Design and implementation of GSM based railway gate control & fault finding system

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DECEMBER 2020

APPROVAL

This Project titled "Design and implementation of GSM based railway gate control & fault finding system", submitted by Pappu Hosen, Mehedi Hasan**,** Md: Mozibor Rahman and Md: Nasir Uddin 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 approved as to its style and contents. The presentation has been endured on 8 December, 2020.

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DECLARATION

We hereby declare that this mentioned project has been completed by us under the supervision of **Md:Ohidujjaman Tuhin, Senior Lecturer, Department of CSE**, Daffodil International University. We are also declaring that not this project or any part of this project has been submitted elsewhere for award of any degree or diploma.

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Acknowledgement

At first, we evolve our heartiest thanks and gratitude to the Almighty Allah for His divine blessing makes us possible to complete the final year project successfully.

We really grateful and wish our profound our indebtedness to **Md: Ohidujjaman Tuhin, Senior Lecturer,** Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Embedded System*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this project.

We would like to express our heartiest gratitude to **Md: Ohidujjaman Tuhin**, **Tajim Md: Niamat Ullah Akhund**, and Head**,** Department of CSE, for his kind help to finish our project and also to other faculty member and the staff of CSE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Nowadays, transport keeps a very important preface in our daily life to carry people and products to move from one place to another. Among the transports, railway is one of the most popular one. But if we look back some previous year, we can see that there are hundreds of incidents of accidents due to lack of proper observation in railway transport system. So, proper steps should be immediately taken so that the number of accidents can be reduced soon. To reduce this problem, we are proposing an automated observation system. In this project, road crossing security system will operate automatically using FSR sensors. Moreover, in case of any kind of fault of the railway path, the microcontroller will receive that signal and the system will carry the message by GSM module to its closet control room so that they can take immediate steps to solve the problem. So, our proposing model is not only use to reduce accidents but also to increase accuracy.

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Chapter 1
Introduction

1.1 Introduction:

The most comfortable and cheapest journey for every people is by train for travelling long distance. It helps to supply raw materials and other products to the industries or factories. Also it helps to carry finished goods to the market. Thus it plays a vital role in our economy and also helps to grow many industries and factories. So, we must have to ensure its safety and accuracy by any means. As the number of railway is increasing day by day, so we have to ensure a modern and digital railway system. But the real scenario in railway is quite different in our country. Almost every time we hear about railway accident which is now a common issue. But a lot of people lose their lives and many asset is destroyed by it. Moreover, communication from one place to another is interrupted for this accidents.
We know, it is very difficult to maintain railway system in a manual method. So, our automated project is able to stop of all kinds of accidents in railway system.

A statistics show that most of the accidents is basically happened for little rift on the rail path from the rail path. Besides, while crossing the main highways the people and the vehicles stands on the railway truck as the railway gate is not closed in time. So, they are not aware of the running train. Thus the train come instantly and accidents occurs. Although, this is simple mistake but it suffers a lot in the long run.

1.2 Objective:

Our project is implementation of automatic gate control system along with railway fault tracking security system using GSM. It uses 30-bits Arduino Nano. Arduino Nano is used to identify of rail-line crack by the series wire and the fault message transmit to the platform management authorities. The main objectives are:

- To track out the cracks or fault on the railway lines.
- To get immediate message and call for safety in case of any cracks on railway tracks.
- Automated road crossing systems.
- To reduce time for closing and opening the gate.
- To reduce traffic jam in crossing area.

The objective of the technical supplement is to provide guidance on how to project system from railway fault by the correct use of Arduino Uno GSM systems.

1.3 Historical Background:

The main goal of this project is railway track security. If this project can be implemented successfully, this will be very helpful for the transport of our country especially in railway transport system. So, it will not only help our transport but also help to increase our economic growth. This project is basically implemented with the combination of hardware and software but mainly it is hardware dependent. So, maximum component are hardware components.

First of all, we have collected a survey of automatic railway track security. The survey helps us a lot to understand that which technologies are needed for developing our project and which will make more efficient. Now, we will discuss about recent technologies which are already developed in this sector.

