MINI PROJECT REPORT

VEHICLE POLLUTION MONITORING AND ALERTING SYSTEM

ECD334 B.Tech : MINI PROJECT

Submitted By

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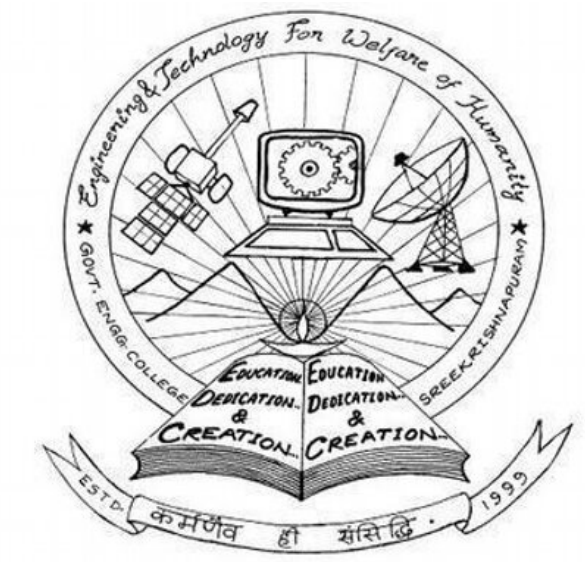

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

GOVERNMENT ENGINEERING COLLEGE SREEKRISHNAPURAM

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CERTIFICATE

This is to certify that the report entitled **VEHICLE POLLUTION MONITORING AND ALERTING SYSTEM** *submitted by* **ABHAYAJITH S (PKD19EC002), ROHITH K P (WYD19EC076), KARTHIKEYAN C R (LPKD19EC066) and VIVIN K V (LPKD19EC069)**, *to the Department of Electronics and Communication Engineering, Government Engineering College Sreekrishnapuram,Palakkad-678633, in fulfilment of the requirement for the award of B-Tech Degree in Electronics and Communication Engineering, is a bonafide record of the project carried out by them under our guidance and supervision.*

Dr SHEELA V K
Guide

Dr BINDU P
Head Of the Department

Coordinators

Place: Sreekrishnapuram

Date:

ACKNOWLEDGEMENT

First of all we thank the Almighty, for giving us the strength ,courage and knowledge to do this project successfully.

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ABSTRACT

Air pollution is not only harmful to the environment but to all the other living beings on earth. Seventy-five percent of the total carbon monoxide emissions are caused due to automobiles. In urban areas, automobile emissions contribute to 50-90 percent of the total air pollution. Every vehicle will have emission. It is not possible to avoid emissions completely but it can be monitored and controlled by using a pollution detection system. Due to the improper maintenance of vehicles the emission level of the vehicle increases. causing more air pollution and decreasing air quality that leads to severe health diseases. The main objective of the mini project is to introduce vehicular pollution monitoring system which is capable of detecting vehicles causing pollution on the city roads and measures pollutant's level in air. The Vehicle is automatically identified by using RFID system, we can get the vehicle owner details and then measures the level of emission from vehicle. GSM Module sent a message to owner informing that his vehicle leads to pollution and the penalty is to be paid.

ORGANISATION OF REPORT

The main body of the report is preceded by detailed contents including abstract. This is followed by system description.

• Chapter 1 The aim of this project is defined in the introduction section.

• Chapter 2 The literature review contains an understandable overview on where in the project's technology was adopted and information gathered.

• Chapter 3 The requirement of this project has been explained in detail in the requirement section.

• Chapter 4 The methods to implement and procedures to be carried out are further explained in the methodology.

• Chapter 5 Implementation of the system provides information about the hardware implementation.

• Chapter 6 The obtained result of the system is shown in the result section.

• Chapter 7 The programming shows the code used to execute the desired project.

• Chapter 8 Conclusion of the project . The main report is then followed by bibliography.

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Chapter 1

INTRODUCTION

One of the major concerns regarding the environment is air pollution. Along with health concerns, air pollution is greatly responsible for environmental problems. Air pollution cause greenhouse gases, which directly affects the ozone layer. Air pollution is not only harmful to the environment but also to all other living beings on earth. Inhaling air pollutants can cause serious impact on human health that affects important parts such as the lungs and the respiratory system. Vehicles and Industries are the major sources of Environmental Pollution. Every vehicle will have emission but the problem occurs due to the improper maintenance of vehicles. This emission from vehicles cannot be completely avoided but emission can definitely be monitored.In order to control the air pollution, the amount of emission from the vehicles needs to be monitored and vehicles responsible for pollution should be identified.For that, an excellent system which monitor the pollution in vehicles is designed.

This mini project proposes a system using wireless sensors that provides a framework for collecting the sensor data at anyplace.Sensors along with passive RFID is used in the proposed system to monitor the vehicular pollution.Global system for mobile communication is integrated with the system to send messages to the user.

1.1 AIM

To develop a Vehicle Pollution Monitoring and Alerting System to monitor and reduce the air pollution from vehicles. The emissions from Automobiles are one of the major reason for air pollution. So our aim of this mini project is to reduce the pollution from vehicle thus reducing the air pollution.

1.2 MOTIVATION

The motivation for doing this project are listed below:

• The increased use of vehicles in cities results in vital increase in the emission load of various toxins into air.

• Air pollutants from taxies, cars and buses result in the damage of ground level ozone.

• Air pollution leads to several health issues and respiratory problem like asthma attacks.

Hence to reduce the above mentioned issues we aim to design a system which can monitor and helps in reducing the air pollution.

Chapter 2

LITERATURE REVIEW

The proposed project vehicle pollution monitoring and alerting system monitor the pollution from the vehicle . We are using Arduino uno to implement this system instead of using raspberry pi in order to reduce the cost. The oxides of carbon and nitrogen are the pollutants . But in our project we are only monitoring carbon monoxide in the vehicle. It is enough to measure level of the air pollution caused by the vehicles because Co is the major contributor to the air pollution. The project based on RFID vehicle identifying system is used in our project to uniquely identifying each vehicles. Thus our system can automatically identify each vehicle by RFID system and measure the emissions by using gas sensors from that particular vehicle. The emission level and vehicle details are displayed on a display. Liquid Crystal Display is used in our project as display to minimise the cost of the system. In the proposed project Global System for Mobile Communication is used to sent message to the vehicle owner to inform the level of emission of his vehicle. A GSM module inserted with active SIM card can send SMS to the vehicle owner mobile phone. So that we are implementing the ideas in our project.

