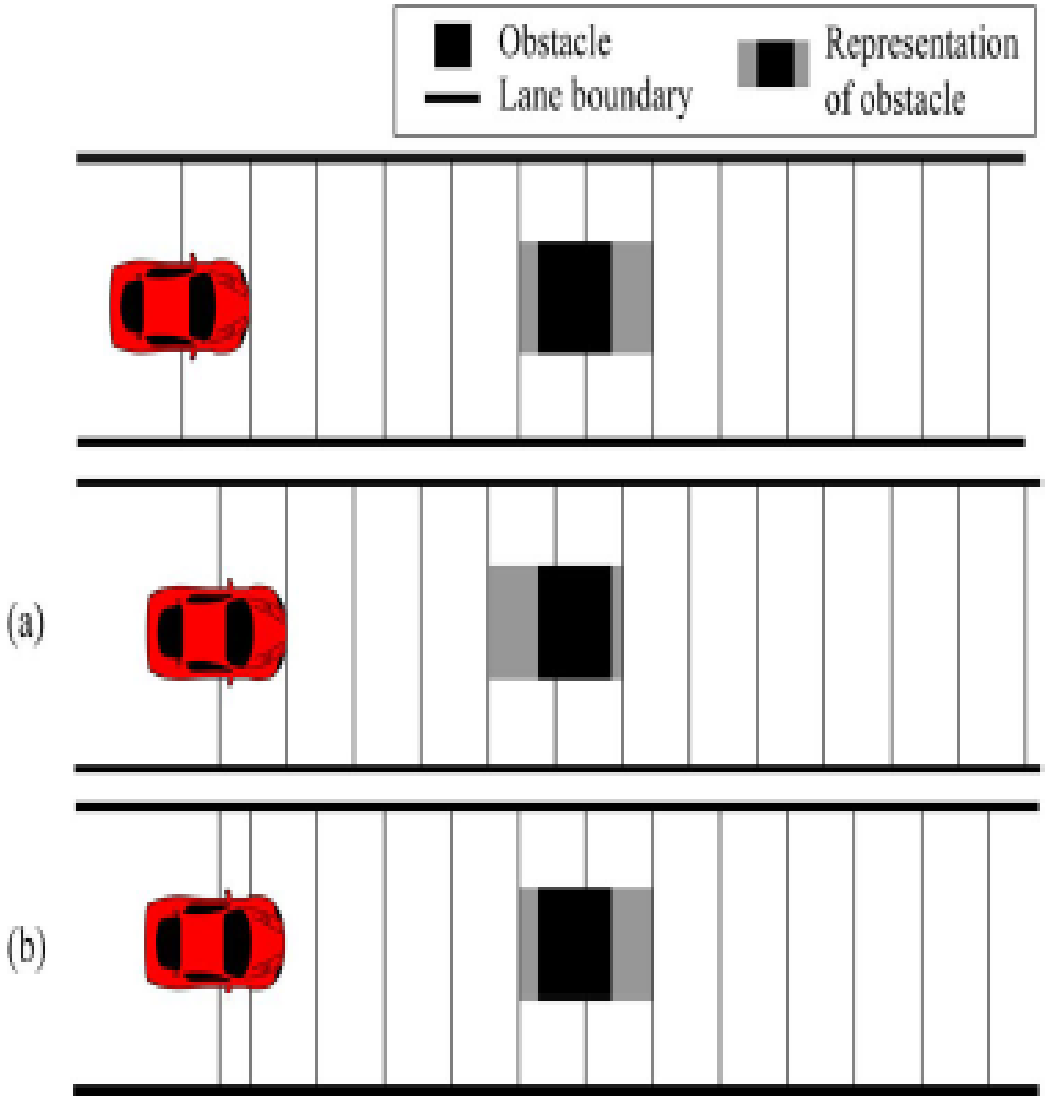

Fig. 2.8: Representation of the environment re-evaluated a short time later (a) without a correction time step and (b) with a correction time step.

DUAN Jianmin et. Al [IEEE 2015]: To make a driverless car with better environment awareness, multi-layer laser radar was applied to detect roads and obstacles. Firstly the road edge data set was extracted from numerous laser radar data based on characteristics of the road edge data, and the cluster analysis of the data sets was done with the improved COBWEB algorithm based on Euclidean distance. In order to divide the road into drivable area and undrivable area, the left and right road edges were respectively fitted into a straight line with the least squares method. Secondly DSmT was applied to establish a grid map for the environment, and dynamic obstacles were detected by the conflict coefficient within drivable area. Finally, the cluster analysis and information extraction of dynamic obstacles was completed by the expansion

algorithm, erosion algorithm and improved eight neighborhood labeling algorithm. The results show that the algorithm can significantly reduce redundant operations and improve efficiency.[5]