According to some statistics, it is clear that rail line is the major cause of almost every train collision in almost every country. But maximum developed country has overcome their problem recently. Although the number of railway is increasing in our country but our facilities are not sufficient at all if we follow the international levels. So, there are frequent incidents of accidents in every year and result in a lot of lose of worthy lives and commodity also. An

analysis shows that from 2005 to 2011 there were 344 numbers of cases of accidents in railways. The result of this collision took almost 230 people lives and almost 500 people had seriously injured and also a loss of millions of dollars. A current statistic reveals that more than 65% rail accidents occurs due to derailments and approximately 90% of this collisions occurs because of fracture on the trains that may be natural causes as like over heats may cause of expansion. As this fracture in rail paths is a forever problem so it must be identified with maximum consideration because of the adequate usage of rail in Bangladesh. Most of time, these fractures and all the matters of the trains remain unseen because of inappropriate protection & also the recent rambling & manual path observing by the railway authorities. The necessity of an automatic method to observe the presence of the fracture on the rail path is very high due to this the unreliability of manual monitoring system and the high frequency of trains.

So, from above discussion and after understanding the crucial circumstances of railway, this project presents a workable and also low-cost which is decent for widely use.

1.4 Motivation:

Every year many railway accidents occurs and as a result many people died and a lot get injured. So, thinking about this we make a plan to make railway system safe and reliable. Our project will ensure the safety of the rail track.

1.5 Methodology:

First of all, the train is kept on rail path, that is to be overlooked. Then the train ID & also the path ID will be given for detection. Then the train goes for others activity. Then it starts to move on the rail path. It has so many sensors that has its specific task. If a fracture or missing plate is identified in the rail path then it sends a message using GSM module to the control room. The rail authorities then take immediate steps to repair it. If any rail is on that fractured way the authorities also can inform the driver about it and they can stop the train immediately.

This system will also close the crossing road by gate when a train is closed to the roads by using automatic gate control method.

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Chapter 2

Circuit Design

2.1 Working Principle:

i. When the power of the train is turned ON then it goes forward to the model path. In that time, the IR obstacle sensors observes the position of the paths.

ii. As whole system is connected with a cable in the rail path any little fracture or missing fishplates cause disconnect of the wire.

iii. If the connection of the wire is disconnected at any place of the path then it sends a text SMS and a voice call.

iv. The SMS and voice call is sent by GSM module to the predefined number with the assistance of a SIM card. The sim card is inserted into the module.