Chapter 3

REQUIREMENTS

3.1 HARDWARE

3.1.1 ARDUINO UNO

Figure 3.1: ARDUINO UNO

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

SPECIFICATIONS

- Board Name - Arduino UNO R3
- Microcontroller - ATmega328P
- Built-in LED Pin - 13
- Digital I/O Pins - 14 (0 TO 13)
- Analog input pins - 6 (A0 TO A5)
- PWM pins - 6
- Communication - UART - Yes
- I2C - Yes
- SPI - Yes
- Power I/O Voltage 5V
- Input voltage (nominal) 7-12V
- DC Current per I/O Pin 40 mA
- DC Current for 3.3V Pin 50 mA
- Clock speed Main Processor ATmega328P 16 MHz
- Memory 2KB SRAM, 32KB FLASH, 1KB EEPROM
- Dimensions Weight 25 g
- 53.4 mm
- Length 68.6 mm

3.1.2 RFID

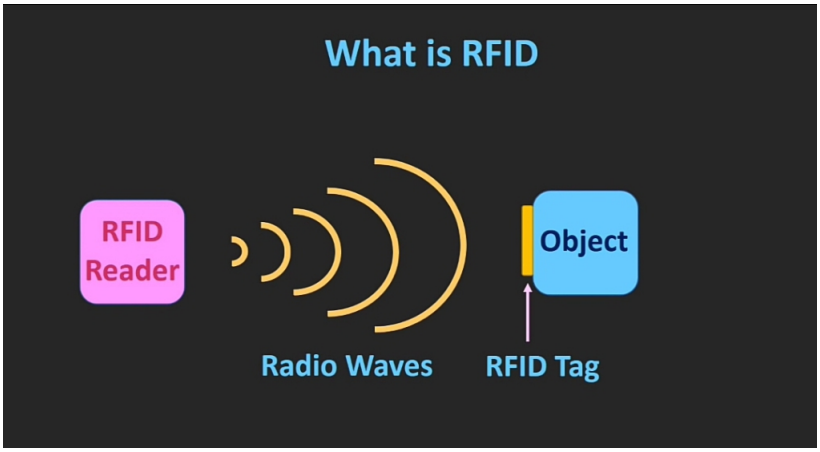

Figure 3.2: RFID COMMUNICATION

Radio Frequency Identification (RFID) refers to a wireless system comprised of two components: tags and readers. The reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag. Tags, which use radio waves to communicate their identity and other information to nearby readers, can be passive or active. Passive RFID tags are powered by the reader and do not have a battery. Active RFID tags are powered by batteries.

RFID tags can store a range of information from one serial number to several pages of data. Readers is a module so that they can be carried by hand, or they can be mounted on a post or overhead. Reader systems can also be built into the architecture of a cabinet, room, or building.

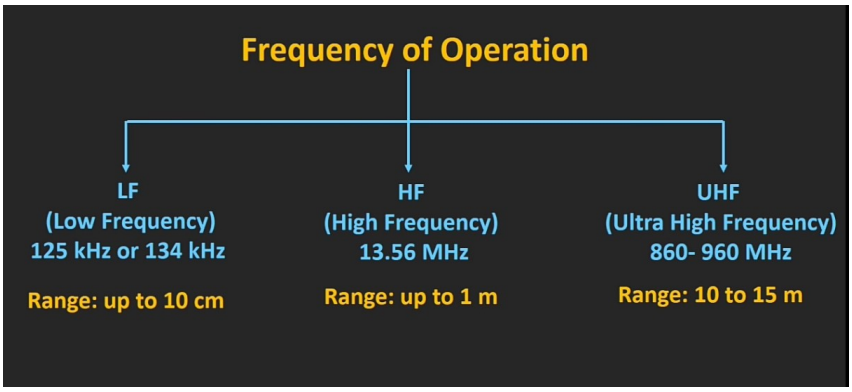

Figure 3.3: FREQUENCY RANGE

RFID READER

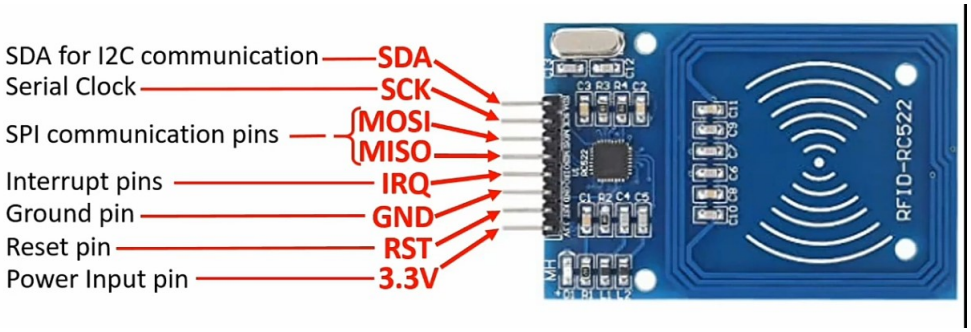

Figure 3.4: RFID READER RC522

- PIN 1 VCC - The power pins are VCC. In some versions of RC522, this pin is denoted by 3V3 on the module instead of VCC.
- PIN 2 RST - It's a reset pin for the module. Therefore, it uses to reset the device in case of an error on when a device isn't giving any response.
- PIN 3 GND - Ground helps to make the common ground with every external device, e.g. power Supply, Microcontroller or Arduino.
- PIN 4 IRQ - This pin connects with the Arduino/Microcontrollers for SPI communication. However, it transfers the data from module to Arduino. The MISO pin is also useable for other functions instead of SPI.
- PIN 5 MISO - It can also interface with I2C for clock pulse and UART Serial for Data transfer from the module
- PIN 6 MOSI - MOSI is the data input pin for RFID module in SPI communication
- PIN 7 SCK - The SCK pins help to send the clock pulse in SPI communications
- PIN 8 SS - The SS pin is a chip enable pin in SPI communication.