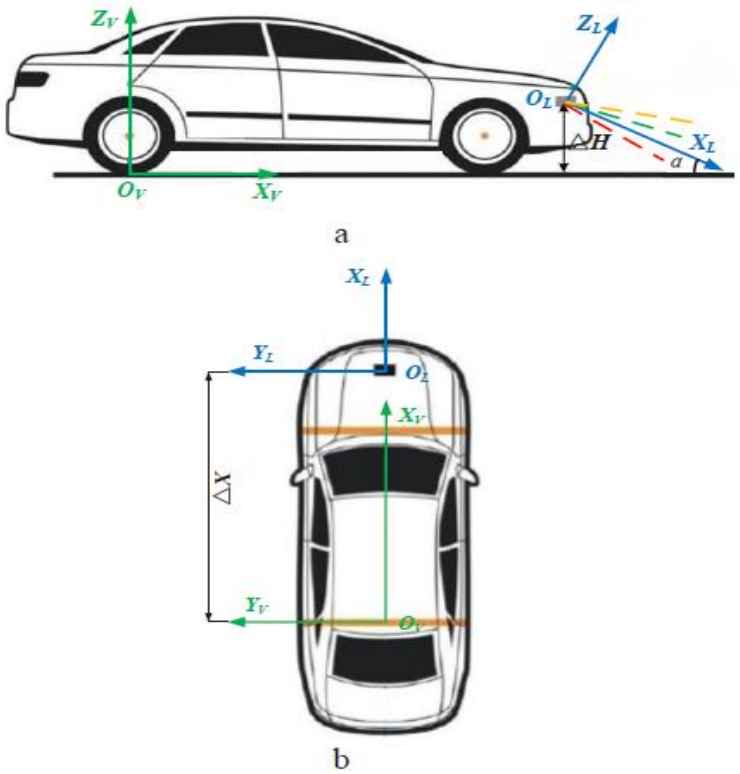

Fig 2.9: Establish the coordinate system (a: lateral view, b: vertical view)

Gurjashan Singh Pannu et. Al [IJCAT 2015]: The project aims to build a monocular vision autonomous car prototype using Raspberry Pi as a processing chip. An HD camera along with an ultrasonic sensor is used to provide necessary data from the real world to the car. The car is capable of reaching the given destination safely and intelligently thus avoiding the risk of human errors. Many existing algorithms like lane detection, obstacle detection are combined together to provide the necessary control to the car.[6]

Fig 2.10: Original road with region of interest (ROI)

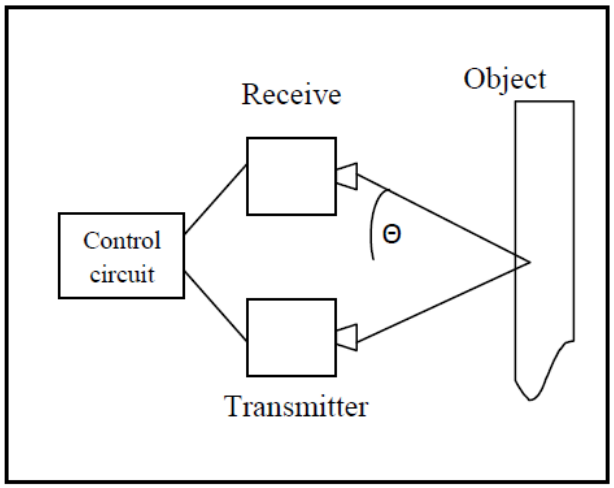

Fig 2.11: Concept of ultrasonic sensor.[6]

Ryo Gohara et.Al [IEEE 2015]: Different reviews have been directed in regards to vehicles and hindrances avoidance,but not very many reviews manage the evasion of snags that all of a sudden and surprisingly show up amid vehicle operation. We direct programmed ceasing control of the vehicle utilizing fluffy control framework when the vehicle stop suddenly.The propose framework conducts halting control of the vehicle relying upon the separation to the obstruction. The reproduction tests and genuine trials utilizing a versatile robot in the interest of a vehicle were led in regards to the proposition.[7]

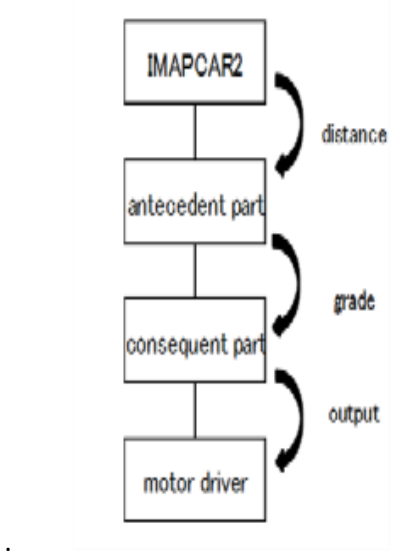

Fig 2.12: Speed control flow.[7]

