# IOT BASED SELF DRIVING CAR

**BY**

**Sadi Mohammad Omi**
**ID: 172-15-9665**

**Md. Robin**
**ID: 172-15-9910**

**Tanbhir Ahmed Tonu**
**ID: 172-15-9589**

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

**Ms. Nazmun Nessa Moon**
Assistant Professor
Department of CSE
Daffodil International University


**DAFFODIL INTERNATIONAL UNIVERSITY**
**DHAKA, BANGLADESH**
**APRIL 2021**

# APPROVAL

This Project titled "**IoT Based Self Driving Car**", submitted by Sadi Mohammad Omi , ID: 172-15-9665, Md.Robin, ID: 172-15-9910, Tanbhir Ahmed Tonu, ID: 172-15-9589, to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and affirmed concerning its style and substance. The presentation has been held on 3 June 2021.

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**Dr. Touhid Bhuiyan**
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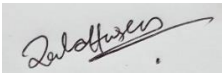

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**External Examiner**

**Dr. Md Arshad Ali**
**Associate Professor**
Department of Computer Science and Engineering
Hajee Mohammad Danesh Science and Technology Universit

# DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon, Assistant Professor, and Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

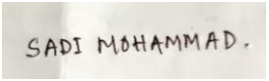
**Supervised by:**

**Ms. Nazmun Nessa Moon**
Assistant Professor
Department of CSE
Daffodil International University

**Co-Supervised by:**

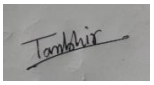
Raja Tariqul Hasan Tusher
Lecturer (Senior Scale)
Department of CSE
Daffodil International University

**Submitted by:**




**Sadi Mohammad Omi**
ID: 171-15-9665
Department of CSE
Daffodil International University

**Md. Robin**
ID: 172-15-9910
Department of CSE
Daffodil International University



**Tanbhir Ahmed Tonu**
ID: 172-15-9589
Department of CSE
Daffodil International University

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Finally, we must acknowledge with due respect the continuous support and patients of my parents.

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# ABSTRACT

This project is an IoT based development project titled "**IoT Based Self Driving Car**". This IoT based development project is designed & built for those people who have knowledge of using digital smart technology. In Keeping pace with the modern age, the paper has been focuses on automated vehicles to make it easier for the human driver. In the field of automobile various aspects have been considered which makes a vehicle automated. Self-driving cars have been tested since the 1920s. Since then, in 2010, Google, and the largest network of self-driving cars began work. And new changes are still being developed to give automated vehicles a whole new level. In this study we have focused on a few applications of an automatic car. Which has two lanes in front of a vehicle will later identify the correct lane. Will also automatically detect traffic signals and road signs. Which will reduce the driver's extra brake pressure and help in traffic control. Which has been described in this paper. Here are a few directions from Google Car. The automatic car under consideration will accelerate the modern era as well as weather problems and intelligent movement of traffic is a problem for the automatic car.

# TABLE OF CONTENTS

# LIST OF FIGURES

# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

Automobiles play a special role in technological development. In the case of these automobiles, just as automated vehicles make life easier for mankind, these automated vehicles are very expensive. A four-wheeled robotic prototype on a small scale has been designed on this paper considering different cost and feature aspects. Which will automatically provide the necessary information to the 2MP high resolution pie camera and analyze the Raspberry Pi-4 data (sample) and it will be trained in pie with neural network and machine learning algorithms. As a result, road lanes, traffic lights have to be identified and the car will take turns accordingly. Also how aware is the driver of the vehicle to obey the traffic laws while on the go? We are doing this research to find the solution of this question.

In this research we have focused on five applications.

1. A major problem is traffic accidents .which causes the car to move from one lane to another due to heavy traffic or the driver's unconsciousness. In this reason is created accident. To solve this problem, a solution has been proposed so that the cars can move actively in their respective lanes and relax the driver to make smart and automatic decisions.
2. The second problem is during heavy traffic a driver to slowly reach the destination frequent brakes, accelerators, and clutches have to be pushed constantly. To allow the car to make decisions automatically and to maintain a certain distance from obstacles and to make the car relaxed its solution has been proposed.
3. The third problem is we see awareness road sign boards in various winding ways. But we don't see all the signs because we are in a hurry and unconscious. In this way to face road accidents. Moreover, seeing traffic sings all the time is very annoying. That's why we've come up with a solution to make the driver automatically decide to relax, which will relax the driver.

4. We see different types of lights in traffic signals such as red, yellow and green which will take pictures through the PI camera and send it to the Reservoir PI and after processing it will give Arduino signal so that the car can automatically understand the signal and drive the traffic law and order. And will relax the driver.
5. Many objects lying on the road are often responsible for accidents. So we figured out a solution to the object lying on the road using image processing using a camera that can automatically avoid or stop an object in front of the car. This will reduce accidents.

## 1.2 Motivation

In daily life almost all of us people need this car which makes life very easy and we use cars in different places in our fast working life. A recent study found that about 1.5 million people die in road accidents every year in this car, so we are inspired to start research on how to reduce this accident using the modern world.

Two our project, we get motivated by the main 2 sectors. All are discussed below:

**1) Road accident:** The development of automobiles in the modern age is increasing day by day. If this technology can be used to transform cars into safer vehicles, then the era will go one step further. We have seen millions of people die in road accidents every year with India at the top. Figure 1.1, we have seen in 2017, there were about 0.15 million road accidents in india.