RFID TAGS

Figure 3.5: RFID TAGS

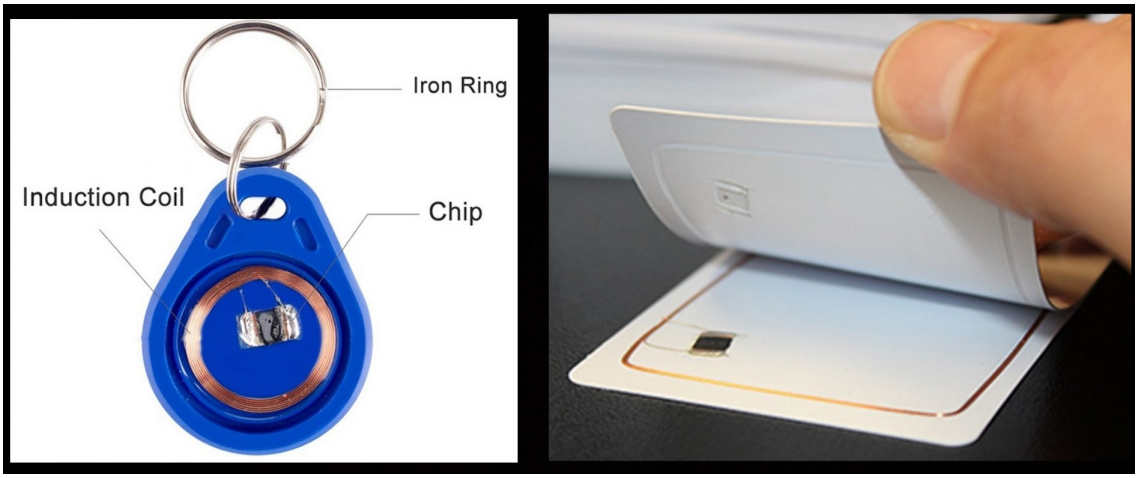

Figure 3.6: INSIDE THE RFID TAGS

Here we are uesed passive RFID wich can only communicate with up to 5cm (Practically)

- Read Distance : Direct contact(5cm)
- Input Voltage : 2.5 V to 3.3 V
- Current : 13 mA to 26mA
- Working Frequency : 13.56 mhz

3.1.3 MQ-7 GAS SENSOR

Figure 3.7: MQ-7 GAS SENSOR

OVERVIEW

- Sensitive for carbon monoxide
- Output voltage boosts along with the concentration of the measured gases increases
- Fast response and recovery
- Adjustable sensitivity
- Signal output indicator

HOW TO USE

- VCC - 2.5V 5.0V
- GND - power supply ground
- AOUT - MCU.IO (analog output)
- DOUT - MCU.IO (digital output)
- Concentration Scope 10 – 1000ppm

APPLICATION

MQ-7 GAS Sensor is used for CO (carbon monoxide) detection.

HOW THE SENSOR WORKS ?

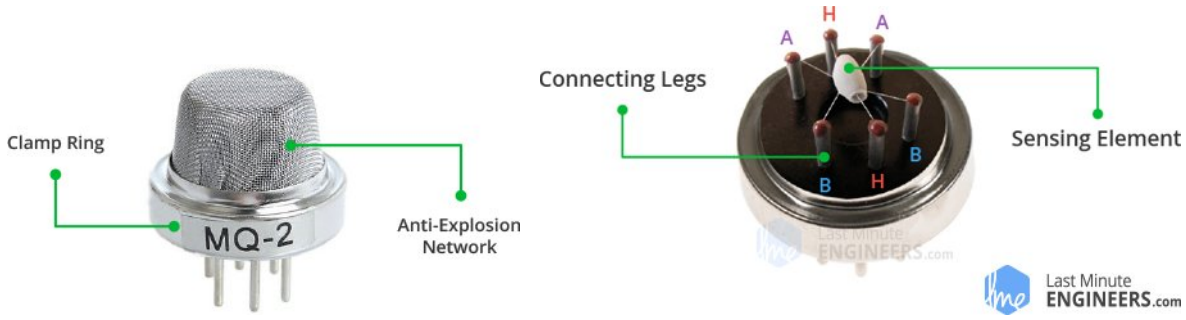

Figure 3.8: MQ-7 GAS SENSOR

When tin dioxide (semiconductor particles) is heated in air at high temperature, oxygen is adsorbed on the surface. In clean air, donor electrons in tin dioxide are attracted toward oxygen which is adsorbed on the surface of the sensing material. This prevents electric current flow.

In the presence of reducing gases, the surface density of adsorbed oxygen decreases as it reacts with the reducing gases. Electrons are then released into the tin dioxide, allowing current to flow freely through the sensor.

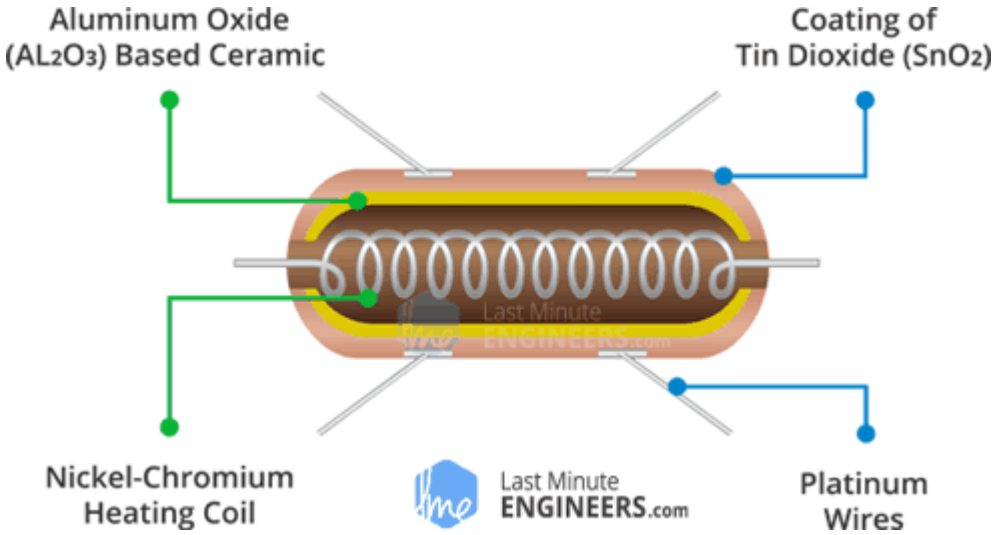

Figure 3.9: TIN DIOXIDE TUBE

3.1.4 LCD

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc The operating voltage of this LCD is 4.7V-5.3V It includes two rows where each row can produce 16-characters. The utilization of current is 1mA with no backlight Every character can be built with a 5×8 pixel box The alphanumeric LCDs alphabets numbers Is display can work on two modes like 4-bit 8-bit These are obtainable in Blue Green Backlight It displays a few custom generated characters.