Kiran Rafique Memon et. Al [IEEE 2016]: Assurance of an appropriate way for a robot that is sans impact between the underlying and end position through a workspace within the sight of snags is trying for self-ruling robot outline .In this paper ,we introduce a model of an independent portable robot that finds the ideal way utilizing google route to explore in a realtime environment.However,google maps or google route don't give realtime obstructions at the current time,so it is likewise critical to think about the constant deterrents display and to keep away from them in genuine time.The robot that we have composed comprises of two section,one is versatile robot and other is work station.The capacity of the work station is to communicate with google delineate acquire numerous approaches to come to the destination,it additionally finds ideal route from different ways and teach the robot to take after the ideal way.The robot will be given an objective area utilizing GPS directions and robot needs to discover its way from current position to focus by finding the ideal way and dodging the impediments and discovering its path even inside the building.[8]

Fig 2.13: Designed robot.[8]

Fig 2.14: Route from IT department to ECE department.[8]

Biqiang Du et. Al [IEEE 2016]: A typical UAV(Unmanned Aerial Vehicle's) impact shirking module was acquainted in this paper with handle the battle wellbeing of the UAV.Some ultrasonic sensor were utilized to gather the hindrance's separation and bearing data progressively. The fluffy calculation was utilized to arrange another obstruction shirking way in view of the information.By assuming control over the control right of the flight controller and sending it to the new order for the movements,the module will permit the UAV to complete the snags evasion task.During the procedure ,any alteration on the first codes of the battle controller was not needed.The MATLAB reproductions and examinations checked the adequacy of the normal UAV's impact shirking module.[9]

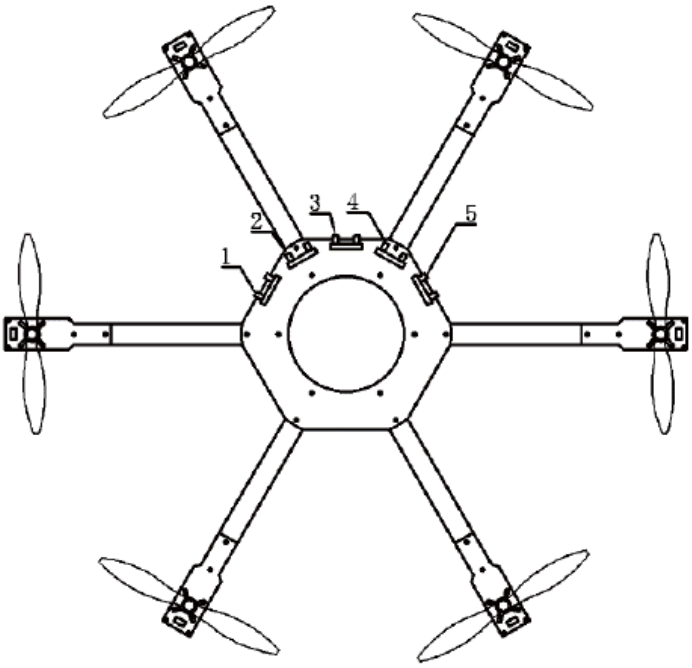

Fig 2.15: Sketch map of the ultrasonic sensor mounting position..[9]

Fig 2.16: UAV with the obstacle avoidance module.[9]

Fig 2.17: flight test.[9]

Jinghua Guo et. Al [IEEE 2016]: This paper examines dynamic control plan for mechanized driving of vision-based independent vehicles, with an uncommon concentrate on the organized guiding and braking control in crisis hindrance evasion. An independent vehicle is a complex multi-input and multi-yield (MIMO) framework, which has the elements of parameter vulnerabilities and solid nonlinearities, and the coupled marvels of longitudinal and sidelong progression are apparent in a consolidated cornering and braking maneuver.In this work, a powerful planned control framework for computerized driving is proposed to manage these coupled and nonlinear elements and reject the unsettling influences. Initial, a dream calculation is built to recognize the reference way and give the neighborhood area data amongst vehicles and reference way continuously. At that point, a novel facilitated guiding and braking control methodology is proposed in view of the nonlinear backstepping control hypothesis and the versatile fluffy sliding-mode control strategy, and the asymptotic union of the proposed composed control framework is demonstrated by the Lyapunov hypothesis. At long last, trial tests show that the proposed control technique has great following execution and upgrades the riding solace and dependability of self-sufficient vehicles.[10]

