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Project Report
on

"TRAFFIC CONTROL SYSTEM TO OVERRIDE SIGNAL FOR EMERGENCY VEHICLE WITH LIVE UPDATE BLYNK USING IOT"

Submitted in partial fulfilment for the requirement of
Project Work Phase – 2 [18ECP83]
ELECTRONICS & COMMUNICATION ENGINEERING

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Academic Year: 2023 – 2024

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CERTIFICATE

This is to certify that the Internship report entitled **"TRAFFIC CONTROL SYSTEM TO OVERRIDE SIGNAL FOR EMERGENCY VEHICLE WITH LIVE UPDATE BLYNK USING IOT"** is bonafide work of Amulya R [4MU20EC001], Bhavana K [4MU20EC002], POORVI G S [4MU20EC005] and Ranjitha M.R [4MU21EC403] students of VIII Sem B.E, at Mysuru Royal Institute of Technology, MANDYA in partial fulfilment for the requirement of Project Work Phase-2[18ECP83] of VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI during the academic year 2023-2024. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. This report has been approved as it satisfies the academic requirements as prescribed by the university.

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ACKNOWLEDGEMENT

The joy and satisfaction that accompany the successful completion of any task would be incomplete without the mention of the people who made it possible. We would like to express our gratitude to **Dr. Abhinandan K.S**, principal, for providing us a congenial environment for engineering studies and also for having showed us the way to carry out this Project Work Phace-2.

We would like to thanks to **Dr. D J Ravi**, Assistant Professor and Head, Department of Electronics & Communication Engineering for her support and guidance throughout the tenure of this work.

It's my privilege and honour to express thanks to Guide **Mohammed Ali**, Assistant Professor, and Department of Electronics & Communication Engineering for her timely support, valuable guidance, motivation, constant encouragement for the successful completion of this Project Work Phace-2.

Also, I extend our sincere thanks to **Ramyashree A.N** Assistant Professor, Project Work Phace-2 Co-ordinator for consistent help in organizing Project Work Phace-2. We intend to thank all the teaching and non-teaching staffs of the Department of Electronics & Communication Engineering for their immense help.

Thanks and Regards

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DECLARATION

We, Amulya R [4MU20EC001], Bhavana K [4MU20EC002], POORVI G S [4MU20EC005] and Ranjitha M.R [4MU21EC403] students of VIII semester Bachelor of Engineering in Electronics and Communication Engineering, MRIT, Mandya, hereby declare that, this dissertation work titled “TRAFFIC CONTROL SYSTEM TO OVERRIDE SIGNAL FOR EMERGENCY VEHICLE WITH LIVE UPDATE BLYNK USING IOT” has been carried out independently under the guidance of Mohammed Ali, Assistant Professor, Department of Electronics and Communication Engineering, MRIT, Mandya in partial fulfilment of the requirement for Project Work Phase-2 [18ECP83] in Bachelor of Engineering in Electronics and Communication Engineering, affiliated to Visvesvaraya Technology (VTU), Belagavi during the Academic year 2023-2024. We further declare that, this mini project has not been submitted with this dissertation either in part or full to any other university or institution for award of other degree or any fellow-ship.

Place: Mandya

Date:

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Two of the most significant aspects of modern civilization are urbanization and industrialization. The severe traffic congestion on the streets is the most detrimental result of growing urbanization and accelerating growth in traffic. Due to the circumstances, there is a confined traffic demand in both time and space. Congestion causes delays and waste of time, especially in road traffic where the peaking phenomena is very noticeable. The impediment and delay caused by one vehicle on another is known as congestion. However, a considerable portion of all investments are made in the transportation industry. Widening highways, constructing elevated flyovers, constructing bypasses, and constructing urban expressways are all costly medium- and long-term solutions.

Additionally, traffic-related environmental degradation has been a major problem. The employment of gadgets and sensors for traffic management systems is best made possible by their low cost and ease of connectivity. The basic idea used for traffic management here is to detect and control congestion by using a decision-making algorithm which determines how the traffic light operates based on the information collected from RFID devices. RFID and IR module are wireless technology that uses radio frequency and infrared rays, electromagnetic energy to carry information between the transmitter and receiver. RFID tag and reader are used to detect the emergency vehicle on the lane and to clear it at a faster rate.

The design proposes a smart and fully automatic system that can detect congestion in real time, and subsequently manage it efficiently to ensure smooth traffic flow with the use of RFID and IR devices. The idea is based on the principle of RFID tracking of vehicles. An RFID i.e. Radio Frequency Identification system consists of two main components, the small transponder, more commonly known as a tag, which is attached to the vehicle needing identification and the interrogator, or reader, which in some cases is used to read its data without contact. The RFID tag consists of all the information regarding the item to which it is attached and this can be wirelessly transmitted to the reader. The IR devices are used to detect traffic congestion on each lane using transmitter and receiver which uses infrared radiations and traffic signals are prioritized based on densely congested lane.

1.2 Problem Statement

Model Traffic congestion is increasing on the road day- by- day. As a result of which, following issues arises. One of the issues is that the vehicles need to wait at the junctions even if there is no traffic on the other side. These problems occur due to fixed control on traffic signal timing. This project will aimto control the traffic according to the density.

Emergency service vehicles like ambulance, fire fighting vehicle, police vehicle etc. might have to wait till the signal turns green which can be solved using this system. This system has a built in WIFI module connected to the microcontroller which notifies about the traffic to the users through BLYNK application.

1.3 Objectives

- To reduce the traffic based on traffic density using IR sensors.
- To ensure immediate clearance for emergency vehicle.
- To update the traffic status to the blynk cloud.

CHAPTER 2

LITERATURE SURVEY REVIEW

2.1 Technical Conferences and Journal papers

[1] Automatic traffic density control system with wireless speed limit notification, in: IEEE 11th Annual Computing and Communication Workshop and Conference, CCWC), 2021.

The proposed system is designed and implemented to control traffic signal timer automatically according toinput traffic volume in a particular lane, which is detected by the sensor unit. As per the level of traffic congestion, the timer value is increased/decreased automatically and at necessary emergency situation like high volume traffic for long time, the system will automatically trigger predefined alert SMS to the authority. The system also notifies the previous lane by sending alert message on LCD to avoid lanes ahead which has high traffic density. A conventional method of controlling signals manually is also provided for emergency situation. The smart pole is installed with LCD to display the alert message and it contains emergency alert buttons which are used to alert police, traffic, ambulance, fire authorities if any problem occurred in a particular lane. Wireless speed limit notifier is installed in desired lanes which notifies the driver about the speed limit of a zone via wireless technology.

[2] Sonal Agrawal, Prakhar Maheshwari, controlling of smart movable road divider and clearance ambulance path using IOT cloud", in: 2021 International Conference on Computer Communication and Informatics, ICCCI, 2021.

In this paper, we design a movable road divider thatmoves depending on the traffic conditions. Real-time data of the traffic compiled using IoT in suchthat it will connect a link between traffic and divider with the help of computer vision. This proposed system provides the free path for an ambulance which ensures the ambulance to reach the destination on time or without any delay and the life of humans is more important. It also reduces the time of journey in peak hours and save time and fuel. Deep learning is used to acquiring the current situationof traffic and these data will store in clouds using cloud computing and big data handling over IOT. Cloud database sends the message to embedded system over IOT protocols to shift the divider left or right. Smart moveable road divider system helps to clearing the traffic on road during peak hours of the day and whenever any ambulance stuck in traffic it will automatically recognize the ambulance andclearing the path using this device.

[3] Qingfang Liu, Baosheng Kang1 Keping Yu, (Member, Ieee), Xin Qi, Jing Li, Shoujin Wangv, Hong-an Li, Contour - Maintaining - Based Image Adaption for an Efficient Ambulance Service in Intelligent Transportation Systems" School of Information Science and Technology, Northwest University IEEE, 2020.

The main aim of this project is to contour-maintaining-based image adaptation method, called SC OE, for an efficient ambulance ITS service. Firstly, the method combinesweighted gradient, saliency, and edge maps into an importance map. Secondly, according to the slope and curvature of the edge in unimportant areas, serrated channels are set in the gentle edge area thatcan guide the optimal seams to evenly pass through edge areas. This method protects the integrity and display proportion of prominent object, improves the continuity and smoothness of edges and contours, and maintains their shape in non-salient areas. To improve the visual effect of adapted images, a contour maintaining based image adaption method for an efficient ambulance service in ITS is proposed here. Finally, applying the sub-procedure of a forward seam carving method, the optimal seams can more evenly pass through the contour areas. The experimental results demonstrate that the proposed method is more effective than other similar methods.

[4] Chakkaphong Suthaputchakun, Yue Cao, Ambulance-to-Traffic light controller communications for rescue mission enhancement, in: A Thailand Use Case" IEEE Communications Magazine December, 2019.