PIN DIAGRAM

- Pin1 (Ground/Source Pin): This is a GND pin of display, used to connect the GND terminal of the microcontroller unit or powersource.

Figure 3.10: 16*2 LCD

- Pin2 (VCC/Source Pin): This is the voltage supply pin of the display, used to connect the supply pin of the power source.
- Pin3 (V0/VEE/Control Pin): This pin regulates the difference of the dis-

play, used to connect a changeable POT that can supply 0 to 5V.

- Pin4 (Register Select/Control Pin): This pin toggles among command or data register, used to connect a microcontroller unit pin and obtains either 0 or 1(0 = data mode, and 1 = command mode).
- Pin5 (Read/Write/Control Pin): This pin toggles the display among the read or writes operation, and it is connected to a microcontroller unit pin to get either 0 or 1 (0 = Write Operation, and 1 = Read Operation).
- Pin 6 (Enable/Control Pin): This pin should be held high to execute Read-/Write process, and it is connected to the microcontroller unit constantly held high.
- Pins 7-14 (Data Pins): These pins are used to send data to the display. These pins are connected in two-wire modes like 4-wire mode and 8-wire mode. In 4-wire mode, only four pins are connected to the microcontroller unit like 0 to 3, whereas in 8-wire mode, 8-pins are connected to microcontroller unit like 0 to 7.
- Pin15 (+ve pin of the LED): This pin is connected to +5V
- Pin 16 (-ve pin of the LED): This pin is connected to GND.

3.1.5 GSM

GSM stands for Global System for Mobile Communications. It's a standard that specifies how 2G (second generation) cellular networks operate. GSM was a significant improvement over the first generation of cellular networks and represented a transition from analog to digital telecommunications. GSM is currently the most widely used network technology in Internet of Things (IoT) applications for its simplicity, affordability, and accessibility.

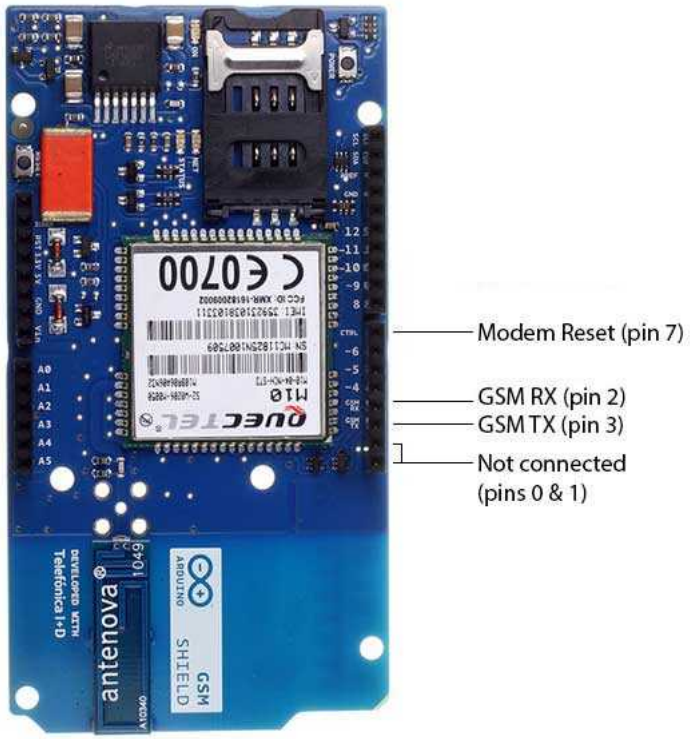

Figure 3.11: GSM SHEILD

PINS USED

- VCC,GND - For Power Supply (12v)
- TX,RX - For Communication.

LED DESCRIPTION

- PWR - Power indication, turns on when the shield is powered
- NET - Network status

  Off - Modem not running

  64ms on/ 800ms off - Modem not registered to the network

  64ms on/ 3000ms off - Modem registered to the network

  64ms on/ 300ms off - GPRS communication is established
- STS - Indicates operating status of the module. LED is on when the module is powered.
- 3D - Blinks when GPS is not fixed, turns off when GPS is fixed

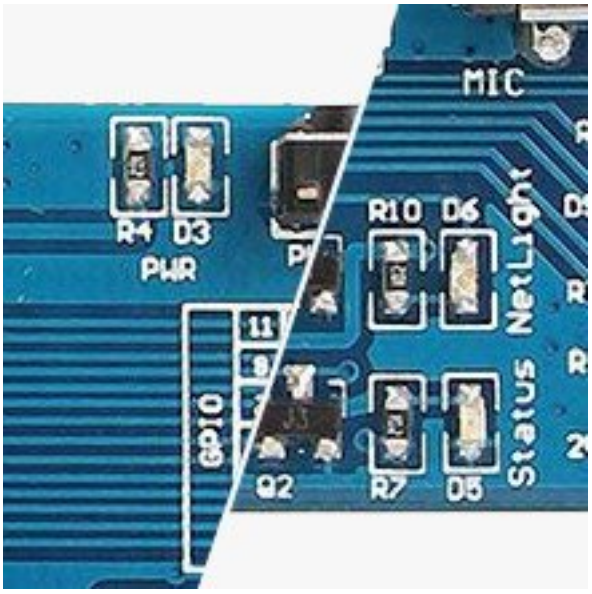

Figure 3.12: LED INDICATIONS

3.2 SOFTWARE

3.2.1 ARDUINO IDE

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. Here, IDE stands for Integrated Development Environment.