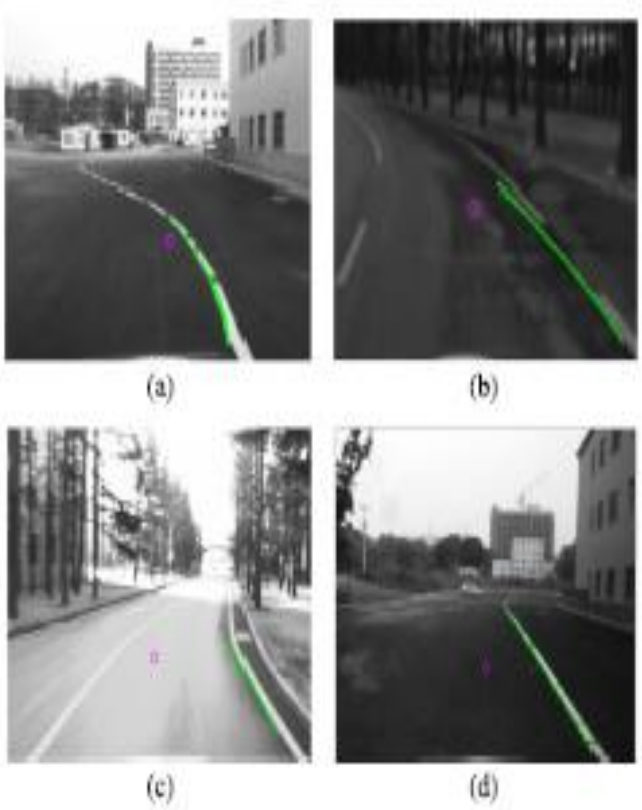

Fig 2.18: Extracted results in different working conditions.

Ching-Lung Su et.Al [IEEE 2016]: This paper presents a design and its implementation of our automatic vehicle that travels outdoors without drivers. Users program the routes by our proposed smartphone application which routes are from Google map API. The vehicle applies the sensors of GPS, LiDAR, and cameras to direct the driving path. The sonars are also applied to the collision prevention in short distance. Based on the restriction of traffic rules, the proposed vehicle be used in close area transportation, such as the campuses and factories.[11]

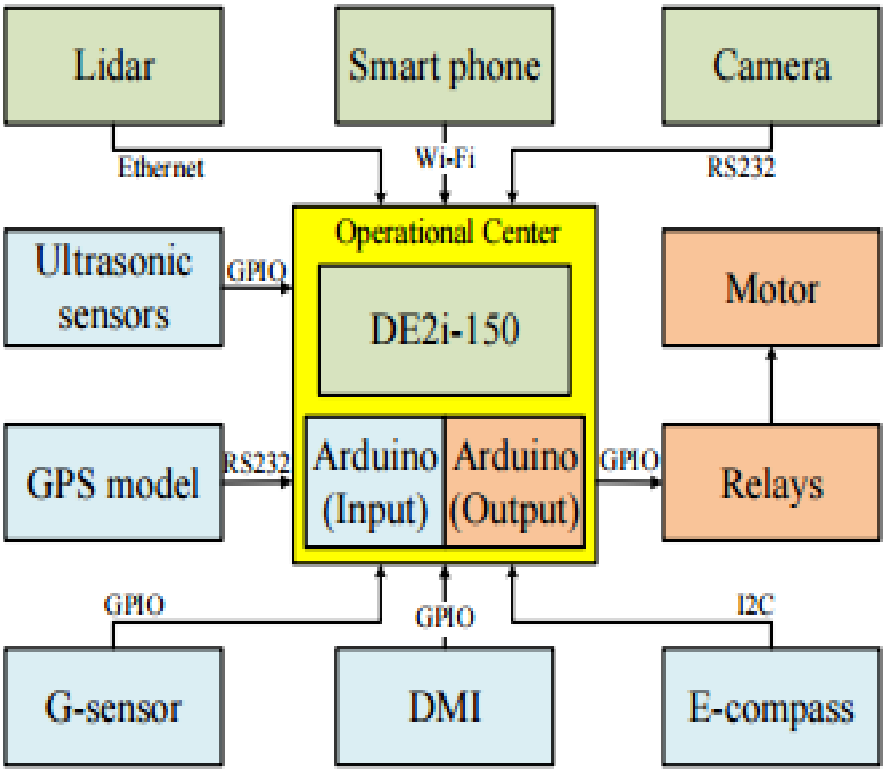

Fig 2.19: System structure diagram.[11]

Fig 2.20: Obstacles distribution.[11]