The main objectives of this paper are to improve road safety and traffic flow. However, the paper focuses on network performance in terms of network throughput and end-to-end delay rather than the rescue mission performance, such as travel time and speed of the ambulances. Without a comprehensive performance evaluation, this approach becomes unconvincing. The proposed A2T aims to promote information sharing between ambulances and trafficlight controllers along rescue routes in advance, through V2I communications. As a result, the traffic light controllers can switch to a green traffic light to allow the approaching ambulances to pass any intersections immediately and safely.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION TO PROJECT

In present day world, traffic congestion has become a genuine issue in our daily life. It brings down the productivity of individuals and therefore lots of working hours are wasting at signals. Huge volumes of vehicle will also cause chaotic congestion. It indirectly adds to increase in pollution level, huge volume of natural resources like petrol, diesel is consumed.

Therefore, to reduce this we should implement newer schemes by using IR sensors based on automation technique. Even though today's methods are robust and work well when traffic load is distributed evenly across the lane in intersection, unnecessary waiting time in the signal can be avoided by determining which side the green should be showed.

This project is designed such that system will work on traffic density and manage signal light based on density using IR sensors. The timing will vary according to density hence improve the light system and reducing the traffic congestion Over recent years, more people have started moving from rural to urban areas for their survival fitness. Increase in population around the globe has led to usage of more vehicles (2,3 & 4 wheelers) and this has led to emergency crises in traffic management for supervising the traffic scenarios in both (pedestrian or vehicles).

In this regard several studies have been either proposed or implemented towards avoiding traffic congestion on the lane having a greater number of vehicles. This makes more traffic on the road and with the help of this module we can monitor and automate the traffic signals according to the density of the vehicles on the road.

3.2 BLOCK DIAGRAM

The Internet of Things (IoT) refers to the interconnected network of physical devices, vehicles, appliances, and other objects embedded with sensors, software, and network connectivity. These devices collect and exchange data, enabling them to communicate and make intelligent decisions.

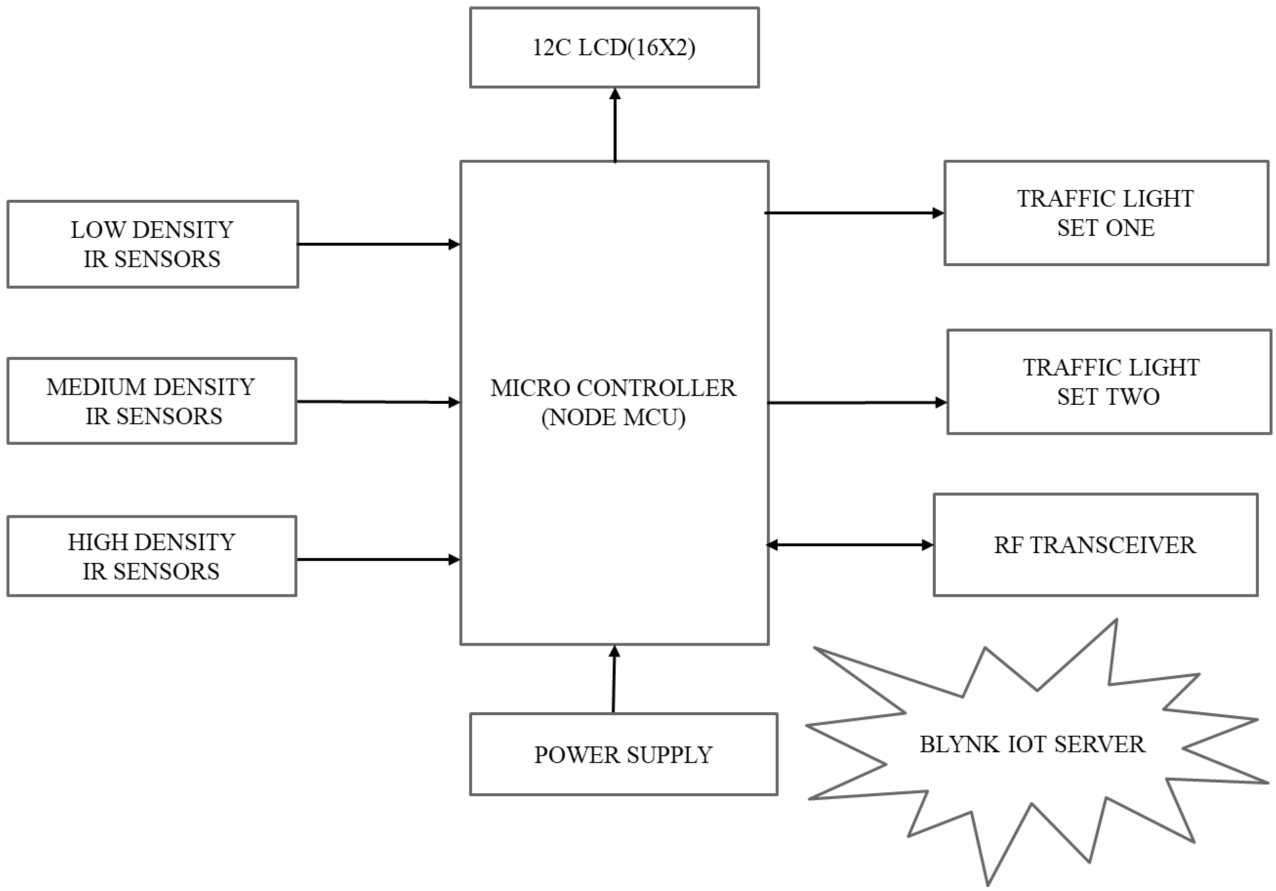

Figure 3.1 Block diagram of Traffic control system using node MCU microcontroller**.**

IoT has applications across various sectors, including smart homes, healthcare, agriculture, and industrial automation. The above block diagram, shows the proposed work of traffic control system to override signal for emergency Vehicle with live update blynk using IOT, here we use node MCU ESP8266 controller as the microcontroller which is having the built in WIFI which is used to update the status of the traffic signal. The IR sensors are used to monitor the density of the traffic here the traffic density is divided into low density, medium density, high density. Based on the density of the traffic, the traffic lights are changed the waiting duration, and density status is displayed on the I2C LCD display. The RF transceiver is used to receive the RF signal from the emergency vehicle and red light is over ride with green light.

3.3 Flowchart

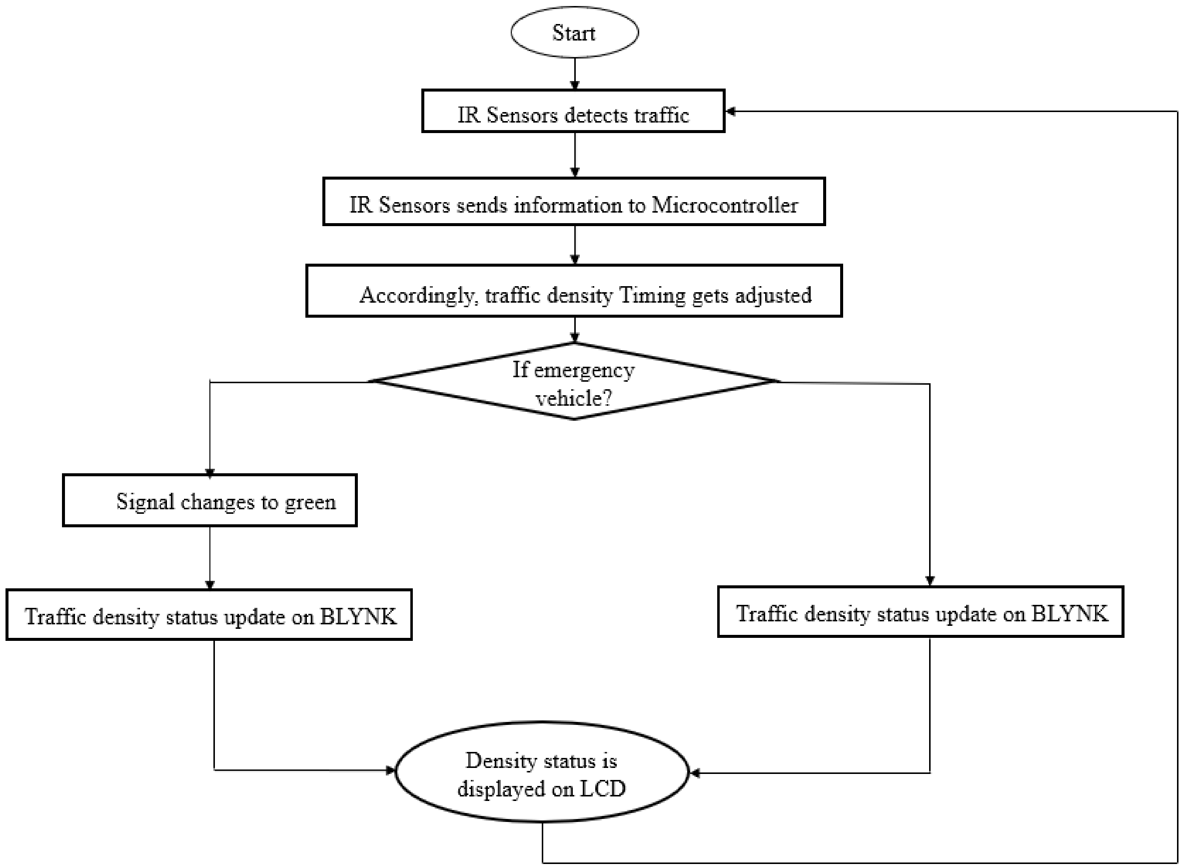

Fig 3.2: Flowchart of Traffic control system using node MCU microcontroller**.**

In this design, it starts when the power turns on then IR sensor will detect the traffic based on its vehicle density and it sends the information to our microcontroller. According to traffic density, if the traffic density is low with 20sec time for the flow of traffic vehicle, if the traffic density is medium it will increase the time with 40sec for the flow of traffic vehicle, if the traffic density is high again it will increase the time with 60sec for the flow of traffic vehicle and it displayed on LCD, if any emergency vehicle appears on the same lane, the emergency vehicle will send the RF signal .Then it is received by our microcontroller and it will turns the traffic signal into green .Once the signal turns green with an emergency vehicle it will also sends the information to the blynk app trough the Wi-Fi, so then it is updated on blynk app and we can see in our device that emergency vehicle is appeared. Once the emergency vehicle is cleared, again it is displayed on the LCD, then the timer is count down to zero other side LED is turned ON, again it will check for the IR sensor for traffic density.