2.2 Schematic diagram:

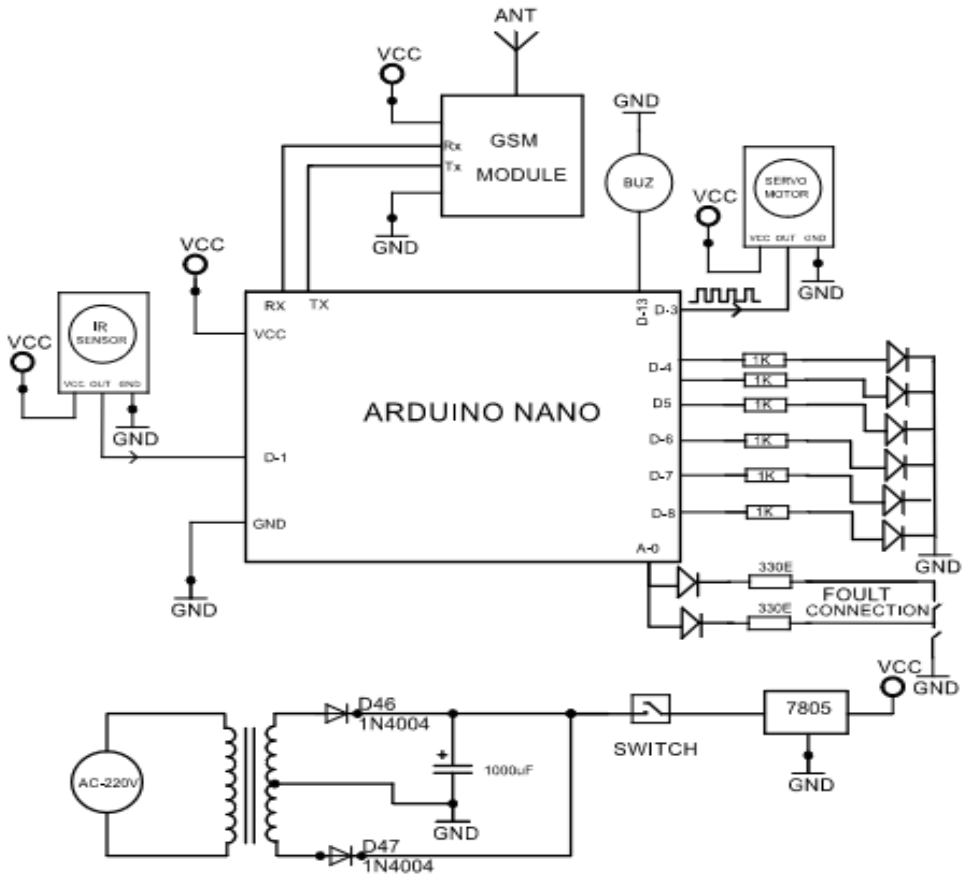

Figure: 2.2 : Schematic Diagram.

2.3 Block Diagram:

Automatic Railway Tracking System can detect the appearance of railway line fault and yield a alarm after that. If the fault is tracked out it turns ON a LED that is pictured in the project. So, by seeing this the train can be immediately stopped and also the passengers and others staff can save their lives. In that moment, it begins to make sounds using a buzzer so that it can wary close people surroundings it by which they are able to take precautions about the presence of rail line fault in this line. Besides, an SMS is instantly sent to the railway control room that will assist them so that they can take instant steps to evacuate the train. Moreover, this project offers a strong and smart technology for safety.

Within the railways that works completely automatic with the assistance of microcontrollers and some sensors.

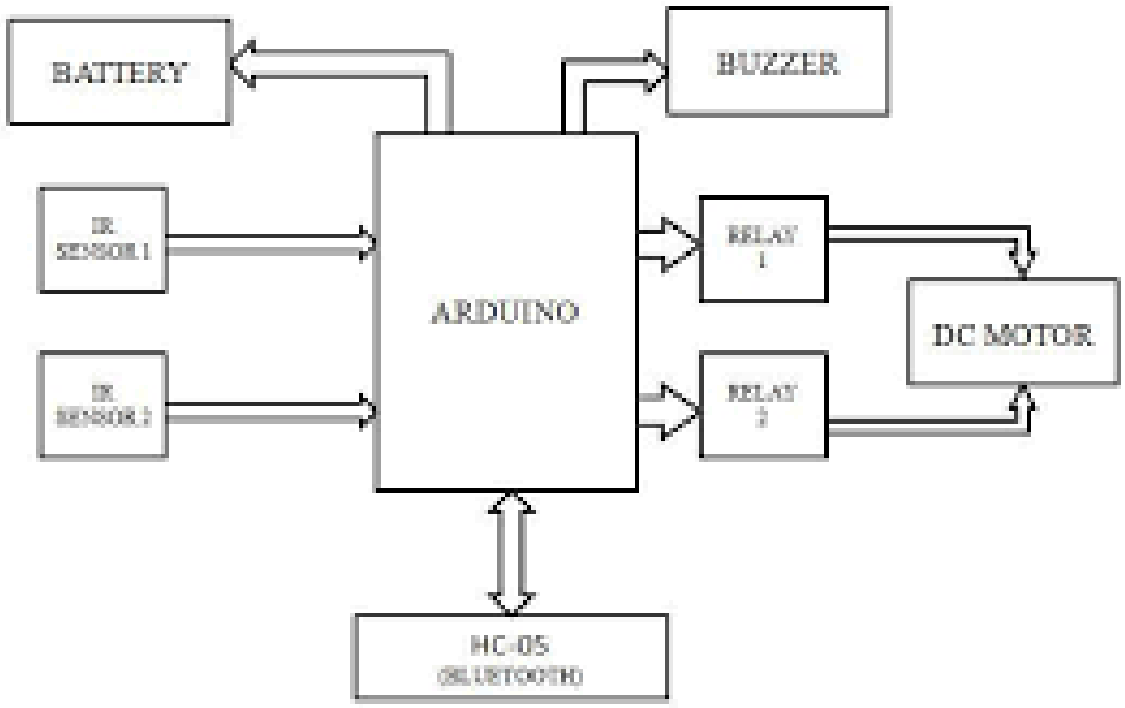

Figure: 2.3 Block Diagram.