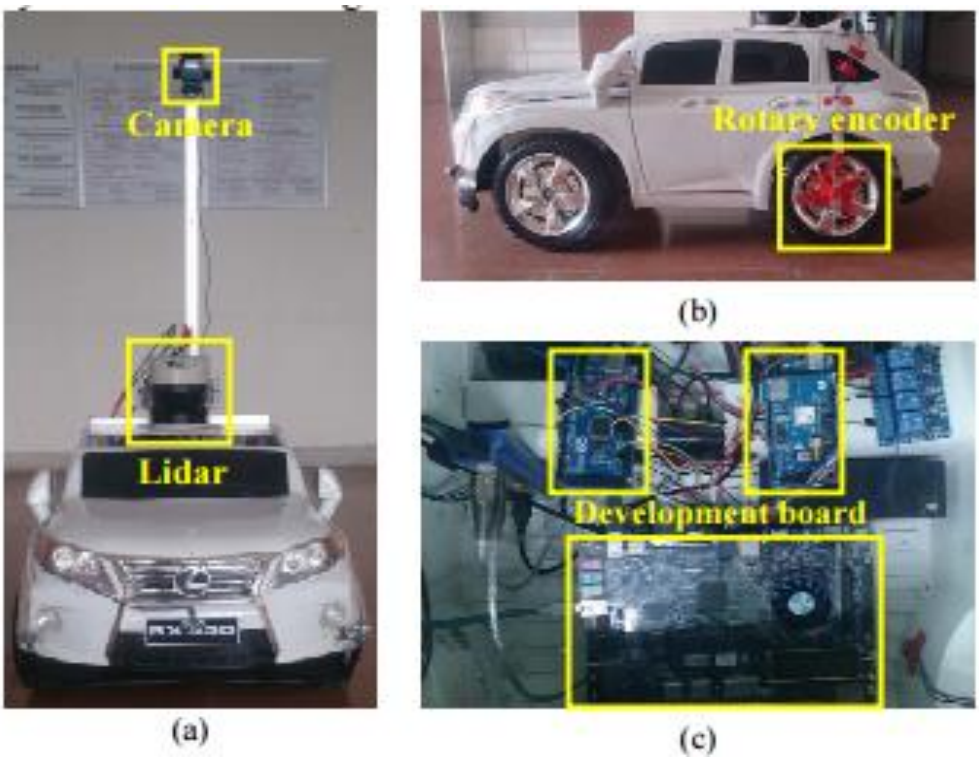

Fig 2.21: (a) Elevation view of vehicle. (b) Side elevation view of vehicle. (c) Configuration of development board.

2.2 Conclusion from the literature review

From all the above research paper I have conclude that to make vehicle more advance we need to avoid the obstacles coming through the way of vehicle and other things also we need to do is to control the vehicle according to the traffic lights and signal boards.The avoidance of obstacles in the road while travelling into the car or other vehicle is very important to avoid the road accidents.There are various methods discussed about the avoidance of the obstacles.For that we have to design a system that can detect the obstacles and notify the system in advance so that system will take action to avoid the any kind of accident to save the assets.For the detection of obstacles we can use Camera or other sensors like ultrasonic sensor,if we will use camera then it require more computation and calculation that generate delays so in my system instead of camera I used ultrasonic sensor that will give more accurate and real time informations about the obstacles.The second thing in my system will be the detection of the traffic signals and signs ,so my system will avoid collisions at traffic red signals also help in reducing the traffic at the red signal light places.System have to also detect the spped limit signs and also detect the stop boards so it will also helps in reducing the road accidents.So the system designing for obstacle detection ,traffic light detection ,speed limit signs detection and stopboard detection will save the lifes and helps in reducing the road accidents.

CHAPTER-3

OBJECTIVE

The main objective of my system is to the detection of the traffic signals and signs.According to the detection of these signals and signs used in the traffics the proposed system will take action accordingly needed at the time of detection of the traffic signs.Another aim is to avoid the collision of vehicle or any other obstacles .For the avoidance of the obstacles this proposed system used ultrasonic sensor to get the distance of the obstacles ahead of the vehicle,accordingly system will stop or reduce/slowdown the speed of the vehicle.

To design this system there is requirement of followings:

*Raspberry pi3-Used for processing the data get from the realworld.

*Opencv-Used for image processing for the detection of the red light dignal,speed limit signs and also for the detection of the stopboard signs.

*Camera-It is needed to get real world information about traffic signs and signals.

*Ultrasonic sensor-Needed to get the distance of the obstacles ahead of the vehicles.

CHAPTER-4

METHODOLOGY

Due to low budget we used a two wheel chasis for the car and implemented all the techniques that gives accurate results.