Chapter 4

IMPLEMENTATION

4.1 PROPOSED IMPLEMENTATION

We have proposed a model of traffic control system for emergency vehicle it will work on the basses of traffic density. The model consists of IR sensor it will detect the traffic density, ESP8266 microcontroller, RF transceiver, 16X2 LCD display and LED. The data which is collected through IR sensor is sent to the ESP8266 microcontroller, which acts as a main component of the whole system and use for providing Wi-Fi connectivity to the entire module. This processed data is displayed on LCD and blynk application. The IR sensors is categorized as Low-density IR Sensor, Medium density IR Sensor, High density IR Sensor, which are all connected to the ESP8266 microcontroller, when Low IR Sensor is detected, it will send the signal to ESP8266 microcontroller which in turn information is updated on LCD display and blynk application this works similarly for both Medium IR Sensor and High-density IR Sensor. In our proposed work we have placed the RF transmitter in the emergency vehicle as it approaches on the lane irrespective of traffic density on road. RF transmitter sends the data/signal to microcontroller it turns traffic signal into green. It also displays on LCD with the time of 60sec and it will update in blynk app, this process works continuously.

4.2 CODE WORKING:

Node MCU microcontroller is having in built wi-fi, to enable wi-fi we are using “ESP8266WiFi.h” header. To update the traffic information, we have included “BlynkSimpleEsp8266.h” header file. To initialize LCD display “LiquidCrystal_I2C.h” header is used. Node MCU microcontroller D3 pin is connected to LOW DENSITY IR sensor, D4 pin is connected to MEDIUM DENSITY IR sensor, D5 pin is connected to HIGH DENSITY IR sensor, D6 pin is connected to set 1 RED LED, D7 pin is connected to set 1 GREEN LED, D0 pin is connected to set 2 RED LED, D8 pin is connected to set 2 GREEN LED. User defined parameters like Wi-Fi ssid “DENSITY”, password “12345678” are initialized for BLYNK APPLICATION using “BLYNK_AUTH_TOKEN”.

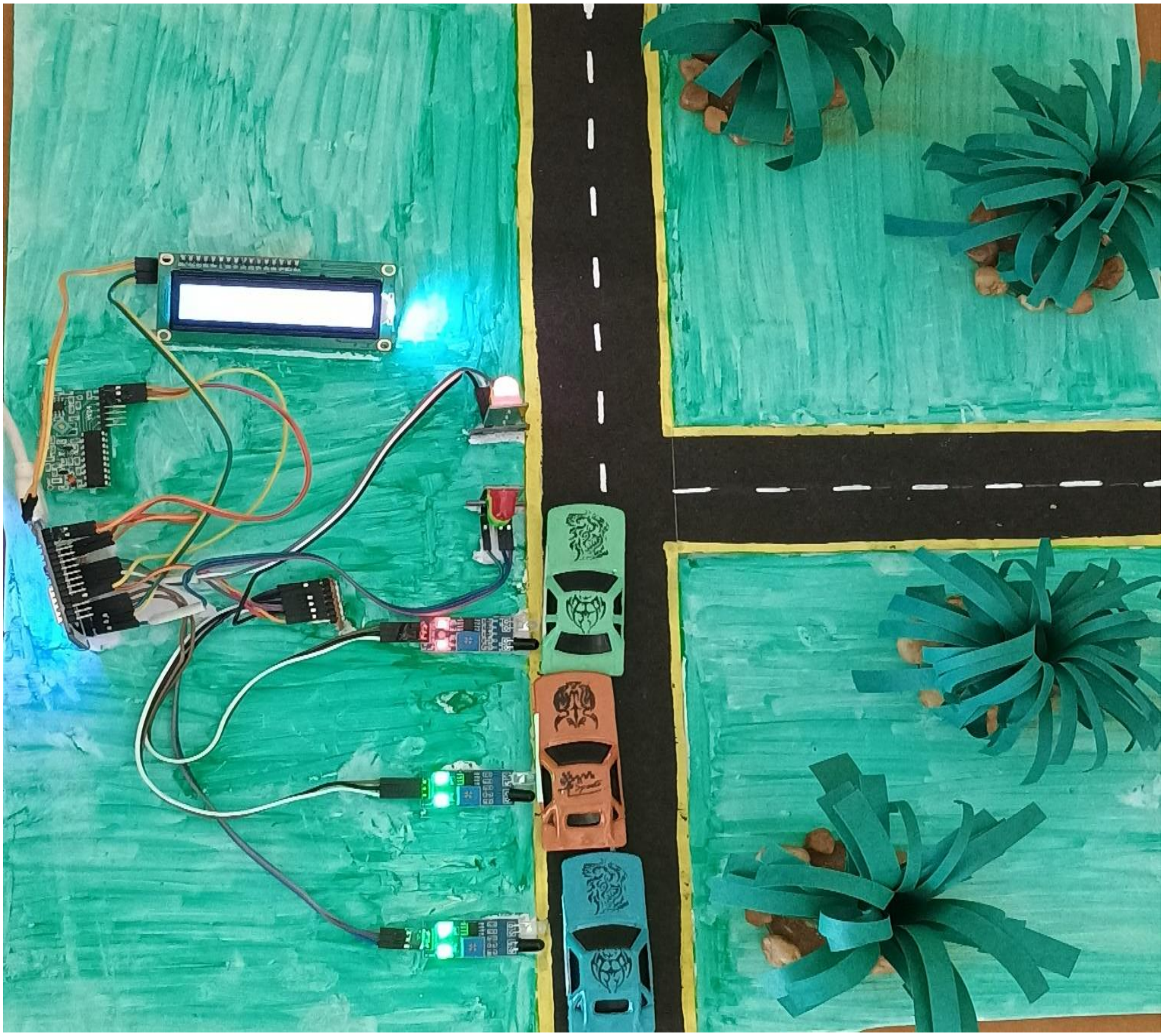

Fig. 4.1. Model

Various pin modes are as follows were D3, D4, D5 and eme are input pins and D0, D6, D7 and D8 are output pins. Then LCD and back light gets initialized, were it displays “connecting to DENSITY”. Once after it gets connected to blynk it displays “CONNECTED” on LCD. After 2 seconds of time delay it clears LCD display and shows the status of traffic density. Again, it clears the LCD display after 1.5 seconds.