2.4 Required Hardware:

- ✓ Arduino Uno
- ✓ GSM Modem
- ✓ IR Sensor
- ✓ Servo Motor
- ✓ Buzzer
- ✓ I2C module
- ✓ LCD
- ✓ Bread board

Required Software: Programming Language: C

2.5 GSM MODEM:

GSM is basically a modem for mobile communication. It was discovered in 1970. At present, the use of GSM is increasing rapidly in whole world. It is used to transmits voice and data services of mobile communication at specific frequency. It has developed using TDMA technology for communication. It can carry more than 100 MB Per Second. It has brought about a revolution change in the field of communication.

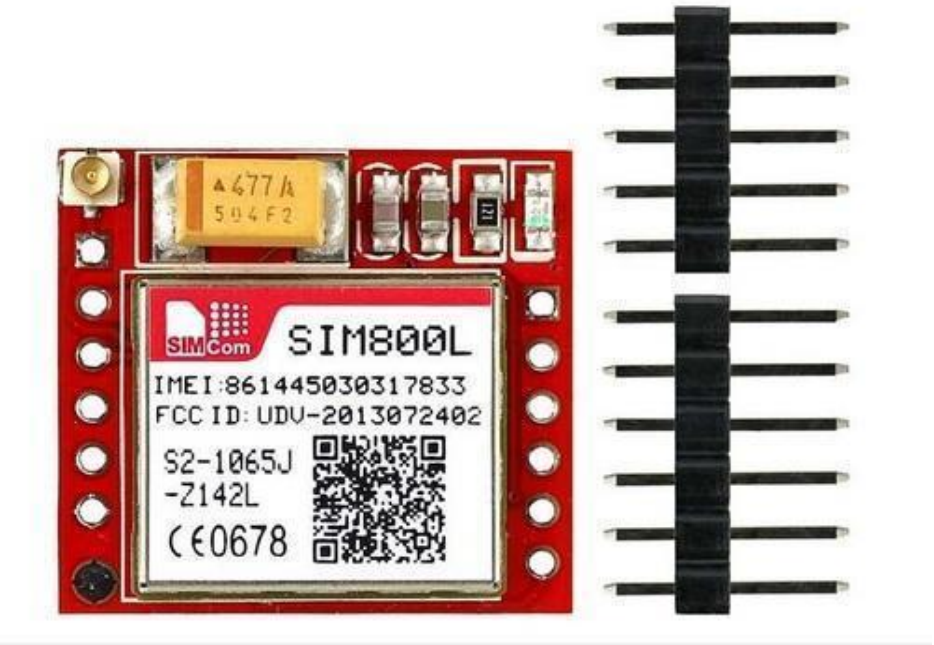

Figure: 2:5: GSM Module SIM 800L.

In a GSM module, there are several cells. Every cell is different according to the implementation. The covered area of every cell is also different based on its implementation.

SIM800L is a module of miniature cellular. It permits for not only GPRS transmission but also sending and receiving SMS. It is also able to send and receive voice call. The cost is low and easy to use that makes it perfect for implementation of any long range connectivity project. It has two antennas. The first one is very useful for narrow places. The next one is called PCB antenna which has both sided tape. It is linked with a special wire along with connector. The PCB antenna has high efficiency and permits to place your module to a metallic element.

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2.6 GSM Architecture:

2.6.1 A Mobile Station:

It consists of two parts. They are;

- The first one is called BSS (Base Station Subsystem). It makes relation between the mobile station & network subsystem. It has Base Transceiver Station that holds the radio transceivers and handles the protocols for mobiles communication. Finally, acts like an interface for communication or data transmission.

- The next one NS (Network Subsystem). It supplies network connection to the mobile stations. The main part of the NS is it connects Mobile Service Switching Centre. Then it gives access to several networks such as ISDN, PSTN etc. It also has especial kinds of register that can identified by its unique IMEI number.

2.7 Some Features of GSM Module:

- It improves spectrum efficiency.
- It also provides international roaming system.
- It is able to manage SIM phonebook
- It has also fixed dialing number (FDN) features.
- It has a features of real time clock with alarm management.
- It uses especial features of encryption to make phone calls and text more secured.
- Finally, the most useful SMS service.

The security system is so much standard for the GSM system. That's why GSM system follows the best security standard.