Figure 1.1: Road fatalities in india

There are 53 road accidents that are being reported and most of the incidents are due to driver's unconsciousness. Aslo a road accident report from thiland which shown in Figure 1.2

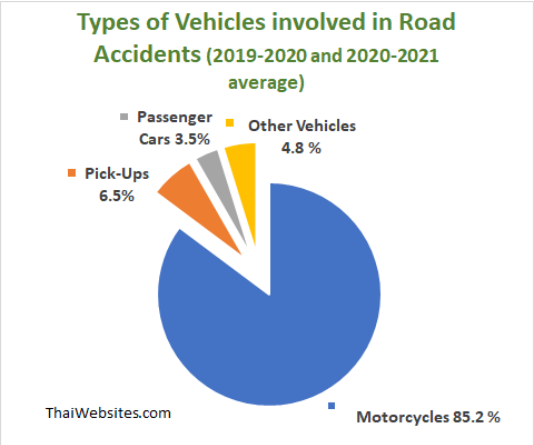


Figure 1.2: Road accident (2020-2021) in thailand

**2) The role of automobiles:** Automobiles are one of the major means of transportation in the world, which is no better than the twentieth century. As technology advances, life becomes easier, so using this technology, we are inspired to create automobile applications to avoid accidents so that we can reach our goals. We focus on building an automated car using the Arduino with the camera module V-2 we get in the Reservoir pie. Unconscious use of traffic control also results in frequent brakeless drivers not paying attention. So we are interested in making automatic cars to relax the driver.

## 1.3 Objectives

- ❖ Introducing smart automatic cars in a future that will reduce road accidents in our country.
- ❖ Ensure self-driving which will relax the driver.
- ❖ Creating a traffic police-free system that allows the car to automatically reach its destination with the help of the traffic control system will reduce the extra stress on the driver.
- ❖ Creating an automated car in a simple system so that any customer can drive a car very easily.
- ❖ Being able to buy an automatic car at an affordable price.
- ❖ Using automated vehicle controlled road system.

## 1.4 Expected Output

- Develop a simple controlled driving system.
- Reducing road accidents.
- Creating an automated self-driving car.
- Creating a comfortable car.
- Will ensure road safety.
- Smarting the driver with technology.

## 1.5 Report Layout

**Chapter 1:** In this chapter we discussed about the motivation, objectives and expected outcome of the project.

**Chapter 2:** This chapter we have described the background, related work which has similar works with this project and also provide challenges that we faced.

**Chapter 3:** Contains basically discuss about research methodology (Raspberry pi camera, Raspberry pi camera, Arduino UNO, L298N Motor Driver) and Methodology at a Glance this is main part of this chapter.

**Chapter 4:** In this chapter discusses all the requirement and work related to the design specification.

**Chapter 5:** This chapter contains the whole results discussion.

**Chapter 6:** Contains conclusion, advantages, limitations, and future work for the development of this project.

# CHAPTER 2

# BACKGROUND

## 2.1 Introduction

This chapter describes the various applications of automobiles and also discusses a few related ones at the same time. The perfect outcome of the project is effectively discussed here. In recent times, technology has become much smarter than ever before. Peoples are doing so much impossible work which they thought in past time. They are researching to discover new things using more and more new technology. So which country has the most investment in a project they have the greater output. Because when an authority invests in a project then the output must be very smarter because they invest the big amount for the latest equipment. Thus they can get the most advanced systems which make their work so simple. So IoT is an advanced form of technology that can be used for doing such inventions. So there are many things which have already invented before by many researchers and developers. So as we are working on some kind of this project so we need to know some of these works. By which we can compare our work as our need that it's actually can fulfill our target and how much our work standard like other works. So the idea of this project is to introduce an automated self-driving car that ensures the safety of both the driver and the passenger from road accidents. So basically our project can be done for road commuters in daily life.

## 2.2 Related Works

In this about part discussed some similar related works with this project.

1. The paper "Self-driving and driver relaxing vehicle" by Shahzeb Ali and Azam Rafique. In this paper an automated car has focused on two applications in which the destination of two cars knows the same form one does not know the other. The two vehicles mentioned will follow one another. Another application states that the driver has to press the brakes and accelerator frequently during a traffic jam. They have solved this by actively creating it. Which will relax the driver [3].

2. The paper "Working model of Self-driving car using Convolutional Neural Network, Raspberry Pi and Arduino" by Aditya Kumar Jain. In this work Rizvi

Pi and Arduino created a self-driving model through UNO. Which connects the raspberry pie with the pie camera and sends the raspberry pie image to the constitutional neural network. The image gives a prediction just before going to the neural network then gives these four outputs left-right-front or stop. The result is then triggered by the Arduino UNO which may later move in a certain direction [4].

3. The paper presented by T. Banerjee, S. Bose, A. Chakraborty, T. Samadder Bhaskar Kumar, T.K. Rana "Self Driving Cars: A Peep into the Future". This paper presents a driverless self-driving, electrified, accident proof and GSM's destination guided car and other embedded control designs. The speed of the vehicle is automatically controlled by keeping a safe distance by accurately locating the vehicle location source and destination and providing adjustments on mapping. Which is the work of speed, having the vehicle in front view. And prevents collisions due to obstruction. Distance of the front and side vehicle are continuously monitored by a stepper motor controlled rotating distance measuring sensor and the speed limit as well as track changing are done accordingly. To prevent collisions 8-megapixel pi-camera with image processing unit has been used to sense traffic signal and traffic density on road. And as an alternative to battery backup, the car uses green energy on the roof [5].

4. In this paper "The Issues and thePossible Solutions for Implementing Self-Driving Cars in Bangladesh" presented by Mohammad Faisal Bin Ahmed, Md. Saef Ullah Miah, Md. Muneef Anjum Timu, Shakura Akter, Md. Sarker.b. Published on some issues of Bangladeshi roads in 2004. Among other things, the most effective way to calculate the Google car. Can change lanes and park if necessary and comply with local traffic rules [6].

5. The paper presented by Giuseppe Lugano "Virtual assistant and self-driving cars" Virtual Assistant a specific software functionality was originally conceived in a desktop computing environment to support the user in learning and using specific software packages. The main purpose of virtual assistants was to increase user productivity and efficiency with specific products. [7].

## 2.3 Comparative Studies

We have seen from previous discussions that all the research and projects have been done in IoT in many sectors. Their most focused is to monitor the whole system using the project. However, there are some problems with their main focus point. They just monitor the field of action and the place of desire and work manually or they just give some ideas. We have tested all the experimental issues for the perfect use of our project. In our project the car will be able to proceed with the decision automatically. Understand the situation and be able to turn left and right and detect different traffic lights and move accordingly. Also the driver will be able to use the automatic car very easily. So this is a great feature in our project. So these features make our project different from the above projects.