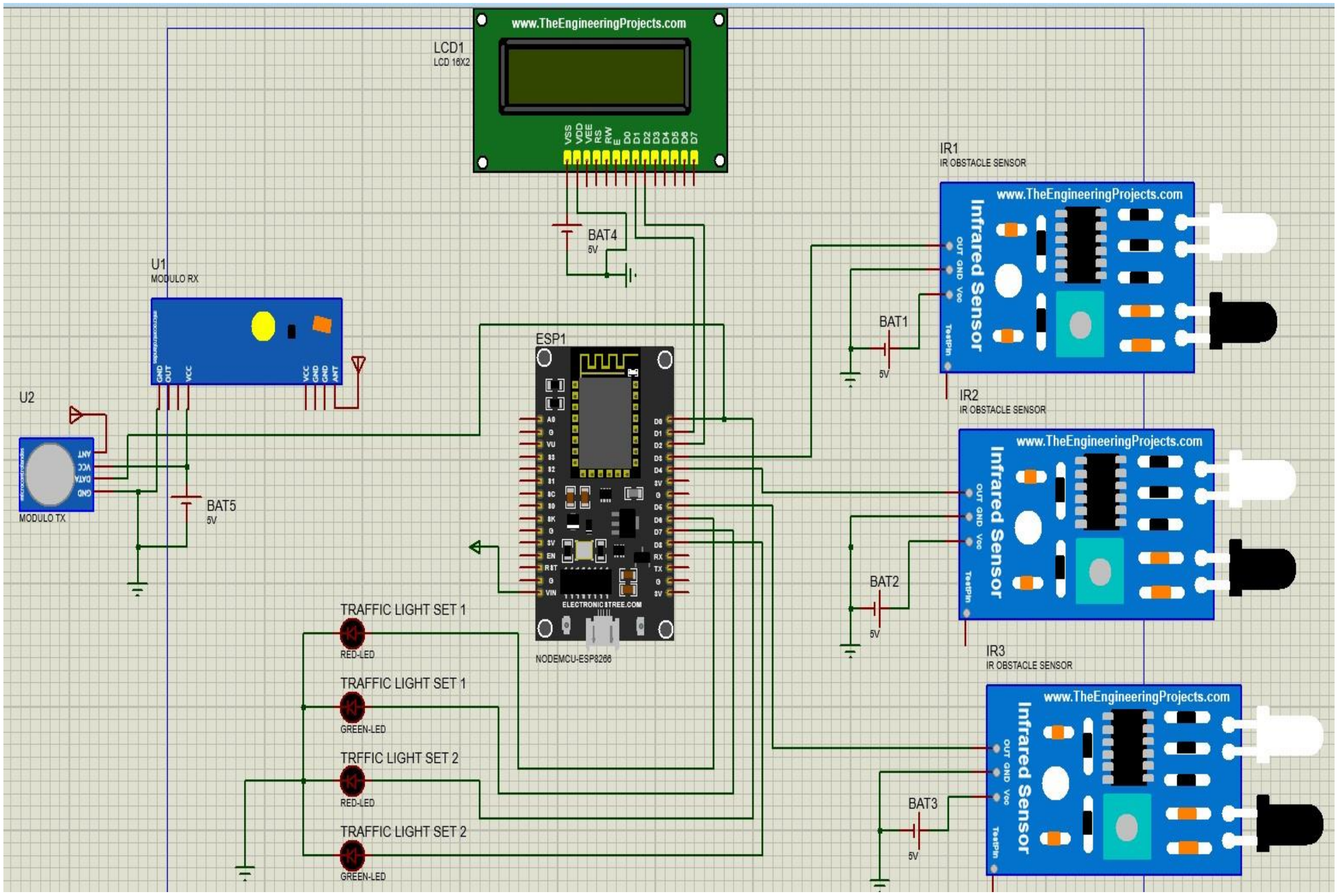

Fig 4.2. circuit diagram

When D6 and D8 pin are active low, D7 and D0 pins are active high the RED and GREEN LED lights are turned ON and OFF in an alternative way and displays “NORMAL TRAFFIC” on LCD and updates the same in BLYNK APP, after 2 seconds of time delay it clears LCD display.

When D6 and D8 pins are active high, D7 and D0 pins are active low, it checks whether (digital Read(D3) ==LOW) && (digital Read(D4) ==HIGH) && (digital Read(D5) ==HIGH), it displays “LOW DENSITY TRAFFIC” on LCD and updates the same in BLYNK APP, which results in overriding of RED into GREEN light in that particular lane with delay of 20 seconds.

When D6 and D8 pins are active low, D7 and D0 pins are active high, it checks whether (digital Read(D3) ==LOW) && (digital Read(D4) ==LOW) && (digital Read(D5) ==HIGH), it displays “MEDIUM DENSITY TRAFFIC” on LCD and updates the same in BLYNK APP which results in overriding of RED into GREEN light in that particular lane with delay of 40 seconds.

When D6 and D8 pins are active low, D7 and D0 pins are active high, it checks whether (digital Read(D3) ==LOW) && (digital Read(D4) ==LOW) && (digital Read(D5) ==LOW), it displays “HIGH DENSITY TRAFFIC” on LCD and updates the same in BLYNK APP which results in overriding of RED into GREEN light in that particular lane with delay of 60 seconds.

When D6 and D8 pins are active LOW, D7 and D0 pins are active HIGH, it checks whether eme=digital Read(eme), it displays “EMERGENCY VEHICLE” on LCD and updates the same in BLYNK APP which results in overriding of RED into GREEN light in that particular lane with delay of 60 seconds. This loop continues.

4.3 CODE: this design works on below code.

```
#define BLYNK_TEMPLATE_ID "TMPL32V4wRMCO"
#define BLYNK_TEMPLATE_NAME "traffic"
#define BLYNK_AUTH_TOKEN "Br51fyAvLs97jZDYYB1f5us2ec3w7OFC"
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,16,2);
#define ir1 D3
#define ir2 D4
#define ir3 D5
#define rled D6
#define gled D7
#define rled2 D0
#define gled2 D8
#define eme 10
char auth[] = BLYNK_AUTH_TOKEN;
char ssid[] = "DENSITY";
char pass[] = "12345678";
```

```
BlynkTimer timer;
void setup()
{
Serial.begin(9600);
pinMode(D3,INPUT);
pinMode(D5,INPUT);
pinMode(eme,INPUT);
pinMode(D4,INPUT);
pinMode(D6,OUTPUT);
pinMode(D7,OUTPUT);
pinMode(D0,OUTPUT);
pinMode(D8,OUTPUT);
lcd.init();
lcd.backlight();
lcd.setCursor(0,0);
lcd.print("Connecting To");    //start message
lcd.setCursor(0,1);
lcd.print(ssid);
Blynk.begin(auth, ssid, pass);
lcd.clear();
lcd.setCursor(0,0);
lcd.print(" Connected :-) ");
delay(2000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print(" DENSITY TRAFIC ");
lcd.setCursor(0,1);
lcd.print(" MONI SYSTEM");
delay(1500);
lcd.clear();
digitalWrite(D6,LOW);
digitalWrite(D8,LOW);
```

```
digitalWrite(D7,HIGH);
digitalWrite(D0,HIGH);
}
void loop()
{
while(1)
{
digitalWrite(D6,LOW);
digitalWrite(D8,LOW);
digitalWrite(D7,HIGH);
digitalWrite(D0,HIGH);
Blynk.virtualWrite(V0,"NORMAL TRAFFIC");
delay(2000);
digitalWrite(D6,HIGH);
digitalWrite(D8,HIGH);
digitalWrite(D7,LOW);
digitalWrite(D0,LOW);
delay(2000);
if((digitalRead(D3)==LOW)&&(digitalRead(D4)==HIGH)&&(digitalRead(D5)==HIGH))
{
Serial.println("LOW DENSITY");
Blynk.virtualWrite(V0,"LOW DENSITY TRAFFIC");
digitalWrite(D7,LOW);
digitalWrite(D0,LOW);
digitalWrite(D6,HIGH);
digitalWrite(D8,HIGH);
for(int A=20 ;A>0; --A)
{
lcd.setCursor(0,0);
lcd.print("LOW DENSITY");
lcd.setCursor(0,4);
lcd.print(A);
```

```
Serial.println(A);
delay(1500);
lcd.clear();

}
digitalWrite(D6,LOW);

digitalWrite(D8,LOW);
digitalWrite(D0,HIGH);
digitalWrite(D7,HIGH);
}
if((digitalRead(D3)==LOW)&&(digitalRead(D4)==LOW)&&(digitalRead(D5)==HIGH))
{
Serial.println("MEDIUM DENSITY");
Blynk.virtualWrite(V0,"MEDIUM DENSITY TRAFFIC");
digitalWrite(D7,LOW);
digitalWrite(D0,LOW);
digitalWrite(D6,HIGH);
digitalWrite(D8,HIGH);
for(int B=40 ;B>0; --B)
{
lcd.setCursor(0,0);
lcd.print("MEDIUM DENSITY");
lcd.setCursor(0,4);
lcd.print(B);
Serial.println(B);
delay(1500);
lcd.clear();
}
digitalWrite(D6,LOW);
digitalWrite(D8,LOW);
digitalWrite(D7,HIGH);
```

```
digitalWrite(D0,HIGH);}
if((digitalRead(D3)==LOW)&&(digitalRead(D4)==LOW)&&(digitalRead(D5)==LOW))
{
Serial.println("HIGH DENSITY");
Blynk.virtualWrite(V0,"HIGH DENSITY TRAFFIC");
digitalWrite(D7,LOW);
digitalWrite(D0,LOW);
digitalWrite(D6,HIGH);
digitalWrite(D8,HIGH);
for(int C=60 ;C>0; --C)
{
lcd.setCursor(0,0);
lcd.print("HIGH DENSITY");
lcd.setCursor(0,4);
lcd.print(C);
Serial.println(C);
delay(1500);
lcd.clear();
}
digitalWrite(D6,LOW);
digitalWrite(D8,LOW);
digitalWrite(D0,HIGH);
digitalWrite(D7,HIGH);
}
int e=digitalRead(eme);
Serial.println("the value is : "+String(e));
if(e==HIGH)
{
digitalWrite(D7,LOW);
digitalWrite(D0,LOW);
digitalWrite(D6,HIGH);
digitalWrite(D8,HIGH);
```

```
Blynk.virtualWrite(V0,"EMERGENCY VEHICLE");
for(int E=60 ;E>0; --E)
{
lcd.setCursor(0,0);
lcd.print("EMERGENCY VEHICLE");
lcd.setCursor(0,4);
lcd.print(E);
Serial.println(E);
delay(1500);
lcd.clear();
}
digitalWrite(D6,LOW);
digitalWrite(D8,LOW);
digitalWrite(D0,HIGH);
digitalWrite(D7,HIGH);
}
}
}
```

Chapter 5

HARDWARE AND SOFTWARE REQUIRMENTS

5.1 HARDWARE REQUIREMENTS

5.1.1 NODE MCU BOARD

Node MCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The Node MCU ESP8266 development board comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. Node MCU has 128 KB RAM and 4MB of non-volatile storage to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects. Node MCU are often powered using Micro USB jack and VIN pin (External Supply Pin). It supports UART, SPI, and I2C interface.