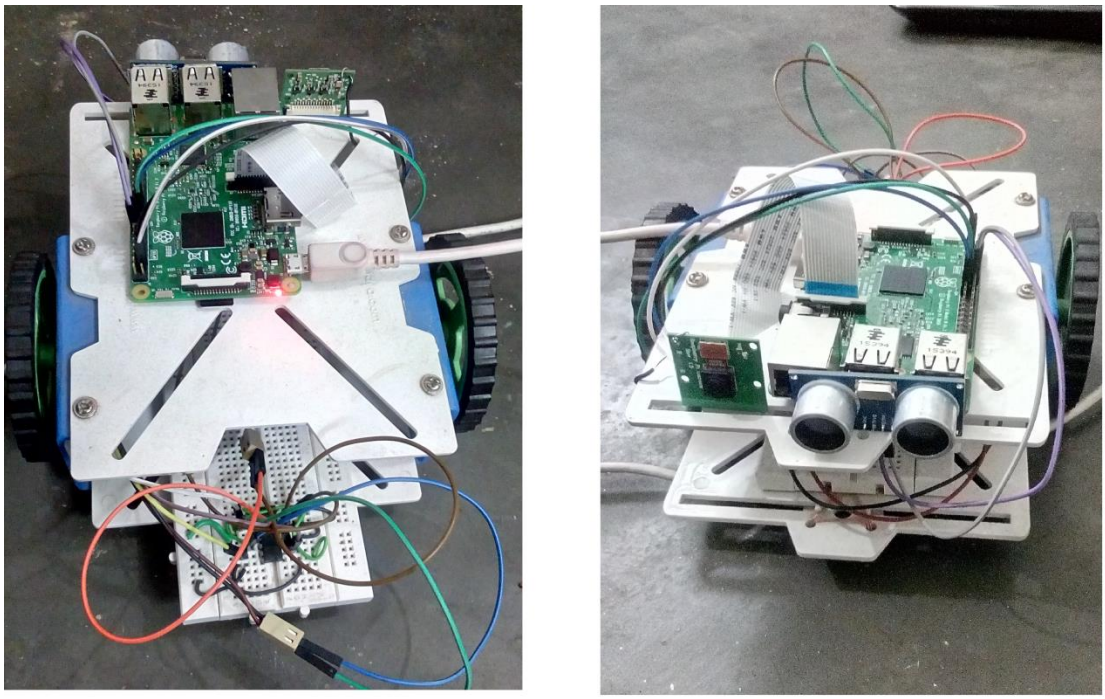

Fig 4.1: Designed two wheel chasis car

4.1 Traffic signs and signal detection

The main work of the proposed system is to detect the sign boards like stop board and signals like red light signal. For red signal system will always trying to determine between the lower and upper range of the red colour and a rectangle be formed on the red signals.The rectangle formed on the red light signal has a fixed area by the use of that area system creates a signal that control the gpio pins of the raspberrypi.

For the detection of the stop board sign system used cascade classifier in which it compare the xml file of different size of stop word with the input available from real world of traffic signboards using camera.After match found it generates a signal so the pi sends a control signal to the l293d to control the motors of the chasis.

4.2 Obstacle detection

Using the ultrasonic sensor system get the distance of the objects ahead of the car .It gives the distance upto the 4 metre and to control the car and applied the break 1 metre distance is enough

so when any objects comes at the range of danger of 50 cm ,it stops the wheels to avoid the accidents.

4.3 Security for parking

During parking of the car there is problem of back side damges by accident so we used an ultrasonic sensor at the backside of the car to avoid these errors .So by the use of an ultrasonic sensor we can save our time and money as well and design a car more technically efficient in performance.

4.4 Working of the system:

The proposed system is basically designing to protect the vehicle and the person inside or outside the vehicle and it is designing to reduce the road accident that is the major issues of todays life.We lost lot of things because of a single accident and we will not get back those things that are so important.So to help in reducing these road accidents this proposed system is basically designed for the safety and security of the assests like life of the human beings that are in danger due to road accidents .It will help in to control the road accidents happened by the traffic signs and signals.This system will detect the following parameters:

*Detect the obstacles ahead of the vehicle.

*Detection of the speed limit signs.

*Detection of the red light signals.

*It will also detect the stopboards.

After detecting above parameter system will perform various operation like:

*Slow down the speed of the vehicle while obstacle detected but not very close to the vehicle.

*It will stop the vehicle in case obstacle is very near to the vehicle.

*System will stop the vehicle after detection of the red light signal.

*Vehicle will force to slow down the speed in case speed limit signs occurred.

Following steps follow for the working of the system:

***Power supply to the designed system.

*Raspberry pi3 initialize all components like- camera, ultrasonic sensor,l293d IC,

*Programm of the system starts running.

* Ultrasonic sensor gives distance of object coming in the way of vehicle and it will gives signal to the control for controlling the vehicle when any objects comes very closer to the vehicle and ccreate chances of accident so after getting closer o danger signal controller will take action and control the vehicle.

Formula used for the distance measurement using ultrasonic sensor:

The speed of sound at sea level is taken as baseline that is 343 m/s.