The program or code written in the Arduino IDE is often called as sketching. We need to connect the Genuino and Arduino board with the IDE to upload the sketch written in the Arduino IDE software. The sketch is saved with the extension '.ino

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

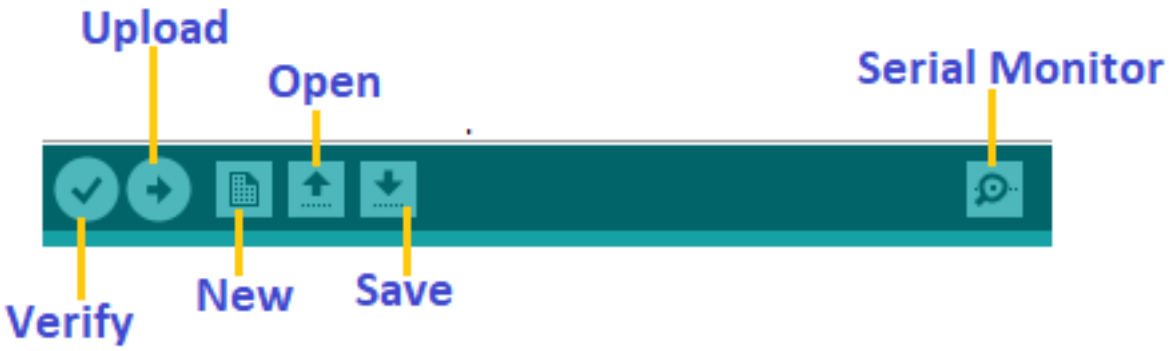

Figure 3.13: ARDUINO IDE VIEW

WRITING THE SECTIONS

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

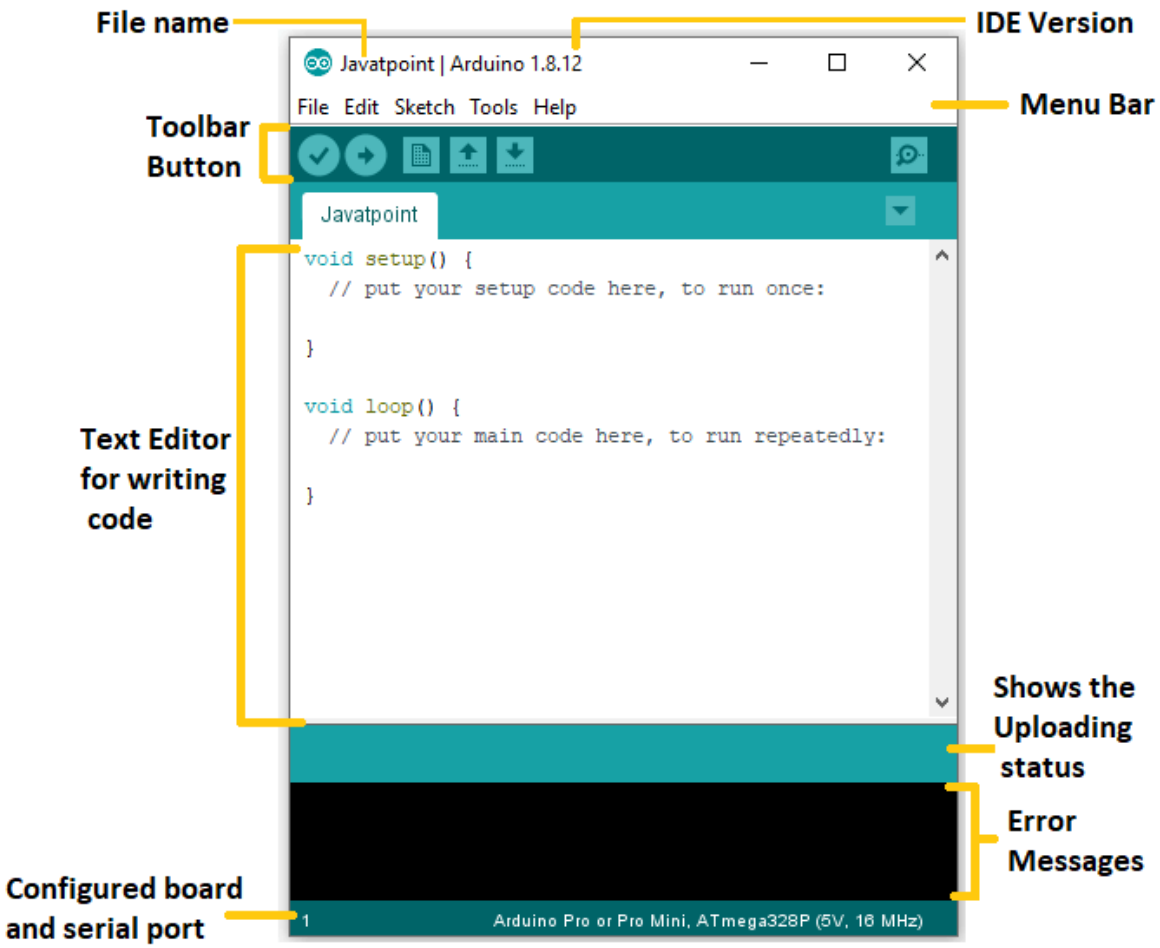

Figure 3.14: ARDUINO IDE VIEW

Chapter 4

METHODOLOGY

4.0.1 BLOCK DIAGRAM

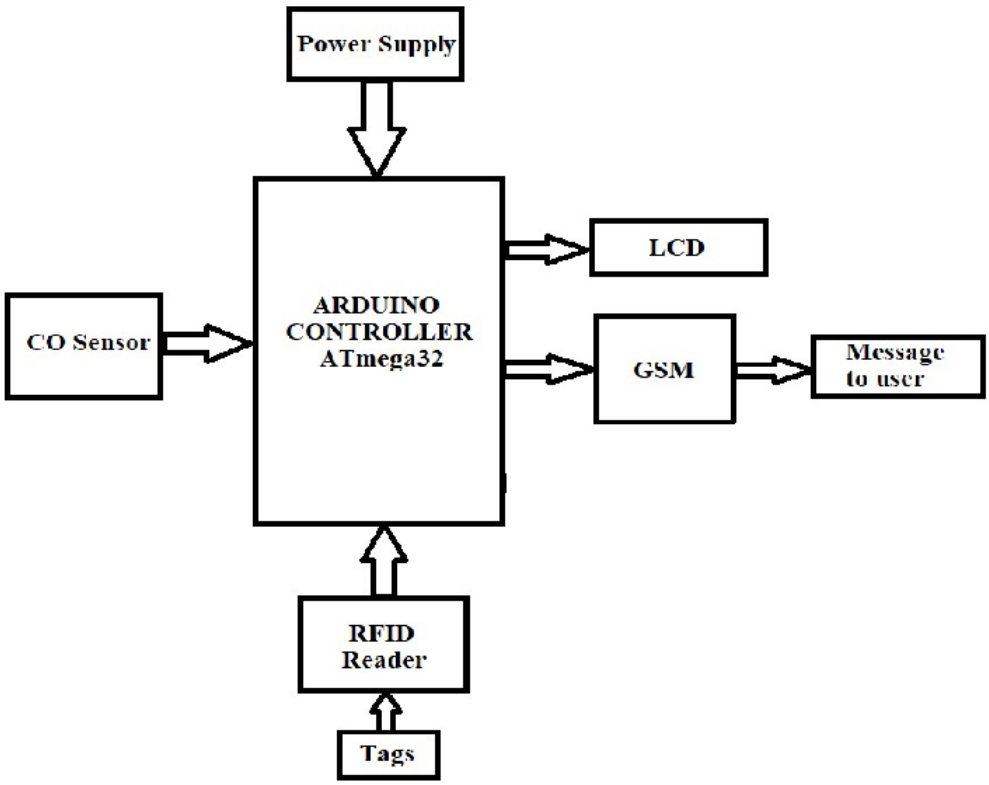

Figure 4.1: BLOCK DIAGRAM

The Arduino act as the controller unit which coordinates al the functions of the system. RFID Reader and Tags which uniquely identifying the vehicle. The gas sensor measures the level of emissions from the vehicle. And the GSM which is used for sending message to the vehicle owner.

First when the vehicle arrives with in the range of RFID reader it can read information from the RFID tag.The RFID tags which are fixed in the vehi-