## 2.4 Scope of the problem

We already mentioned the scope of the problem above. Mainly this project is for those who are knowledgeable and interested in working with new digital technologies. Because all people want to do their work fast with comfortable. So our project has that comfortable point of work. So to use this project you need to have some general technological knowledge. The project in question was not working during the traffic, which caused a lot of frustration, but it is possible to solve these problems in the future. The problem is to increase performance Arduino IDE and raspberry pi. This project has a future development opportunity. We are working to add a voice control system which will also more useful for disabled peoples. In addition to this we are also working on helmet detection. We also try to add a web-based control system and additional sensors which will provide security and many more alerts. Also through these developments in the future this project will be more user friendly which will create a comfortable transport system through new experience which is a great innovation. Which we have tried to make with our best work to appreciate in all stages of the life. We can say that we have learned more things. And this work helps us discover new things to learn more. These kinds of work are a source of new knowledge.

## 2.5 Challenges

We have had to face many challenges and problems for the developing of this project. The main challenges are the design and implementation of this system. We tried our best to make this project easier and driver friendly. And also we Know that an internet connection still now more costly for the purpose of our county. We need a good internet connection for the user to use this system. Which is not a good internet connection in many parts of Bangladesh which is a big problem in this project. We are hopeful that this problem will be solved in the future. As we are studied the embedded system in the final year that's why we have not so much professional knowledge to make a top-level project. So that at the beginning of the working we have faced many problems to set up the whole system. In addition, the system was not working during the heavy Traffic, which caused a lot of embarrassment.We will have problems with the hostile weather of this project. Also sometimes many parts are lost in working time by testing. Sometimes we have some loose connection issue for which we faced many occurrences. like such as due to road being broken and bad weather. A lot of the time some parts are invented which are broken or not working. And the another problem is the financial investment. Which is very hard for us to invest and sometimes it is a waste of money to buy a part twice due to breaking the item or not working. If we can raise this project as a business, it will be a great project for a new discovery.

# CHAPTER 3

# RESEARCH METHODOLOGY

## 3.1 Introduction

In this part, we will describe our research methodology. Moreover, tools for the research project, Raspberry pi camera, Raspberry pi, Raspberry pi, Raspberry pi, and its implementation will be discussed in this session.

In Figure 3.1, we can see the full methodology at a glance.

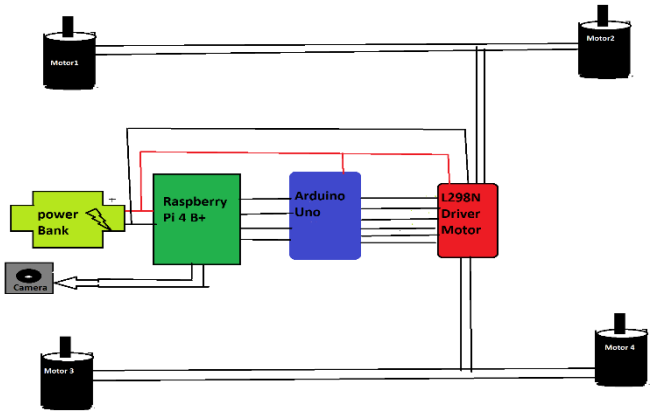


Figure 3.1: Methodology at a Glance

## 3.2 Raspberry pi camera

In this project we are using pi camera v2. This camera has Sony IMX219 8-megapixel sensor and its supports 1080p30, 720p60 and VGA90 video modes, as well as still capture. This Camera Modules captures the images of all around and send them to the raspberry pi for further processing. Which is shown in Figure 3.2

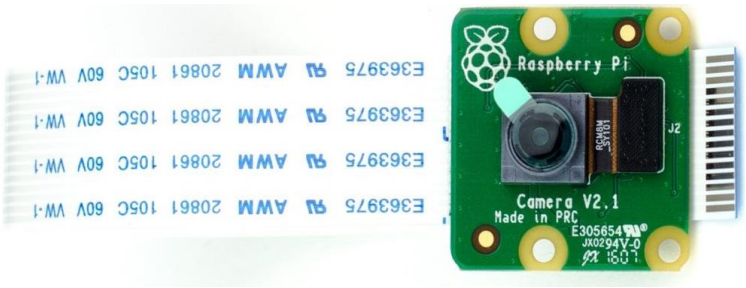


Figure 3.2: Raspberry pi camera

## 3.3 Raspberry pi

We are using Raspberry Pi 4B with 2 GB ram. This is the main processor here. All working procedure will be done by this. Popularly it is known as Low-cost, credit card size minicomputer. We are using this Raspberry pi 4B version for image processing. With the help of Open Cv 4 software, a machine learning algorithm implemented and the images are rained in different lighting conditions using neural network technology. Further the decisions taken by the raspberry pi are sent as commands to Arduino like move Forward -Backward, Left-Right, Stop etc. Which is shown in Figure 3.3

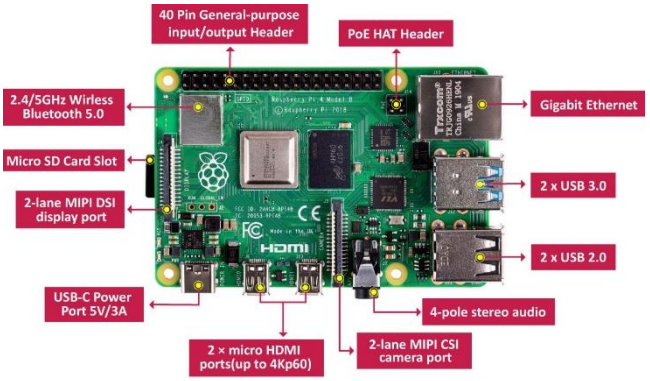


Figure 3.3: raspberry pi 4B

## 3.4 Arduino UNO

Arduino Uno is a micro-controller board which is based on the ATmega329P (datasheet). It is widely popular more making mini projects. In our project, Arduino is used to control Left-Right, Stop,Backward-Forward movement of vehicle. We programmed the code in Arduino using Arduino IDE. Upon getting command from pi, Arduino will ship signal to motor driver circuit to take the suitable motion informed by the way of Arduino. Which is shown in Figure 3.4