Fig 5.1. Node MCU

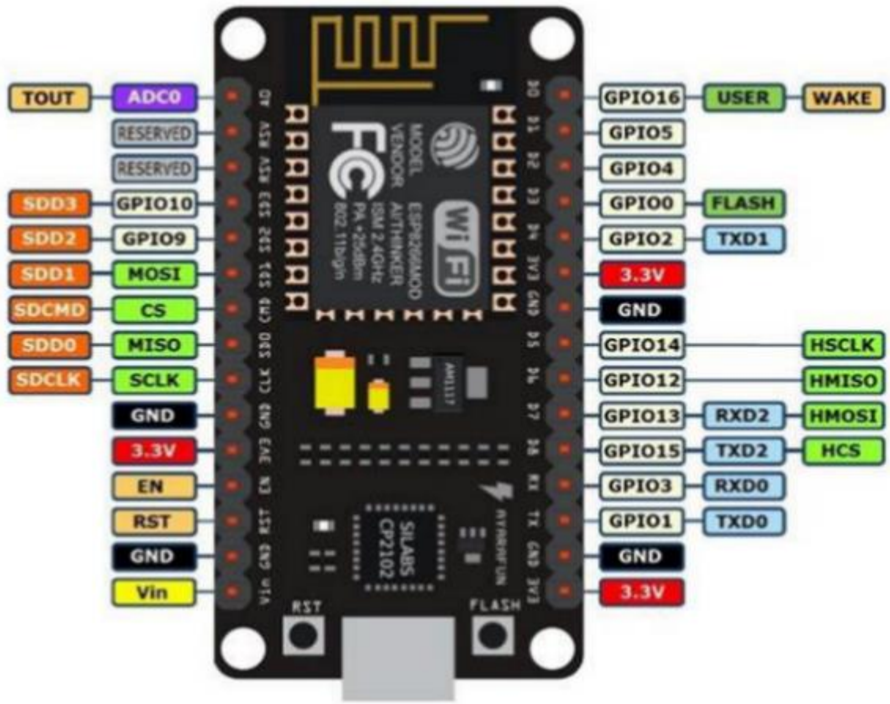

Fig 5.2. NODE MCU PIN DIAGRAM

NODE MCU ESP8266 SPECIFICATIONS & FEATURES:

- Microcontroller: Ten silica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1
- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL supported CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna

5.1.2 IR SENSOR

This IR Sensor consists of two parts, a Transmitter, and a Receiver. The transmitter emits IR light, and the object reflects that light. The photodiode (receiver) receives the reflected light. The amount of reflection and reception varies with distance. These differences cause a change in the input and thus used for proximity detection. IR LED sensor module has both the transmitter and emitter designed to work on the 940 nm wavelength.

A typical infrared detection system consists of five fundamental components: an infrared source, a transmission channel, an optical component, infrared detectors or receivers, and signal processing. Infrared sources include infrared lasers and infrared LEDs with specified wavelengths. Vacuum, atmosphere, and optical fibers are the three basic types of media utilized for infrared transmission. Optical components are used to focus or limit the spectrum response of infrared radiation.

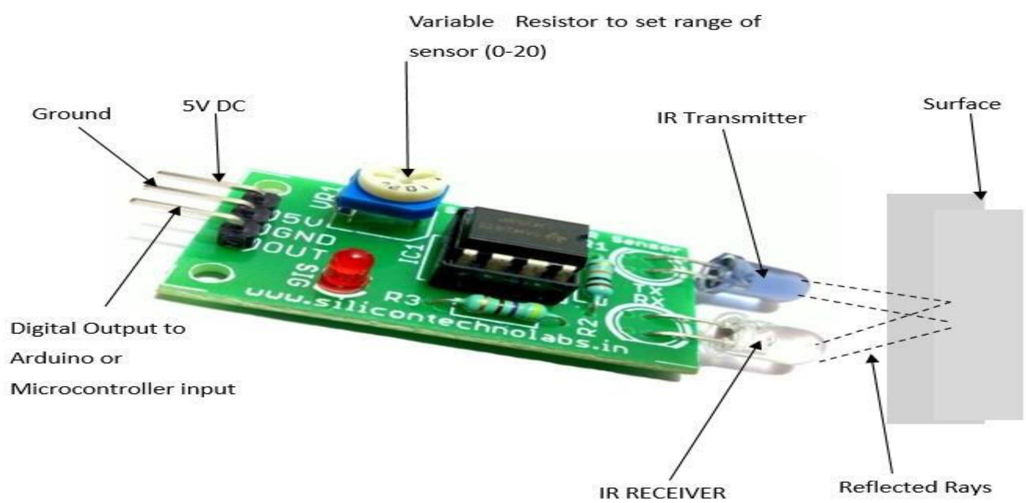

Fig 5.3. IR SENSOR

Specifications:

- The operating voltage is 5VDC
- I/O pins – 3.3V & 5V
- Mounting hole
- The range is up to 20 centimeters
- The supply current is 20mA
- The range of sensing is adjustable
- Fixed ambient light sensor

5.1.3 16x2 LCD Display

This is I2C interface 16x2 LCD display module, a high-quality 2-line 16-character LCD module with on-board contrast control adjustment, backlight and I2C communication interface. For ESP8266 beginners, no more cumbersome and complex LCD driver circuit connection. The real significance advantages of this I2C Serial LCD module will simplify the circuit connection, save some I/O pins on Arduino board, simplified firmware development with widely available ESP8266 libra

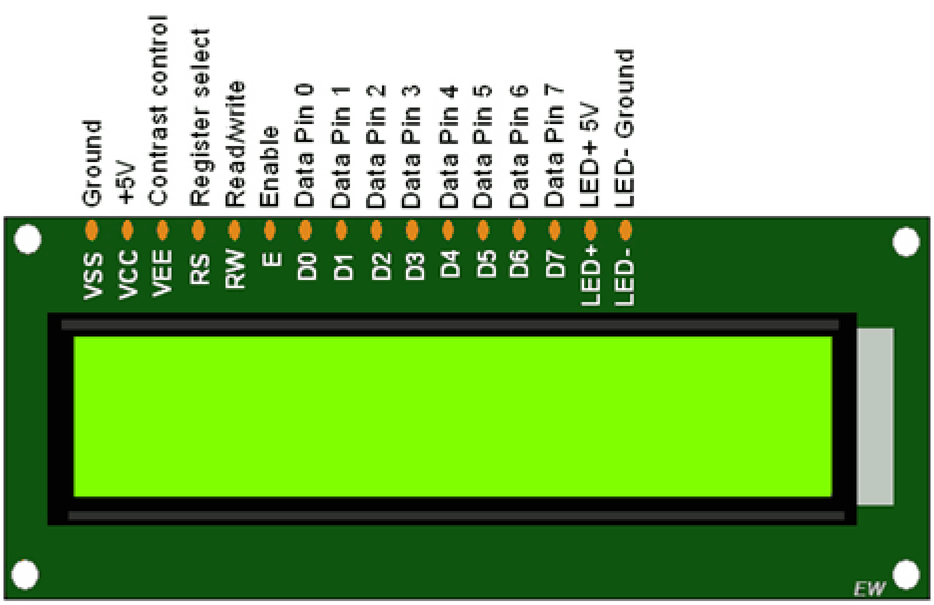

Fig 5.4. 16X2 LCD pin diagram

- **VCC** = power supply (5VDC)
- **GND** = ground
- **SDA** = serial data line
- **SCL** = serial clock line

- Normally, to interface LCD16x2, we need 10 GPIOs, i.e. 8-Data Pins and 2-Control Pins. Although we use LCD16x2 in a 4-bit mode, it takes 6 GPIOs, that's a lot of GPIOs getting engaged to use the display.
- There is a solution to this, by using I2C Driver with LCD16x2, which takes only 2-GPIOs.
- This makes using LCD16x2 simplified and also helps to avoid hardware connection complexity. It will free GPIOs for other purposes.