cles.Once the RFID reader reads the information from the RFID tag the sensor will be activate.Sensor will measure the emissions from the vehicle. All these data are given to the controller unit.The controller unit analyse and process the out puts from RFID and gas sensor. And displays it in LCD. If the measured level of emission is greater than the threshold level the controller unit displays a indication message on LCD and also a message is send to the user informing the user that his vehicle causes pollution and the amount of fine he has to be pay. If the level of emission is below the threshold level no message is send and displays pollution level is normal on LCD.

Circuit Diagram

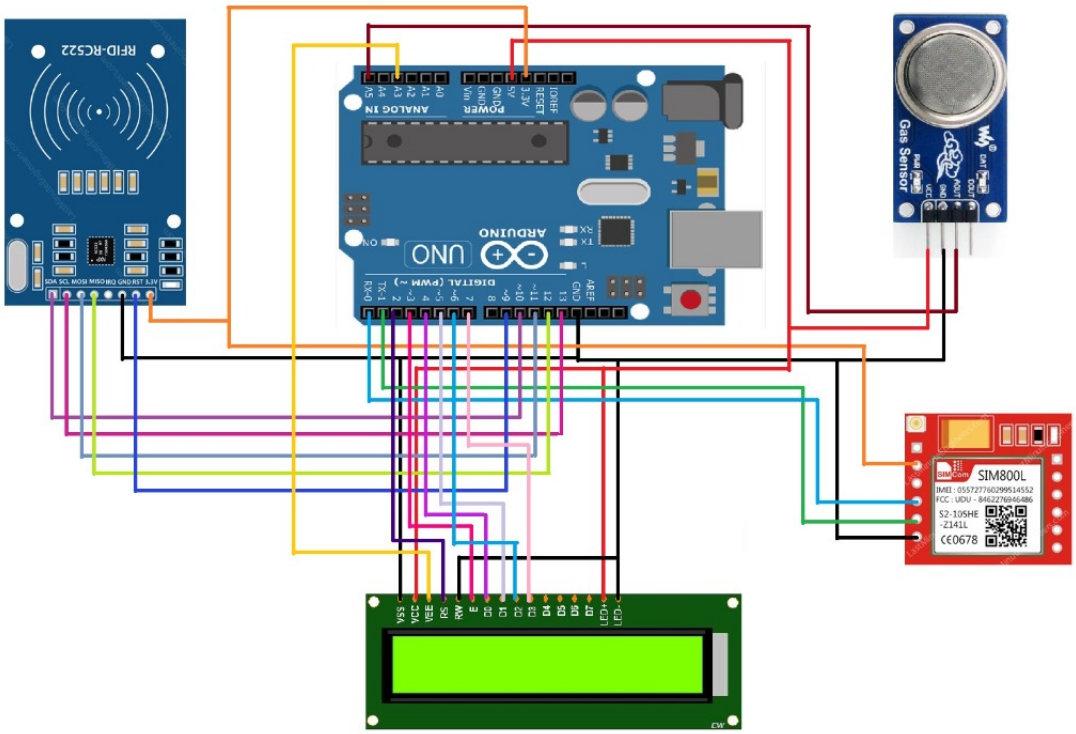

Figure 4.2: CIRCUIT DIAGRAM

Chapter 5

IMPLEMENTATION OF PROJECT/ Work Done

A prototype was developed for integration of all the devices and the prototype is tested. The information of RFID card sends serially to Arduino board through active RFID reader. The Arduino microcontroller board read the data and also displays them on lcd. Message has been send to user if the pollution level is not normal.