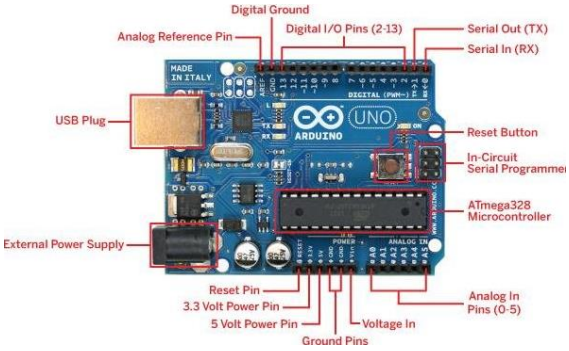


Figure 3.4: Arduino Uno

## 3.5 L298N Motor Driver

It's a simple motor driver module that can control both dc and stepper motors. To drive motors, H bridge is used in conjunction with the L298 IC. The h bridge is a circuit that can drive polarized current and is regulated by pulse width modulation (PWM).Which is shown in Figure 3.2.

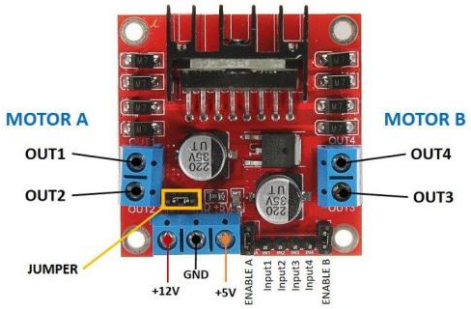


Figure 3.5: L298N Motor Driver

# CHAPTER 4

# REQUIREMENT AND DESIGN SPECIFITACTION

## 4.1 Design Requirements

In this part, we will describe the design requirements of this system which will be hardware requirements and software requirements.

In this system, the hardware requirements are the most important part of the main implementation of this project. Because of the hardware, we developed the whole system. The hardware requirement list has given below.

Hardware Requirements:

1) 220uf 16v Capacitor
2) 4WD Smart Robot Chassis Kit
3) 5 mm Green LED (Pack of 5)
4) 5 mm Red LED (Pack of 5)
5) 5V LED Traffic Light Module
6) Capacitor 25v 100uf
7) Capacitor 47uF 16V (pack of 5)
8) Jumper Wire Single Medium - Jumper Wire Type : Male to Female
9) Jumper Wire Single Medium - Jumper Wire Type : Male to Male
10) Kiloohm(KΩ) 1/4w Resistors - Pack of 5 - Resistor Pack of 5 : 10 KΩ
11) L298N H-Bridge Dual Motor Driver, Stepper Motor Driver
12) NE-555 timer
13) Ohm (Ω) 1/4w Resistors - Pack of 5 - Resistor Pack of 5 : 220Ω
14) Ohm (Ω) 1/4w Resistors - Pack of 5 - Resistor Pack of 5 : 330Ω
15) Raspberry Pi 4 Computer Complete Set Pack2 - MicroSD Card Size : 32GB Class 10 UHS-I microSD- RAM : 2GB
16) Raspberry Pi Camera Module V2 - 8 Megapixel,1080p
17) Veroboard Dot Type

In this system, the software requirements are the second most important part of developing the project. By the software, we designed the system process and how the app and system will interact. Also, the execution of the project has been designing by the software. The software requirement list has given below:

Software requirements:

- Arduino IDE
- VNC Server
- Geany IDE On raspberry pi

In this part we just discussed about the requirement list of the hardware and software requirements. Next we will discuss about the whole system briefly.

## 4.2 Front-End Design

In previous discussion we described about the requirement of the system and its list. So in this section we will discuss about the all requirements.

### 4.2.1 Hardware Equipment

In this discussion we are going to discuss about the hardware equipment which will need for making the project prototype.

1. **220uf 16v Capacitor:** Electrolytic decoupling capacitor 220uF / 16V. This is a gadget that works great in transient / excitatory and works well in high-voltage and audio applications. It is a high quality radial electrolytic capacitor. Our current day hardware depends on it as shown in Figure 4.1.


Figure 4.1: 220uf 16v Capacitor

2. **4WD Smart Robot Chassis Kit:** The 4W Smart Robot Car Chassis Kit is the most important parts that are easy to use by assembling the robot chassis platform. It provides the robot with a variety of sensors, pie cameras and a raspberry pie and controller such as the Arduino to provide the robot with a fast

four-wheel drive platform to enhance a lot. The specified prototype is shown in Figure 4.2.

Figure 4.2: 4WD Smart Robot Chassis Kit

3. **5 mm Green Red LED:** It connects the positive of the battery / power source to the anode to the negative cathode and will ensure that the polarity will match and the power will flow will illuminate the 5mm LED with adequate input voltage. Which is shown in Figure 4.3.

Figure 4.3: Green Red LED (5mm)

4. **5V LED Traffic Light Module:** It is a suitable mini traffic light display module that produces models of traffic light systems. It features common cables, targeted and with custom installations that are very small in size. It can be control the brightness of the LED by connected PWMM. Which is shown in the figure 4.4.

Figure 4.4:  4.5V LED Traffic Light Module

5. **Capacitor 47uF 16V:** It is a polarized capacitor whose anode has a higher or more positive voltage than the cathode. And it is the function of the electrolytic capacitor that uses an electrolyte. Which is shown in the figure 4.5.


Figure 4.5: Capacitor 47uF 16V

6. **Jumper Wire:** Jumper wires are mostly used in electrical small project works. These wires have pins that are easy to use. And anyone can use these cables on this breadboard as shown in the Figure 4.6.