5.1.4 RF transceiver

A device known as a radio frequency (RF) transceiver can transmit and receive radio signals. A radio frequency (RF) transceiver combines the capabilities of a transmitter and a receiver into a single device. Common devices containing RF transceivers include citizens' band radios, walkie-talkies, cordless phones, cellphones, and computers capable of using a wireless network

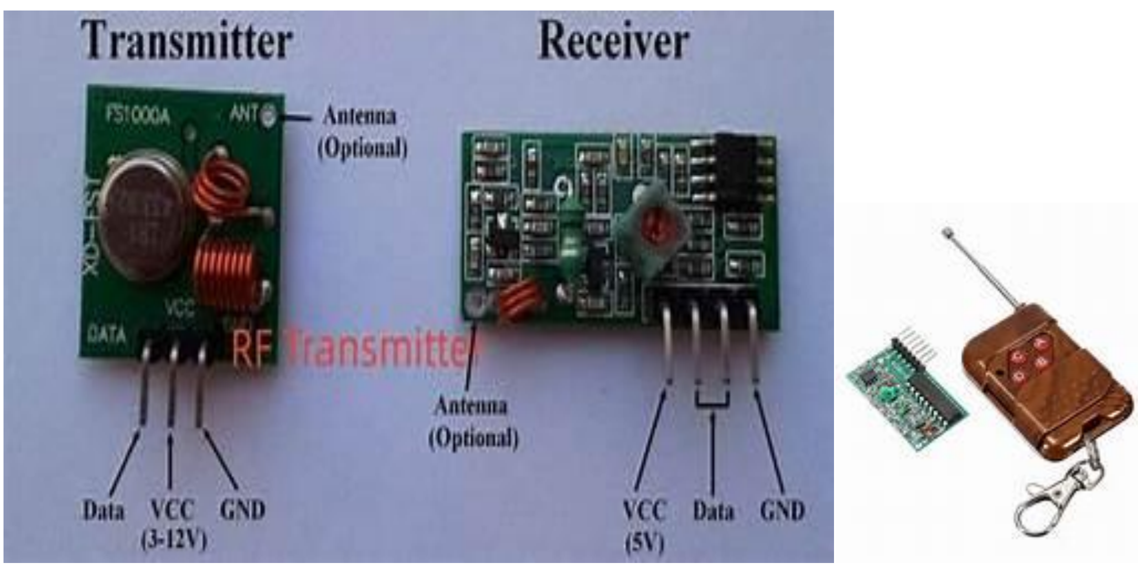

Fig 5.5. RF Transceiver

SPECIFICATION

Transmitter part

- input and output frequency range
- conversion gain
- gain flatness
- gain adjustment
- spurious and harmonics output
- 1dB compression point
- frequency stability

Receiver part

- input and output frequency range
- conversion gain
- gain flatness, gain adjustment
- noise figure
- spurious output, Image rejection
- frequency stability, adjacent
- non adjacent channel rejection

5.1.5 LED lights

LEDs are been used as indicator lamps in many devices and are used for lighting. The color of the 3mm LED is determined by the energy band gap of the semiconductor. The 3mm LED lamps are available in different colors. Hence in our project we are using Green and Red LED lights Red LED indicates the vehicle to stop and the Green LED indicate the vehicle to move. LEDs produce light in a variety of wavelengths, ranging from visible to infrared and ultraviolet. They are powered by a low voltage and electricity. LEDs are a common electronic component that are frequently used as circuit indicators. They're also used in luminance and optoelectronics.

Fig 5.6. LED light

Features:

- Popular T-1 3/4 colorless 5mm package
- High luminous power
- Typical chromaticity coordinates x=0.30, y=0.29 according to CIE1931.
- Bulk, available taped on reel.
- ESD-withstand voltage: up to 4KV .
- The product itself will remain within RoHS compliant version. Descriptions:
- The series is designed for application required high luminous intensity.

5.1.6 JUMPER WIRES

A jumper wire (also known as jumper, jumper wire, jumper cable, DuPont wire, or DuPont cable – named for one manufacturer of them) is an electrical wire or group of the min a cable with a connector or pin at each end (or sometimes without them simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

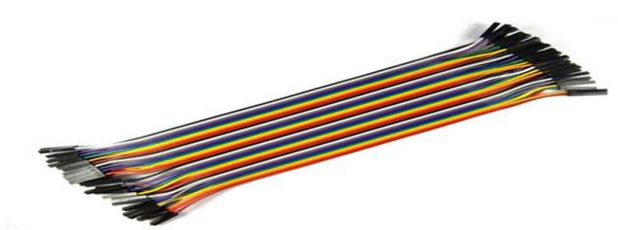

Fig 5.7. Jumper Wires

5.2 SOFTWARE REQUERMENTS

5.2.1 ARDUINO IDE

The Arduino IDE (integrated development environment) is a cross platform application which is written in the functions from C, C++ and JAVA. The Arduino IDE is also a derivative of Processing IDE. The Arduino IDE is used for easy to write and upload programs in Arduino boards by using a cable that is connected between board and IDE. The operating system for Arduino software can be Windows, Mac Os and Linux depending upon the user. The IDE has a software library from the wiring projects and to provide a common input and output procedures. • setup (): a function that runs once at the start of a program and that can declare and initialize settings. • loop (): a function that is called repeatedly until the board powers off.

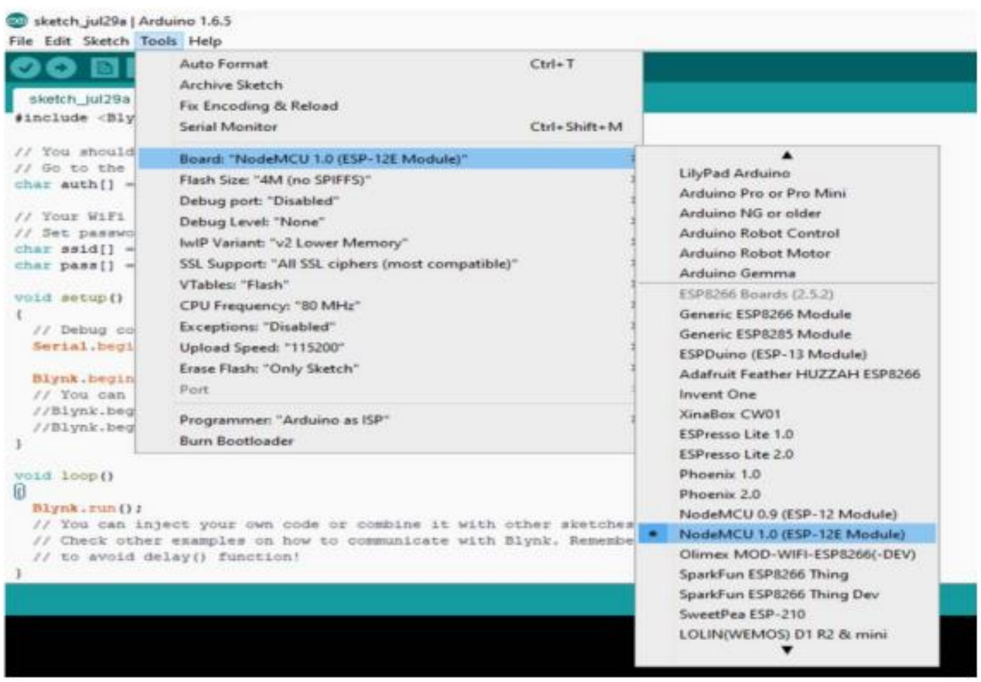

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Figure 5.8. Arduino IDE Setup

5.2.2 BLYNK APP

IMPLEMENTATION

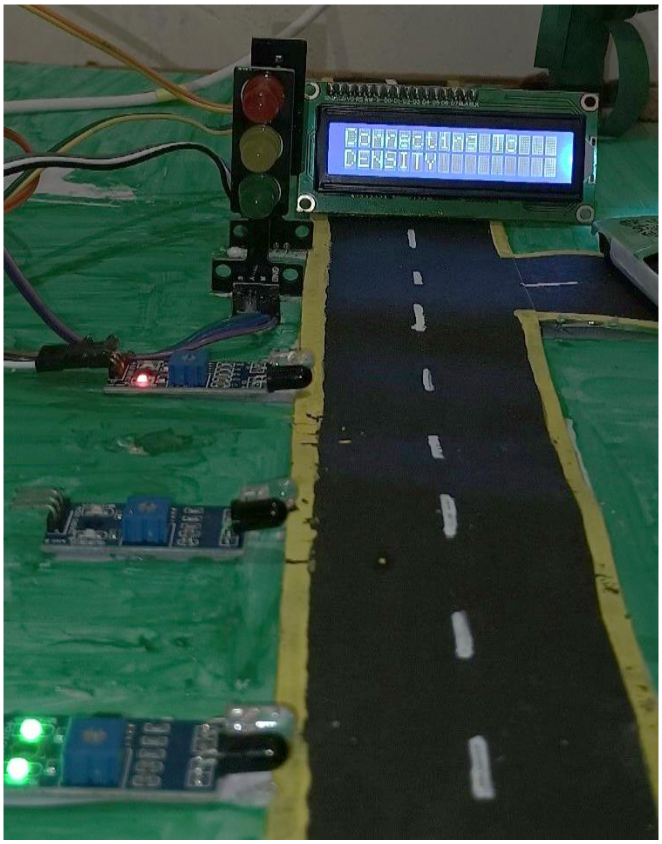
The implementation phase is the stage of a project where the plan or design is put into action. It involves the actual execution of the project plan, and the resources required for the project are mobilized. Thus, it is the most important phase out of all phases.