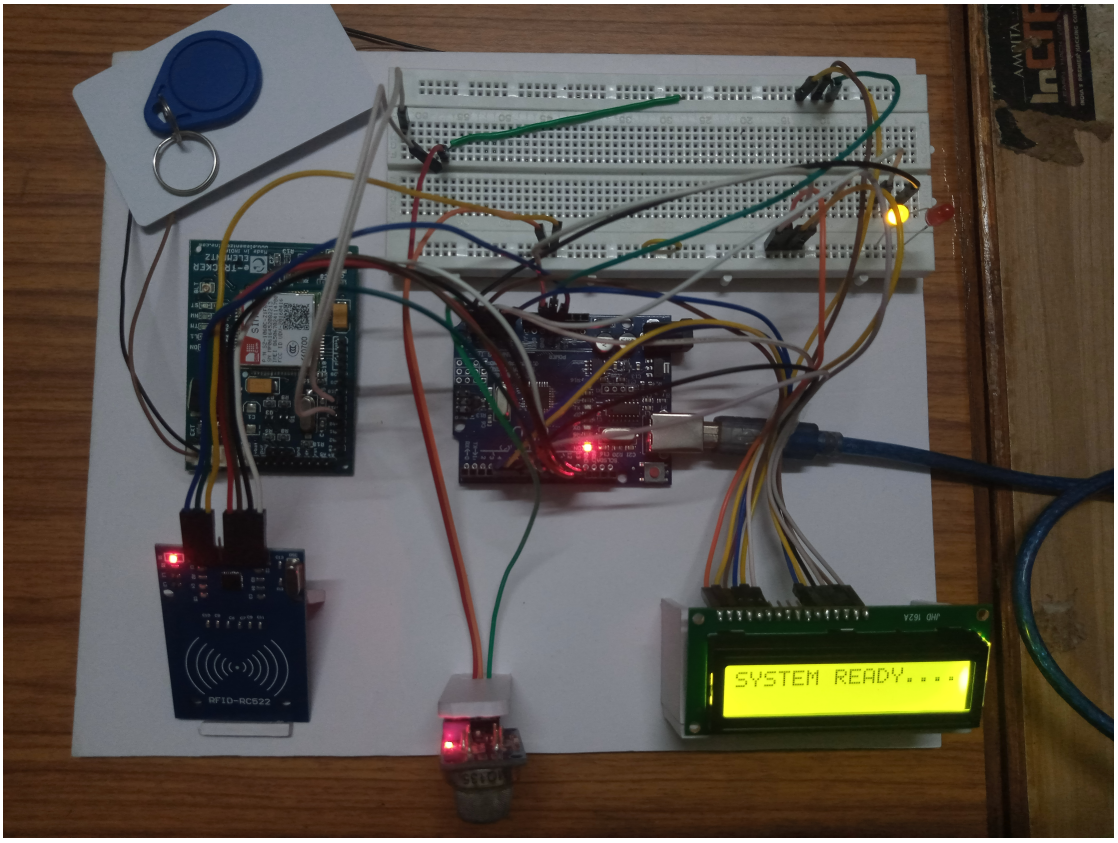

Figure 5.1: PRODUCT PHOTO

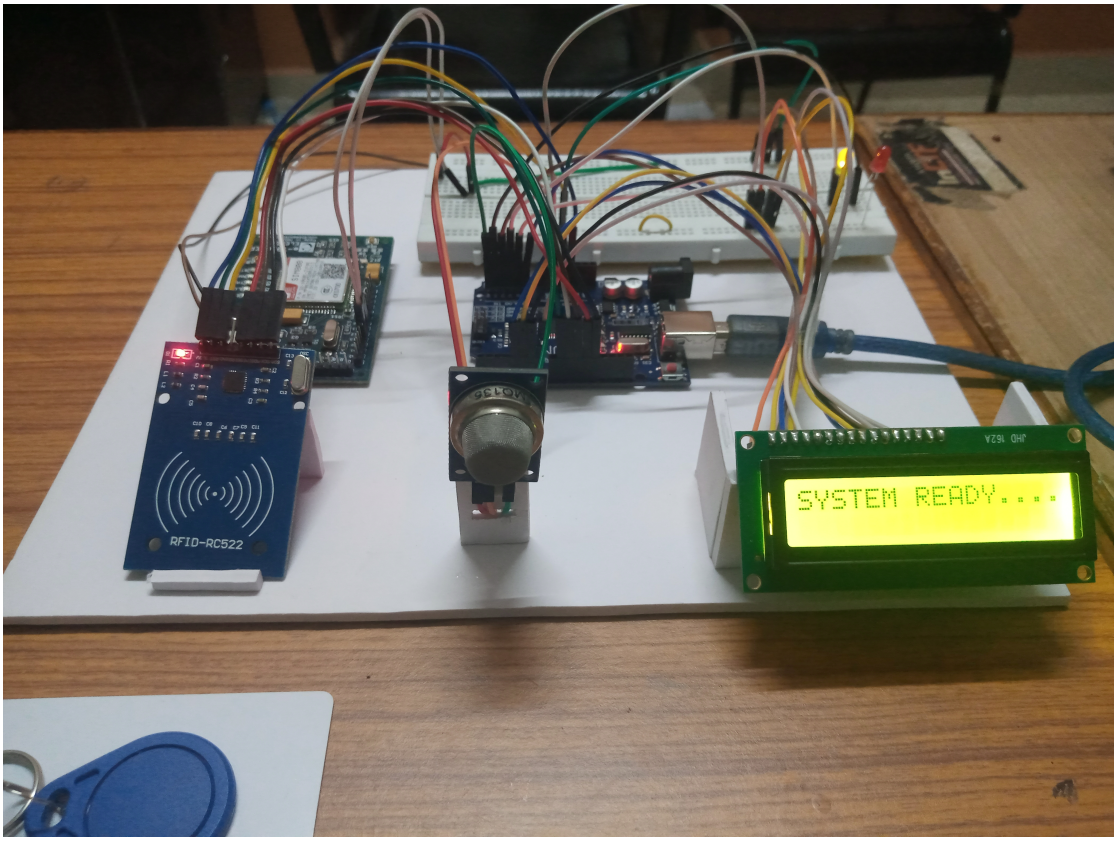

Figure 5.2: PRODUCT PHOTO

5.0.1 FUNCTION OF EACH PARTS

Atmega328p microcontroller

It is a low power and high performance microcontroller used to read and control the data from sensors and RFID reader. It sends the data to server and LCD display for displaying the pollution level and RFID ID.

Arduino board

Arduino is a hardware source platform that can work with different communication technologies and sensor devices. Due to its simplicity and number of hardware extensions more users and developers are used the Arduino.