Figure 4.6 Jumper Wire

7. **Registers:** Registers are used to quickly recognize, store, and remove information and directions that are being used instantly by the CPU. This is a kind of CPU memory. The articles used by it are often named as processor registers. Which is shown in Figure 4.7.

Figure 4.7: Registers

8. **Raspberry Pi 4 Computer:** The latest product in the popular Raspberry Pi 4 Model B range is the Raspberry Pi 4 Model B computer. It has better processor speed, multimedia performance, memory and connectivity than the previous generation Raspberry Pi 3. Raspberry Pi 4 delivers comparable desktop performance with entry-level x86 PC systems. It features high-performance 4-bit quad-core processor, dual-display support in resolution up to 4K via a pair of micro-HDMI ports, hardware video decode up to 4Kp60, 4GB RAM, dual-band 2.4 w / 5.5. , Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capabilities. Dual-band wireless LAN and Bluetooth have modular compliance certification, which allows the board to design on end products with

significantly reduced compliance testing. Which is very time consuming. Which is shown in Figure 4.8.

Figure 4.8: Raspberry Pi 4 Computer

9. **Raspberry Pi Camera Module V2:** Raspberry Pi Camera Module V2 is an 8 megapixel camera which is very high quality. HD video and photography can be done with this camera. It supports 1080p030, 720p60 and 640x480p90 video. And it is capable of enabling 3280 x 2464 pixel static images. Figure 4.9.

Figure 4.9: Raspberry Pi Camera Module V2

10. **NE-555 timer:** A very cheap gadget is the 555 timer IC which is a very popular and useful timing device. Which can act as a common timer for creating single pulses or long-term delays. It can act as a relaxing pendulum by producing a string of stable waves of 100% different charge cycles which is shown in Figure 4.10.

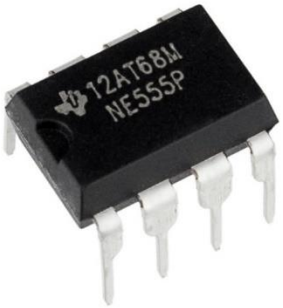


Figure 4.10: NE-555 timer

11. **L298N H-Bridge Dual Motor Driver, Stepper Motor Driver:** It is a popular dual bi-directional motor driver based on the L298 dual H-bridge motor driver IC. This module allows two motors to be easily and individually controlled up to 2A on each side. It is ideal for applications in the world of robotics. Suitable for connection to a microcontroller that requires a control line at only a few points per motor. Which is shown in the figure 4.11.

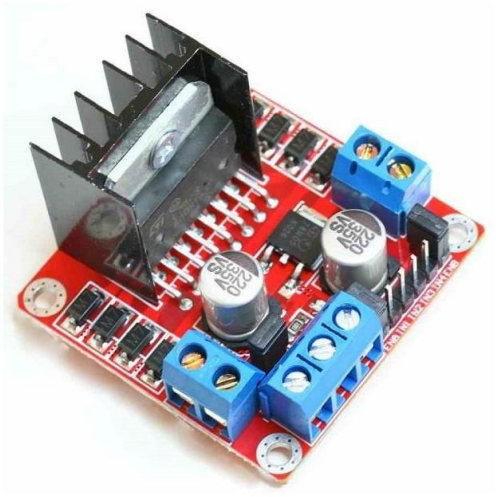

Figure 4.11:L298N H-Bridge Dual Motor Driver, Stepper Motor Driver

## 4.3 Back-End Development

In this discussion we are going to discuss about the back end development of this project. Mostly we will discussion about the flowchart diagram, block diagram and the main schematic diagram of this project.

## 4.4 Flowchart Diagram of Proposed System

Figure 4.12, shown that as early as the vehicle starts, all of the sensors and hardware components are enabled, The camera begins to capture photos, and the Raspberry Pi begins to work, and the car begins to move. Nevertheless,

When the processor begins to process the photos, it will look for three things.

1. Red signal
2. Obstacle detection
3. Stop sign detection

In the event that any of this identified, raspberry pi sends fitting sign to Arduino to work further. If red sign is identified raspberry pi provides order to Arduino Uno to stop the vehicle until red is transformed into green. On the off chance that stop sign is recognized, at that point vehicle will stop for indicated foreordained time limit if an obstruction is identified then vehicle will pause and surpass it by giving legitimate turning signs. If raspberry pi detects the end lane it detects the lane and U-turn on the other lane.

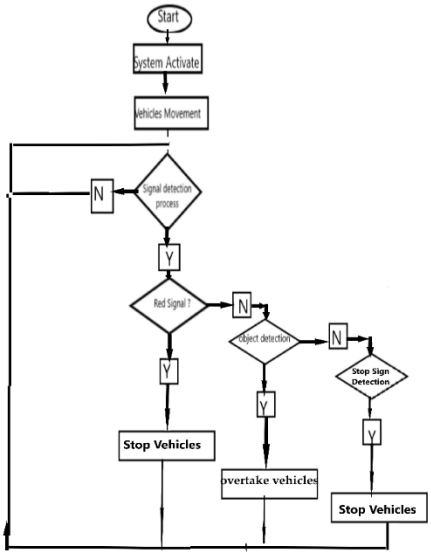


Figure 4.12: Flowchart Diagram of Our System

## 4.5 Implementation Requirement

In a previous discussion, I mentioned this project is an IoT based control system. So that we needed a different type of language to build this project. We used C++ language to design the system architecture. We compose a code in Arduino IDE. By following this code our whole project is work. At first, we need a token that is generated from the Blynk app by registering with a google account. After that, we will need a Wi-Fi name which will need for our system internet connection and the details which will display after the system turn on and display it in LCD Display. More we need the logical all condition implementing code which will work behind the system. The main implementation will need the hardware equipment with a good arrangement which will make the implementation look so smarter.