34300 = Distance/(time/2)

17150 =Distance/time

17150 * time = Distance.[15]

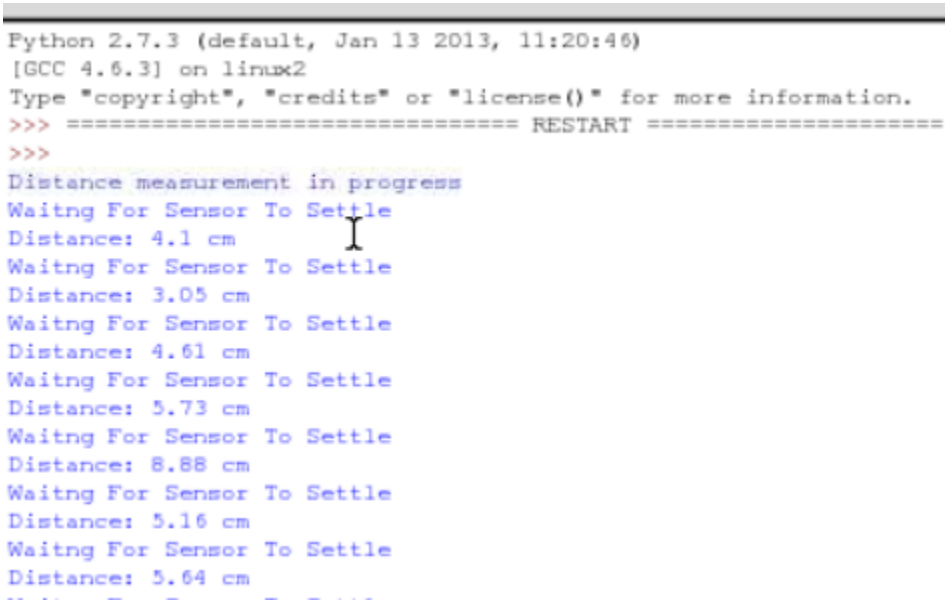

Fig 4.2: Distance measure by ultrasonic sensor.

*Detection of stop sign boards done by the camera which takes real world information and starts cpmparing with the stop sign boards

*For stop sign board detection I used haarcascade algorithm.

-In haarcascade I used multiple number of positive samples of stop board means different shape sizes of stop words taken as positive sample.

-Also number of negative samples taken ,negative samples means other than the stop words or positive samples.

-Then using Haarcascade algorithm train the system to learn stop word in different situation.

-After training the using these negative and positive samples a new .xml file has generated that is used in the program for matching real world data with stop word

-.xml file that has generated after the training can be saved in the same directory where the program has saved.

-Then only that .xml file can be usable

-Now when we run the programm for the detection of the stop sign board stop word will detected and a square around stop word will generated that notify that the stop word has detected.

Fig 4.3: Stop word detection.

*After getting the input from the camera to control the system.

*Controller send signal to the motor driver IC (l293d).

*L293d IC will control the motors according to the received signal from the pi.

*If signal for the stop word detected from the camera then pi will send stop signal to the l293d IC.

*Other than stoping signal pi will continuously send the True signal so that motor will continuously moves .

*Detection of the red signal basically based on the range of the colours,In this I used the range of the red signal and took the upper value and lower values for the BRG for detection of red colours that will detect red lights.

After detection of red light same as the stop sign board detection I generated a square on the red detected area for confirmation that signal has detected.Take that area accordingly to stop the vehicle if area is more means vehicle is closer to the red signal and if the area is less means vehicle is far from the red signal.When vehicle comes closer to the red signal controller will stop the vehicle till red signal will present.