Gas sensor

In this research work MQ-7, MQ-2 gas sensor is used to measure the carbon dioxide and sulpher oxides concentration in air. It is simple and low cost gas

sensors. There are widely used because of they provide high performance and better accuracy.

RFID

RFID technology is used for detecting, tracking and finding location of vehicles. In this proposed system Em-18 RFID reader and RFID card is used. RFID card is inserted to vehicles, it has 12 byte data. RFID reader detects RFID card and it sends the data to microcontroller.

GSM

The controller unit sends message by using the GSM.It sends message to the user if the level of emission is exceeded.

Chapter 6

RESULT

Each vehicle attached with RFID tag is identified using RFID reader and displayed the details of vehicle like vehicle number and owner name in the LCD. The emissions from the vehicle is measured using MQ-7 Gas sensor. The message is sent to the user if the emission level is greater than the threshold level. The measured level of emission is is also displayed in the LCD.

Figure 6.1: VEHICLE DETAILS

Figure 6.2: MEASURED LEVEL

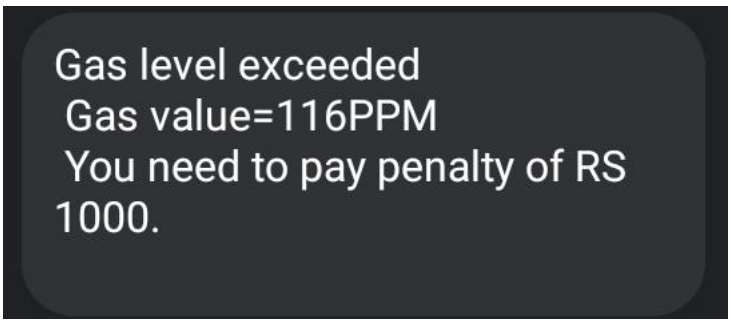

Figure 6.3: MESSAGE SENT

Chapter 7

APPENDIX

```
#include <LiquidCrystal.h>
#include <SPI.h>
#include <MFRC522.h>
#include <SoftwareSerial.h>
SoftwareSerial gsmSerial(2,3); //RX, TX
#define SS_PIN 10
#define RST_PIN 9
#define green A2
#define Red A4
MFRC522 mfrc522(SS_PIN, RST_PIN);
int g_sensor=A5;
LiquidCrystal lcd(A0,A1,4,5,6,7);
int b=75;

void setup()
{
  // put your setup code here, to run once:
  analogWrite(A3,b);
  pinMode(g_sensor,INPUT);
  Serial.begin(9600);
  gsmSerial.begin(9600);
  SPI.begin();      // Init SPI bus
  mfrc522.PCD_Init();
  delay(1000);
```

```
  lcd.begin(16,2);
  lcd.setCursor(0,0);
  lcd.print("   pollution");
  delay(1000);
   lcd.setCursor(0,1);
  lcd.print("monitoring system");
  delay(3000);
analogWrite(green,150);
  analogWrite(Red,0);

}

void loop()
 {
   analogWrite(green,150);
    analogWrite(Red,0);
   lcd.clear();
   lcd.print("SYSTEM READY....");
   delay(1000);
    lcd.clear();
   if (! mfrc522.PICC_IsNewCardPresent())

    {
      return;
    }
```

```
  {
    return;
  }

     if ( ! mfrc522.PICC_ReadCardSerial())
     {
       return;
     }
  Serial.print("uid tag :");
  String content= "";
  byte letter;
  for (byte i=0; i<mfrc522.uid.size; i++)
  {
    Serial.print(mfrc522.uid.uidByte[i] <
0x10 ? "0" :" ");
    Serial.print(mfrc522.uid.uidByte[i],HEX);

content.concat(String(mfrc522.uid.uidByte[i]
< 0x10 ? " 0" : " "));

content.concat(String(mfrc522.uid.uidByte[i],
HEX));


  }
  Serial.println();

  content.toUpperCase();
```

```
    Serial.println();

    content.toUpperCase();


    if(content.substring(1) =="53 D8 F5 11")
    {
    lcd.setCursor(0,0);
      lcd.print("USER 1 ");
      lcd.setCursor(0,1);
       lcd.print("KL 08 BC 5698  ");
       delay(5000);
       lcd.clear();
       gasvalue();
    }
    if(content.substring(1) =="E3 31 5C 0D")
    {

      lcd.setCursor(0,0);
      lcd.print("USER 2");
      lcd.setCursor(0,1);
      lcd.print("KL 07 AC 9856");
      delay(5000);
      gasvalue();
      lcd.clear();
    }
}
    void gasvalue()
    {
```

```
  lcd.clear();
int gas_v=analogRead(g_sensor)/7;
lcd.setCursor(0,0);
lcd.print("gas value=");
lcd.print(gas_v);
lcd.print("ppm ");
lcd.setCursor(0,1);
lcd.print("group 5");
delay(6000);
if(gas_v>70)
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Gas Level Exceeds");
analogWrite(green,0);
analogWrite(Red,200);
SendMessage();
lcd.setCursor(0,1);
lcd.print("SMS sent");
delay(6000);
while(gas_v<70);
}
else
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Gas Level Normal");
lcd.setCursor(0,1);
delay(3000);
   }
```

```
 void SendMessage()
{
  Serial.println("Setting the GSM in text
mode");
  gsmSerial.println("AT+CMGF=1\r");
  delay(2000);
  Serial.println("Sending SMS to the desired
phone number!");
gsmSerial.println("AT+CMGS=\"+919656707
953\"\r");
  delay(2000);
  Serial.println("Your Vehicle causes
Pollution & You have to pay penalty 500Rs");
  gsmSerial.println("Your Vehicle causes
Pollution & You have to pay penalty
500Rs"); // SMS Text
  delay(200);
  gsmSerial.println((char)26);
  delay(2000);
}
```

Chapter 8

CONCLUSION

This mini project presented the design and development of vehicular pollution monitoring system for green revolution. The hardware architecture and software implementation are discussed in length.The designed smart intelligent environmental system monitors the pollutants produced by the vehicles and also alert the vehicle owners to control the pollution. The air pollution monitoring authority can identify the vehicles that causes more pollution to the atmosphere .

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