# CHAPTER 5

# RESULT DISCUSSION

## 5.1 Stop sign detection

At the point when the vehicle distinguishes the stop sign, the vehicle will be stop at a specific distance. Which is shown in Figure 5.1

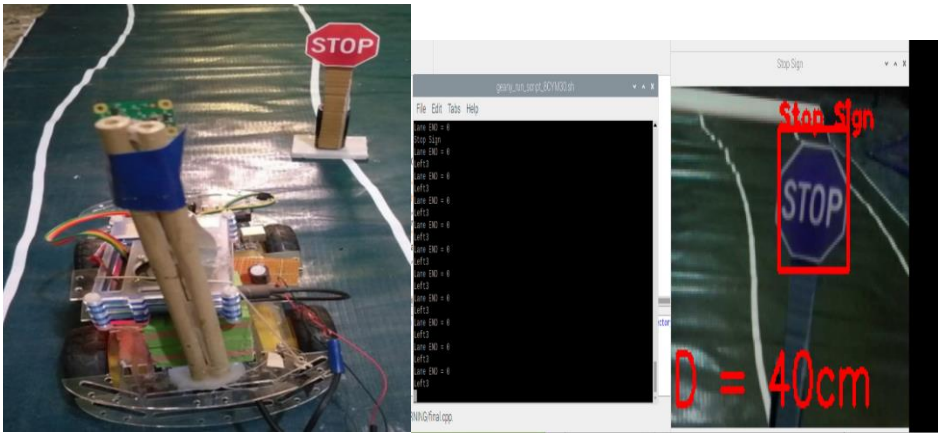


Figure 5.1: Stop sign detection

## 5.2 Lane Detection

The car detects the road lane. if the car is at the middle point its going forward and if the car is in the left side its turn into right side and go to the middle to move forward. If the car is in the right side its turn into right side and go to middle point to move forward. And when the lane is ending its U-turns and move to the other lane. Which is shown in Figure 5.2

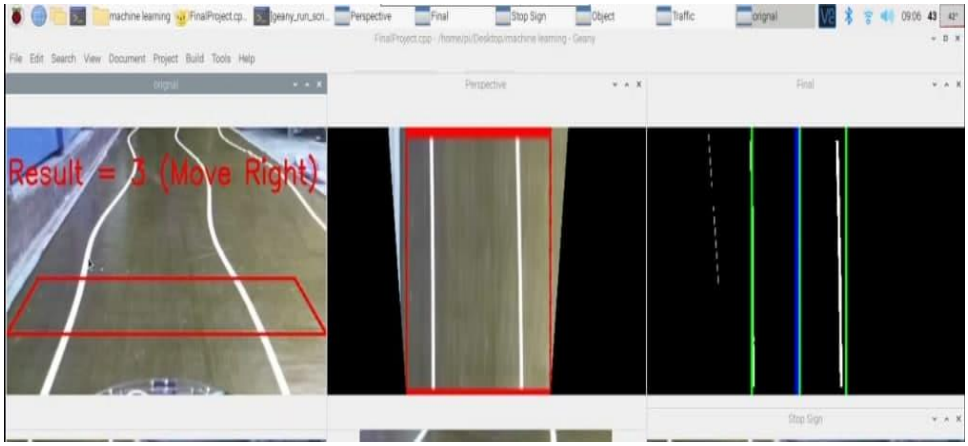


Figure 5.2: Lane detection

### 5.3 Obstacle detection

When the car sees an objects like other vehicles it detects the objects at a particular distance and stop the car. And also, the car will over-take immediately. Which is shown in Figure 5.3

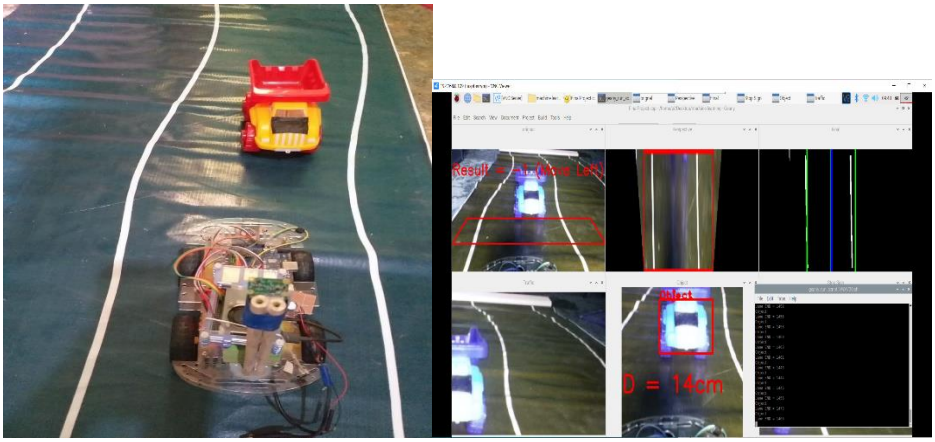


Figure 5.3: Obstacle detection

### 5.4 Traffic Light detection

When the car sees an objects like other vehicles it detects the objects at a particular distance and stop the car. And also, the car will over-take immediately. Which is shown in Figure 5.4