Fig. 5.9. Blink app

Chapter 6

EXPERIMENTS RESULTS

6.1 Hardware results



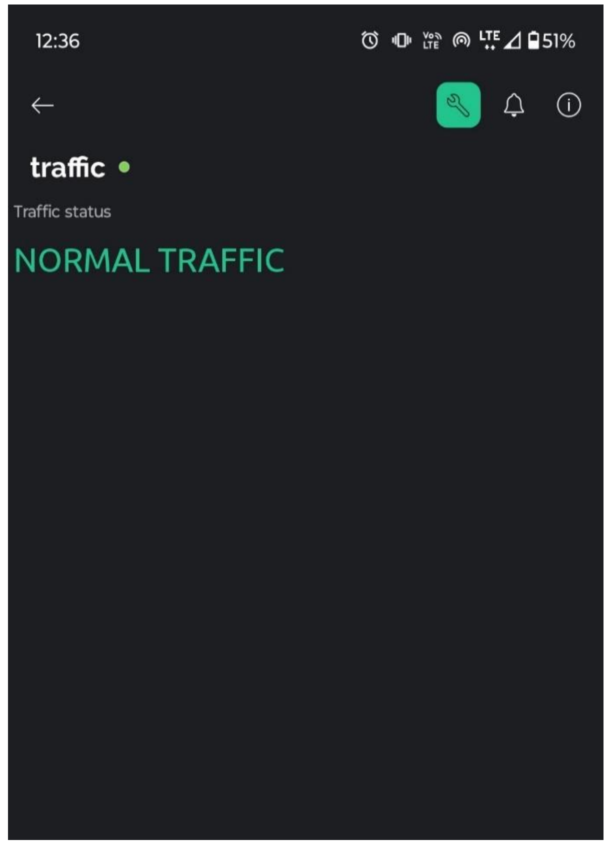


Fig 6.1. Normal density displays in LCD

Fig 6.2. Normal density update in blynk app

When there is no vehicle on the road then traffic signal runs in a normal way, which displays "NORMAL DENSITY" on LCD display as shown in figure 6.1. Then it will be updated in blynk application as shown in figure 6.2.

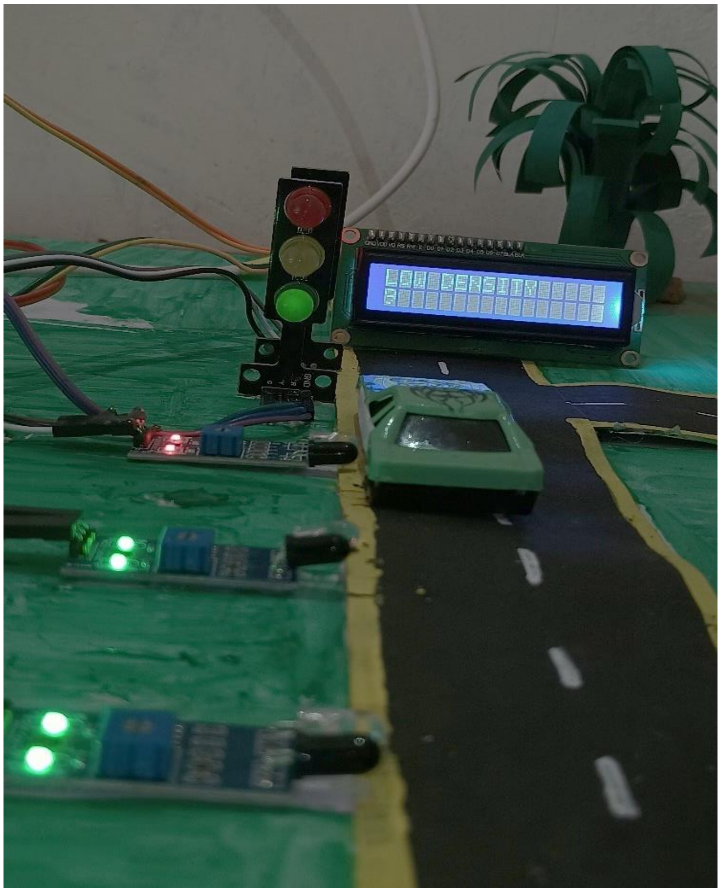


Fig 6.3. Low density displays in LCD

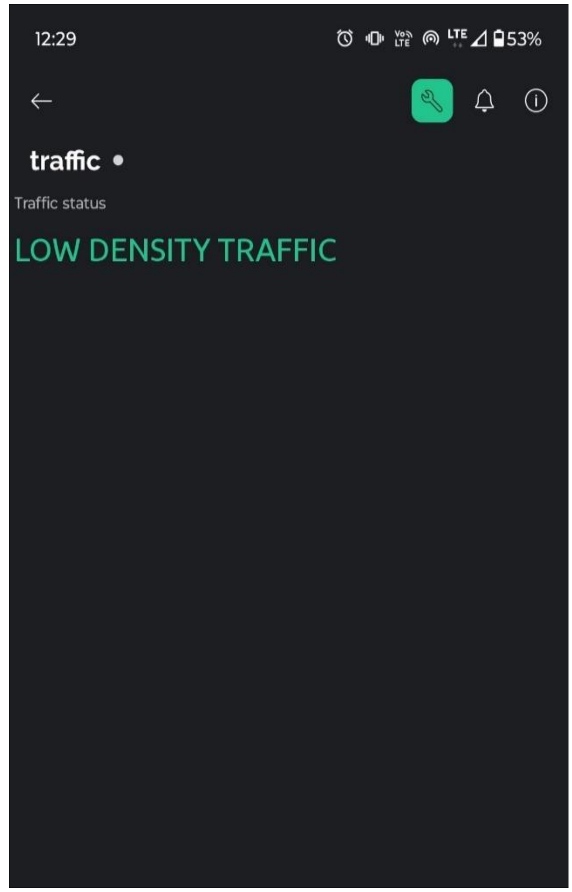


Fig 6.4. Low density update in blynk app

The IR sensor which is nearer to the traffic signal that is low density IR sensor, it will detect the density of vehicles as a low density which is displayed on the LCD display with the time count of 20sec. Parallelly which is also update in blynk application “LOW DENSITY TRAFFIC” as shown in figure 6.4.

Fig.6.5. Medium density displays in LCD

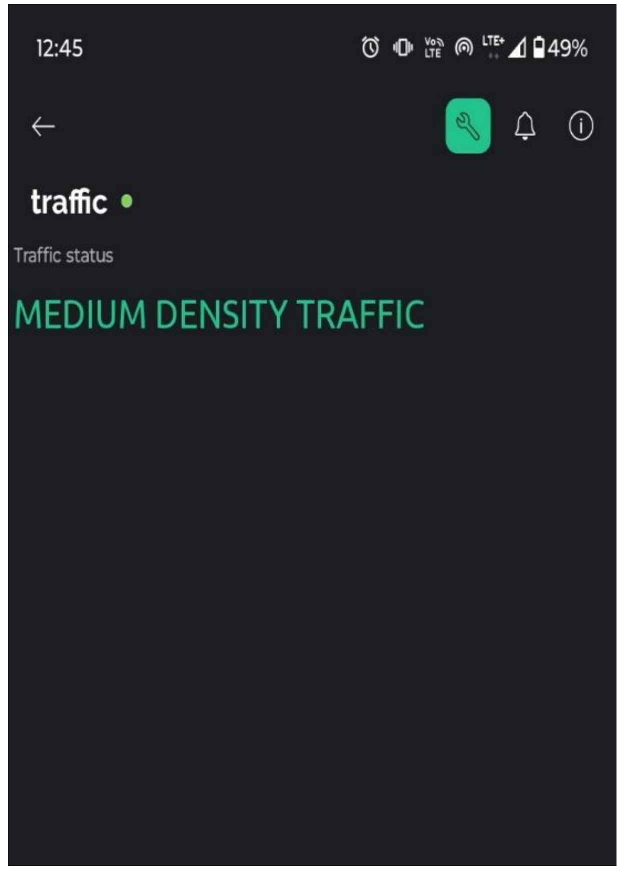


Fig.6.6. Medium density update in blynk app

The medium density IR sensor which is placed next to the low density IR sensor, it will detect the density of the vehicles as a medium density which is displayed on the LCD display with the time count of 40sec. Parallelly which is also update in the blynk application "MEDIUM DENSITY TRAFFIC" as shown in figure 6.6.