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GSM MODEM:

It is an especial type of modem that can accept a SIM card and operates like a mobile phone. To operate it a SIM card is mandatory. By using USB or Bluetooth it can be connected with computer or any other device.

It is widely used in many projects like embedded GSM embedded terminal, industrial control, GSM security systems and so on.

2.8 Servo Motor:

A servo motor is very popular to pull or rotate any object accurately. If an object needs to pull or rotate in a fixed angle or distant then servo motor can be used. It is built with ordinary motor vehicles driven only by the service system. It is portable and little in size but has a great efficiency. It is widely used in numerous project that needs to pull or rotate any object accurately. There are mainly two types of servo motors. They are:

- ✓ DC motor
- ✓ AC motor

Application:

- ✓ In toy car for kids.
- ✓ In RC Helicopter
- ✓ Making a moving robots.
- ✓ Hardware based project.

Servo motors are generally rated in kg/cm. This indicates how heft a motor is able to take up at a fixed distance. If distance is greater, it will reduce the capacity of weight carrying.

2.8.1 Mechanism of Servo Motor:

It has 3 parts. They are:

- Controlling device
- Output sensor
- Option of feedback

.

Figure: 2.8.1: Servo motor

2.8.2 Servo Motor How Does It Work:

Servo motor has 3 cables. They are:

- ✓ Power
- ✓ Ground
- ✓ Signal.

The power cable is quite red in color and it must be linked to the 5V pin on the board. The base cable is black or brown in color and it is linked with Arduino board. The sign wire is quite yellow, orange or white in color and it is joined to a digital pin.

When servo is commanded to move it will move to the expected position and grip that position. If external force pushes to the servo will defend to move from that position. It is maintained by transmitting PWM, into the cable. This types of motor may bend only 90° generally angle. This motors are tiny and effective but quite difficult to use for all.

2.9 Components of servo motor SG-90:

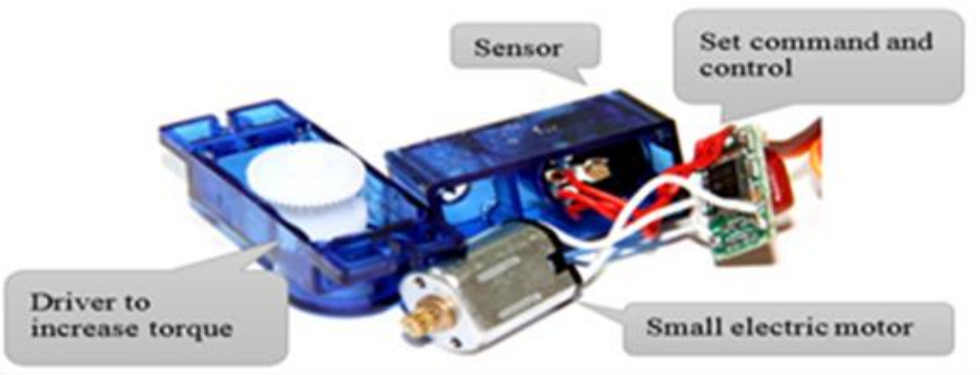

Figure: 2.9: Servo Motor Components

In our work we have used Servo Motor SG90 and its very easy to use because it is small in size which make our work more comfortable. In below we discussed about SG90.

2.9.1 Servo Motor Sg-90:

It is pony & portable that has lofty supply of power. It is able to turn almost 180º and it works is like the standard one.

2.10 Specifications:

- Weight is only 8 gm
- Operating speed is 0.1s/60º
- Voltage is about 5V

- Temperature is between 0ºc to 55ºc

2.11 How the Servo is controlled:

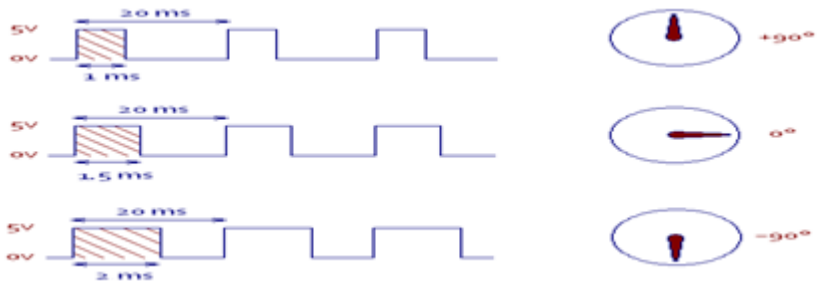

Figure: 2.11: Variable pulse width control servo position.