Fig 4.4: Red signal detection

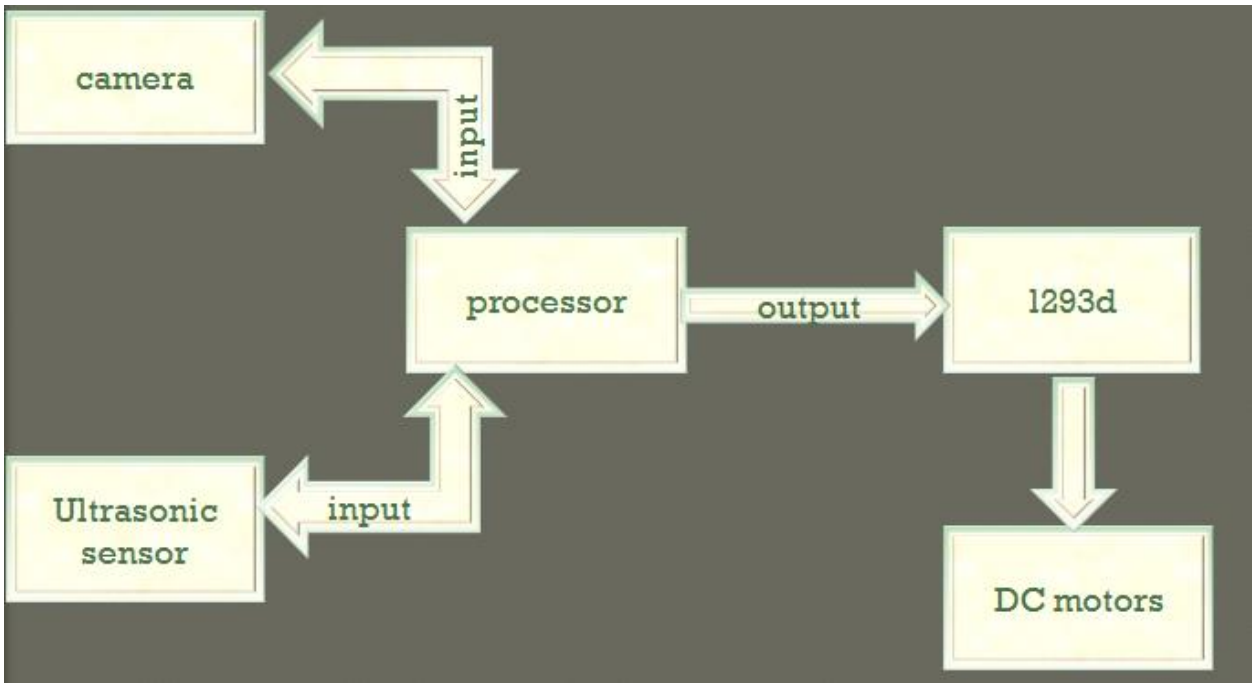

Fig 4.5 : Block diagram of the system

CHAPTER-5

RESULT AND ANALYSIS

In this proposed system the aim was to avoid the obstacles by measuring the distance,to detect the red signal and stop sign board of the traffic and control the gpio pins of the raspberry pi.After implementation of all these objective finally my system is able to detect the stop sign board and also able to detect red signal, also able to avoid the obstacles in a define range using ultrasonic sensor.

After implementing all the required objective ,final things required was to control the gpio pins that is also controlled successfully.All this proposed system is practically implemented using a robot car. Robot car follow a black colour as a road and it will stop if any obstacles comes in front of the robot car,it will also stop when red signal or stop sign boards comes while running the car.

Stop sign board detection and red signal detection implemented on the raspberry pi and also implemented in laptop having intel i3 processor .After successfully implementation on both platform I compared the output coming from both the platform .Following are the comparision of from both the platform are :

Points	**Intel i3**	**Raspberry pi3**
OS	Available	Available
DELAY	Less	More
SPEED	Fast	Moderate
GPIO	Unavailable	Available

Table 5.1 : comparision of intel i3 and raspberry pi.

Comparision between IR sensor and Ultrasonic

Points	**IR Sensor**	**Ultrsonic sensor**
Range	Less	More
Accuracy	Less	More
Destruction	More	Less

Table 5.2 :comparision of IR and Ultrasonic

CHAPTER-6

TIMELINES

In this research process I have done my work at the given timeline by my mentor.He has decided for the completion my research work in the steps and he helped me lot to complete the work in time.Timeline for my work has been mentioned below:

DATE TIMELINE	**WORK**
JAN –APRIL(2016)	Searched various paper and read them and finalized the topic .
MAY-JULY(2016)	Work on basic level of pi like installing os then opencv etc.
AUGUST-SEPTEMBER(2016)	Learn basics of python and implemented on software
OCTOBER-DECEMBER(2016)	Interfacing of different hardware with Raspberrypi.
JANUARY(2017)	Finding the working of haarcascade and train the system for the required images.
FEB-MARCH(2017)	Make the system in running state
APRIL(2017)	Paper work for publishing and final report working.

Table 6.1: Timeline report

CHAPTER-7

FACILITIES FOR THE PROPOSED WORK

Facilities used

1.Lab

2.Python

3.Internet

4.Library books

5.Journals and Publication

6.Mentor help

Proposed place of work

Lovely Professional University Phagwara Punjab,144005

CHAPTER-8

SUMMARY AND FUTURE SCOPE

Summary:

Today`s major challenge is to reduce the road accident that happens due to many reasons like – not following the rules of traffic, driver mistakes etc,So to overcome these problems this proposed system will definitely helps and reduce the road accident.This system automatically control the vehicle when any obstacles comes in front of vehicles and also take care of red signals and stop sign boards.System will automatically detect these signals and signs of the traffic and control the vehicle.

For obstacle avoidance ultrasonic is used that will give the distance of the obstacles coming in front of vehicle.Camera is used for the detection of the stop sign board and red signal. Raspberry pi is used as controller for the system that will take input from the camera and ultrasonic sensor and generate output to control the car.

Future scope:

In this system there is some delay and to overcome the problem of delay we need to use more powerful processor than the raspberry pi.To increase the distance range we can use lidar or we have to use more powerful ultrasonic sensor that can measure more distance.

To make this system we have to use machine learning algorithms that will allow the system to learn itself .So by the use of machine learning system will become self learner and take action And also reduce the chances of errors.

*machine learning algorithm

*more powerful processor for omage processing

*for more distance more powerful ultrasonic sensor having power to measure more distance with this accuracy.

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