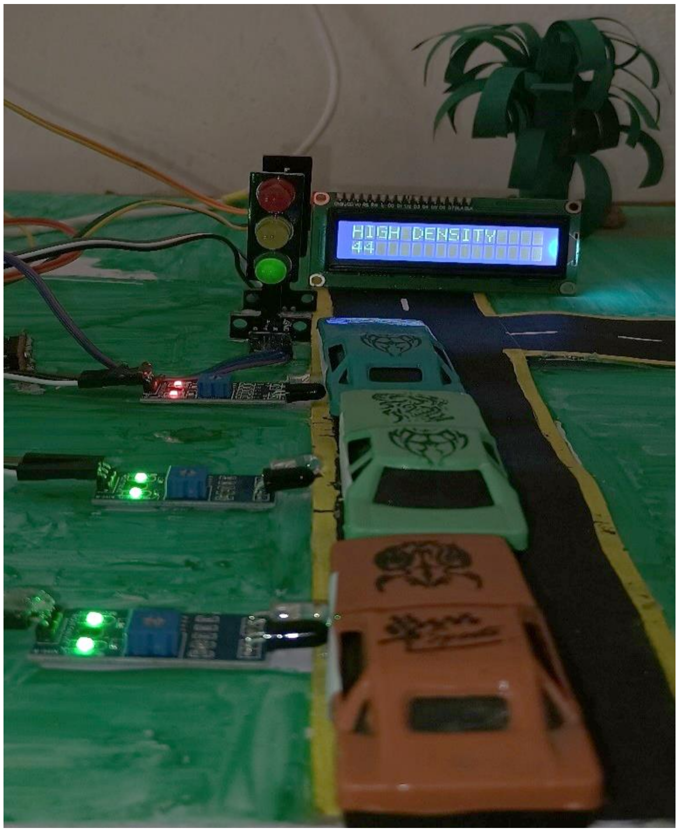


Fig.6.7. High density displays in LDC

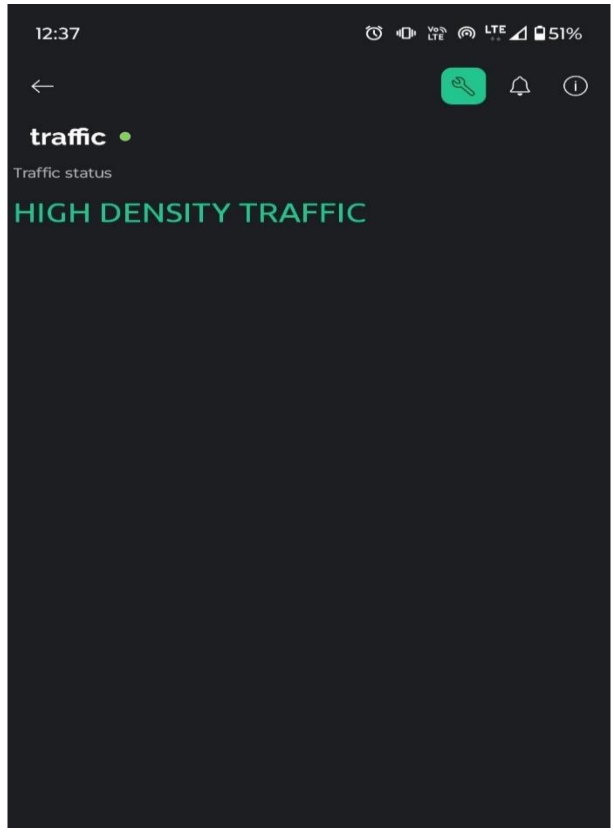


Fig.6.8. High density update in blynk app

The high-density IR sensor which is placed next to the medium density IR sensor, it will detect the density of the vehicles as a medium density which is displayed on the LCD display with the time count of 60sec. Parallelly which is also update in the blynk app “HIGH DENSITY TRAFFIC” as shown in figure 6.8.

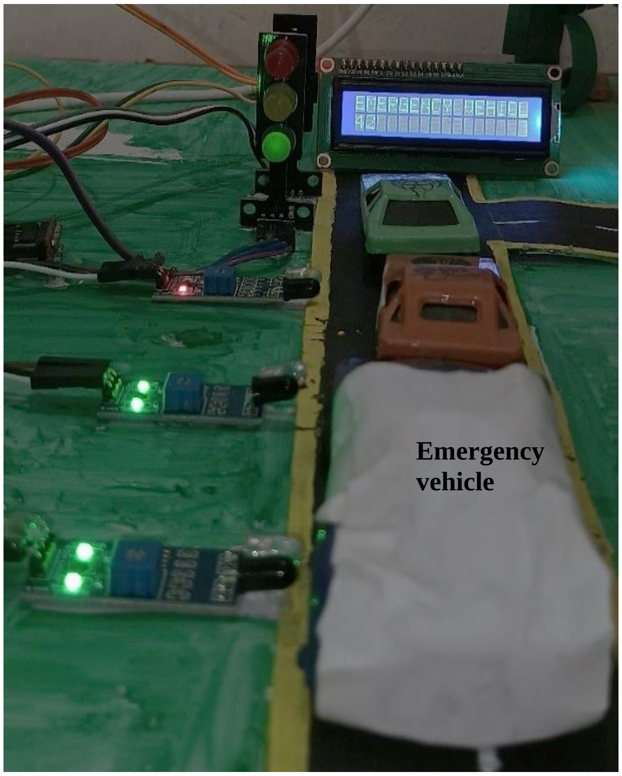


Fig.6.9. Emergency vehicle display in LCD

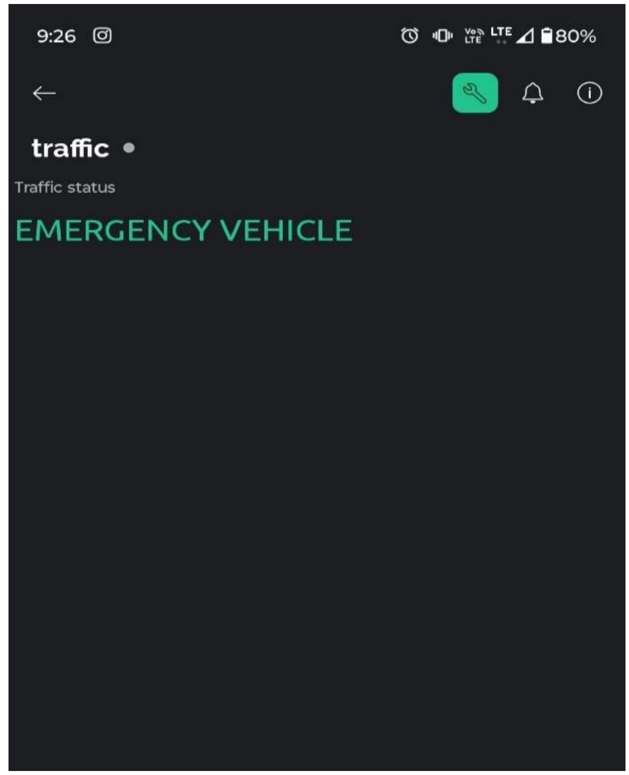


Fig.6.10. Emergency vehicle status update in blynk app

When emergency vehicle is enters on read traffic light signal road it can not move between the vehicles so we have fixed the RF transmitter to that emergency vehicle when that emergency vehicle is enters that RF transmitter send the signal to RF receiver then that will display in LCD “Emergency Vehicle”. so that the traffic signal automatically turned into green then emergency vehicle will easy pass and that will update in blynk app “EMERGENCY VEHICLE”.

Chapter 7

Advantages and Benefits

7.1 Advantages

- Improved Traffic Management: It will analyze real-time data on traffic flow, congestion, and accidents to optimize traffic signal timings and reroute traffic when necessary.
- Enhanced Safety: The received real-time data can be used for making timely decisions and reacting to any possible threat effectively.
- Smart Parking Management: Automated Smart Parking System with Mobile Application
- Data-Driven Decision Making: The objective is to provide real-time traffic updates on traffic congestion and unusual traffic incidents through roadside message units. The early-warning messages will help citizens to save their time, especially during peak hours.
- Improved User Experience: The proposed system can be operated in a user friendly mane manner.

7.2 Benefits of the project:

- Easy to clear the traffic in heavy traffic region.
- Save the vehicle fuel.
- Clears the traffic immediately as the emergency vehicles approach near the signal.
- The people can see the density of the traffic easily before reaching the signal

7.3Application:

- Implementation of IoT systems in smart city projects and urban areas to reduce traffic congestion.
- Priority given for emergency vehicle for easy movement in heavily congested area.
- Reduction of time in signal clearance on each lane in urban and densely populated areas.
- Data can be stored based on entry and exit points of the emergency vehicle.

Chapter 8

CONCLUSION AND FUTURE SCOPE

8.1 CONCLUSION

Nowadays, traffic congestion is a main problem in major cities since the traffic signal lights are programmed for particular time intervals. However, sometimes the demand for longer green light comes in at the one side of the junction due to huge traffic density. Thus, the traffic signal lights systemis enhanced to generate traffic-light signals based on the traffic on roads at that particular instant. The advanced technologies and sensors have given the capability to build smart and intelligent embedded IOT systems to solve human problems and facilitate the life style. Our system is capable of estimating traffic density using IR sensors placed on either side of the roads. Based on it, the time delay for the green light can be increased and we can reduce unnecessary waiting time. The whole system is controlled by node MCU microcontroller. The designed system is implemented, tested to ensure its performance and other design factors. The data is sent to the blynk cloud and emergency vehicles are allowed as the emergency vehicles approach near the signal.

8.2 FUTURE SCOPE

The future scope of IoT-based traffic infrastructure projects is incredibly promising, with numerous advancements expected to transform the way we manage and optimize transportation systems. One key aspect is the continued development of Intelligent Transportation Systems (ITS) that leverage IoT technologies. These systems will utilize advanced analytics, machine learning, and artificial intelligence algorithms to analyses vast amounts of real-time data from sensors and devices embeddedin the infrastructure. This data will enable more accurate and efficient traffic management, including dynamic signal control, predictive congestion detection, and proactive incident management.

The integration of IoT in vehicles will also play a crucial role in the future of traffic infrastructure. Connected vehicles, equipped with IoT capabilities, will communicate with each other and with the surrounding infrastructure through Vehicle-to Everything (V2X) communication. This connectivity will enable cooperative collision avoidance, real-time traffic updates, and personalized routing suggestions to drivers. Moreover, autonomous vehicles will benefit from IoT-based infrastructure, as they can access real-time data to make informed decisions and navigate more efficiently.

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