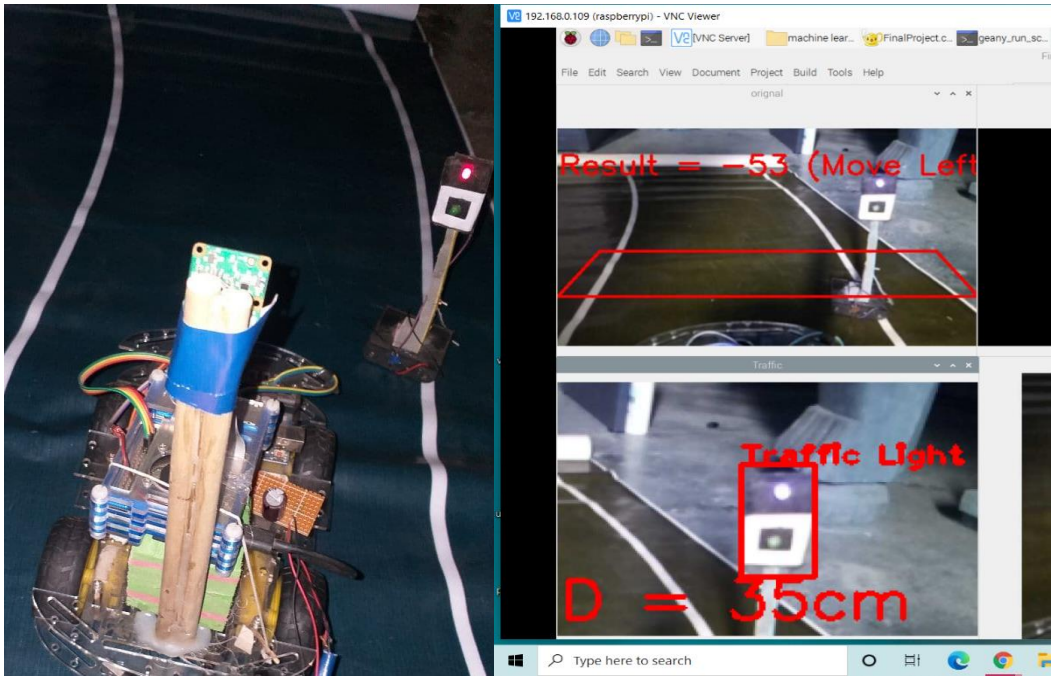


Figure 5.4: Traffic light detection

### 5.5 Road Sign detection

Figure 5.5, shown that the car detects road signs when it sees something like a road sign. And the car moves forward with the decision accordingly.


Figure 5.5: Road Sign detection

## 5.6 Final System Analysis and Result

Since testing the whole system continuously we have come up with a great result with quick response. This fast automated system can be easily used wherever we need automation systems. Comparison of previous work We can say that we have to create a good system with patience and hard work because we have no previous professional knowledge about this job. Also, we have a very small team of work by which we suffered many problems to make this project. Our main focus was to use the Raspberry Pi and Arduino IDE and Pie camera hardware which is very important at the moment to create good projects. So we have successfully worked our hundred percent and get success. Because we tested our project several times with different types of users. They said it is a safe vehicle project that will reduce accidents so everyone appreciated our work that it is very useful and comfortable as well as very easy to manage. The project has been analyzed and the result has been very good as per our plan.

## 5.7 Arduino IDE

Figure 5.6 this is Arduino IDE. We write simple code to move the vehicle backward-forward, left -right ,u-turn and stop vehicles.

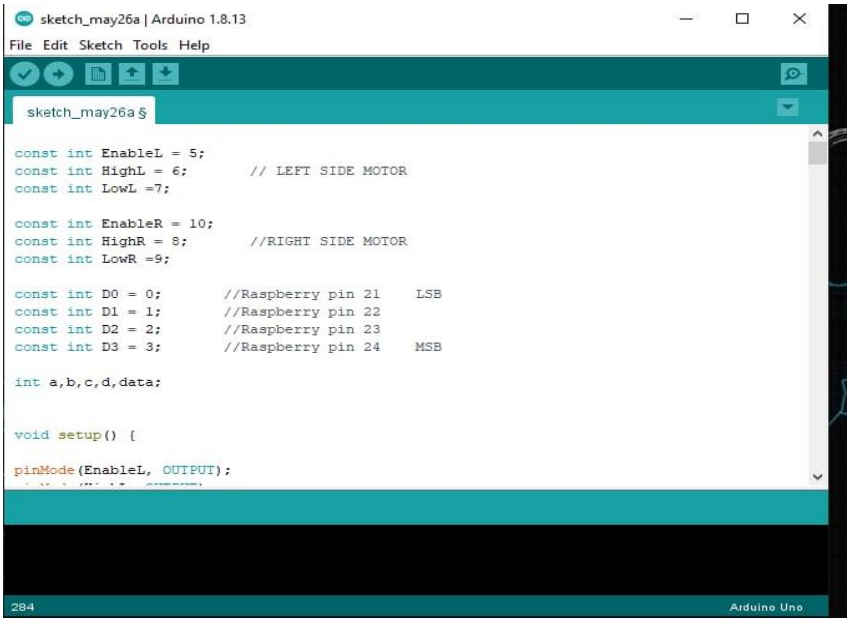


Figure 5.6: Arduino IDE

## 5.8 Vnc Server

In this project we are using vnc server to connect the raspberry pi to the computer. then control the raspberry pi through desktop.Which is shown in Figure 5.7

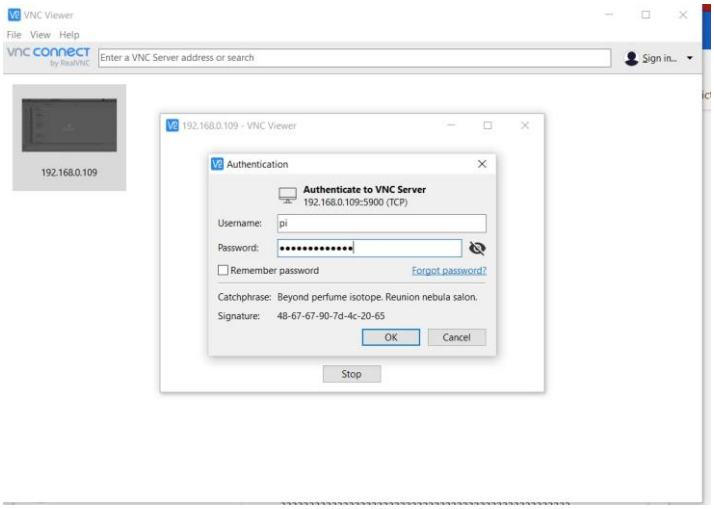


Figure 5.7:Vnc Server

## 5.9 Geany IDE

Figure 5.8, shown that in our project, we are using Geany IDE for our open CV and C++ code. This is the main process of our project. This software will run in raspberry pi. In this code we are doing image processing and machine learning Algorithm to detect Lane, Stop Sign, Obstacle and Traffic Light.

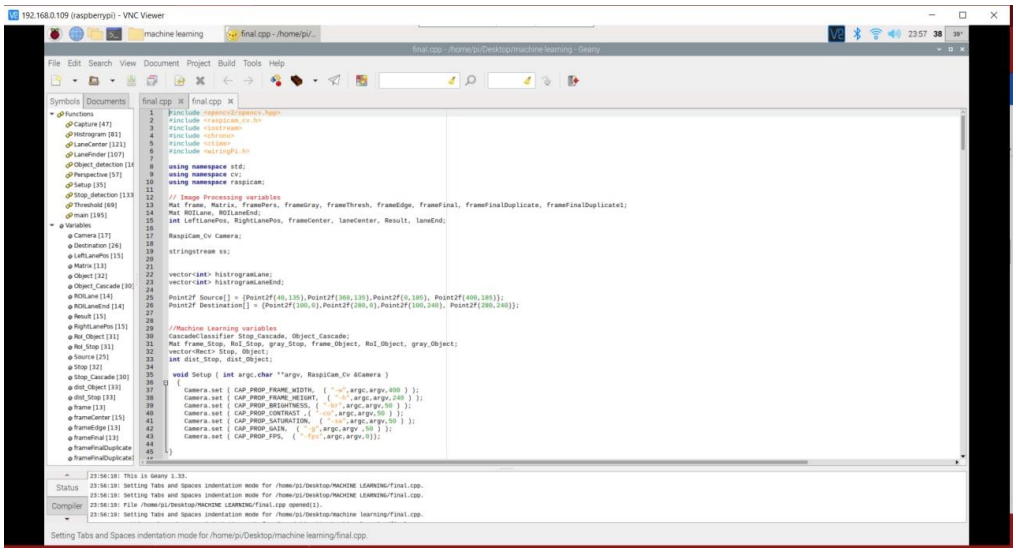

Figure 5.8: Geany IDE

## 5.10 Cascade trainger GUI:

We also use Cascade trainger GUI to train our dataset and make xml file. Like we train here Stop Sign, Traffic Signal, And also trained Obstacle. to train our image we took around 300 image of each elements in different way.if we take more image and train that , we will get more accuracy to detect those objects. Which is shown in Figure 5.9

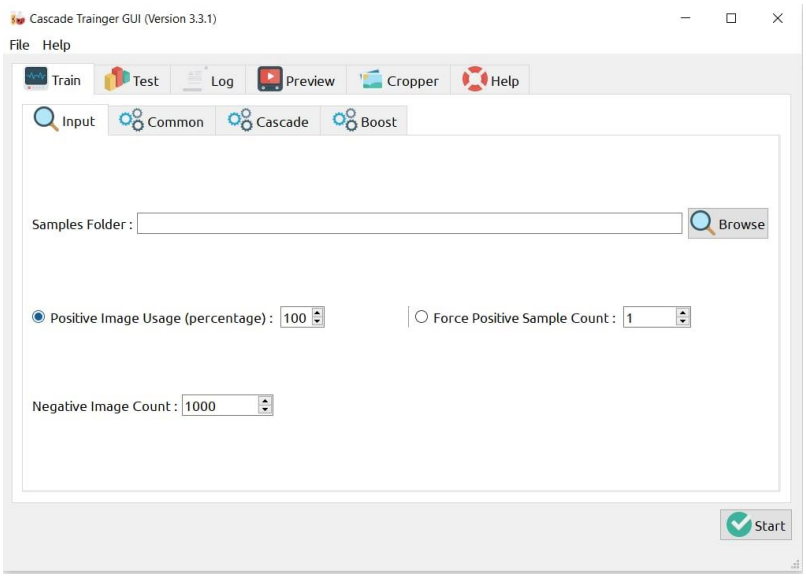


Figure 5.9: Cascade trainger GUI

# CHAPTER 6

# CONCLUSION AND FUTURE DEVELOPMENT

## 6.1 Advantages

Automation vehicles will reduce vehicle accidents. A government data shows that 94% of accidents are caused by driver errors. That’s why self-driving cars help prevent vehicle driver errors. This will reduce accidents. It will also be a comfortable vehicle system that will make the driver feel very comfortable to drive as it will reduce accidents on the one hand and make life easier on the other.

## 6.2 Limitations

We have some limitations in this project which are given below:

1. This project will require a proper traffic control system and a beautiful road system to drive automatic vehicles.
2. The car our project is not suitable for driving on roads like Bangladesh or India.
3. The Automatic car can cause a variety of problems during heavy traffic.
4. There will be many kinds of problems in hostile weather.
5. The car is not able to provide 100% security in our project.

## 6.3 Conclusion

The above proposed self-driving car has been built very experimentally, practically and successfully. The automatic vehicle is trained with more than 100 samples in different light. Self-conducted experiments have found that the use of high-resolution V2 of versioned Raspberry Camera lighting can influence a vehicle's decision to overcome a variety of environmental conditions. A perfect technology is needed to solve this problem. Also voice controlled commands can be used with this automatic car in the future. The working method of our autonomous vehicle this paper clearly describes.

## 6.4 Future Work

The proposed system can be enhanced via

1. Creating a digital monitoring system.
2. Creating advance warnings for weather conditions.
3. Creating passenger safety during an accident.
4. An alternative power supply.
5. We will working to add a voice control system.
6. We will work helmet detection.
7. Intended to get a great market value.
8. Creating a voice controlled command vehicle.
9. Creating turbulent drones during traffic jams.
10. Advanced technology is being used to understand road conditions in advancnce

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## Appendix: Project Arduino IDE Code Documentation Reflection

This is the documentation of Arduino code. We will need to install the proper library for doing this code section. After that we have to follow the format of code. So by following the code format we can design our desire code in Arduino IDE and upload it in NODE MCU.

**********

Download latest fdhjky library here:

https://github.com/Smomi99/iot_Based_self_driving_Car

Downloads, docs, tutorials: http://www.blynk.cc

# Plagiarism Report

Self Driving Car2

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