Usually, it can turn 90º angles. But it can move in the same direction at 180º angle. When a command is given to the servo motor to move it moves to the exact position that was commanded. It can defend to change if external force is given to move it. But to holds the position pulses needs to repetition. This is very much user friendly and accurate with high power.

Moreover, they are cheap, long-lasting and also available in everywhere.

2.12 Voltage Regulator:

A voltage regulator creates a definite output voltage inspite of shifting its input voltage. The voltage regulator should be durable with its condition. In this project, we will use IC 7805. 5V. It fixed the output voltage to 5V then bear 5V power. The voltage source in a circuit may be ups and downs and may be not give the accurate voltage output in every time. Its IC controls the output voltage at a fixed rate.

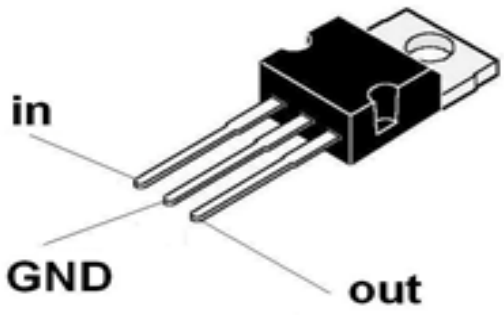

Figure: 2.12: Voltage Regulator.

APPLICATION:

- ✓ Uses in every power supplies to control voltage at a fixed rate.
- ✓ To save electronic device from high voltage.
- ✓ Used for electronic circuit and alternator internal engine.
- ✓ Voltage Monitoring.

2.13 Capacitor:

Capacitor is one of the most important component of this project. It can be used in various applications. In a microcontroller using capacitor is must because the microcontroller is a digital device with fast changing edges that uses a lot of current for a very short period of time at every transition. The capacitors supply this large amount of current so that the power supply doesn't sag at that time while creating noise. The main task of a capacitor is to store electric charge. After storing charge capacitor can be used as like a voltage source. It will be better to use different capacitors on the power supply pins of the microcontroller so that it can provide a low impedance wideband supply. In this project, we have used variable value of capacitors. We have used 10 µf (6 Pcs) and 100µf (1Pcs) capacitor. Capacitors are used widely for various

purposes like: timing, smoothing power supply, coupling, filtering, tuning for radio system, storing energy and so on.

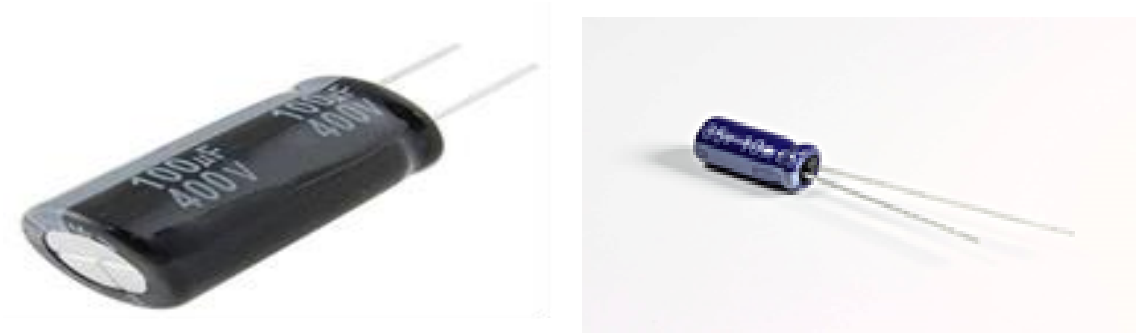

Figure: 2.13: 100µf and 10µf Capacitors.

2.14 I2C Module

It has a inbuilt PCF8574 I2C chip that converts I2C serial data to parallel data for the LCD display. It is a serial communication protocol, so data is transferred bit by bit along a single wire.

Figure 2.14.: I2C module

2.14.1 I2C module pinout

Figure 2.14.1: I2C module pinout

2.14.2 I2C Circuit diagram

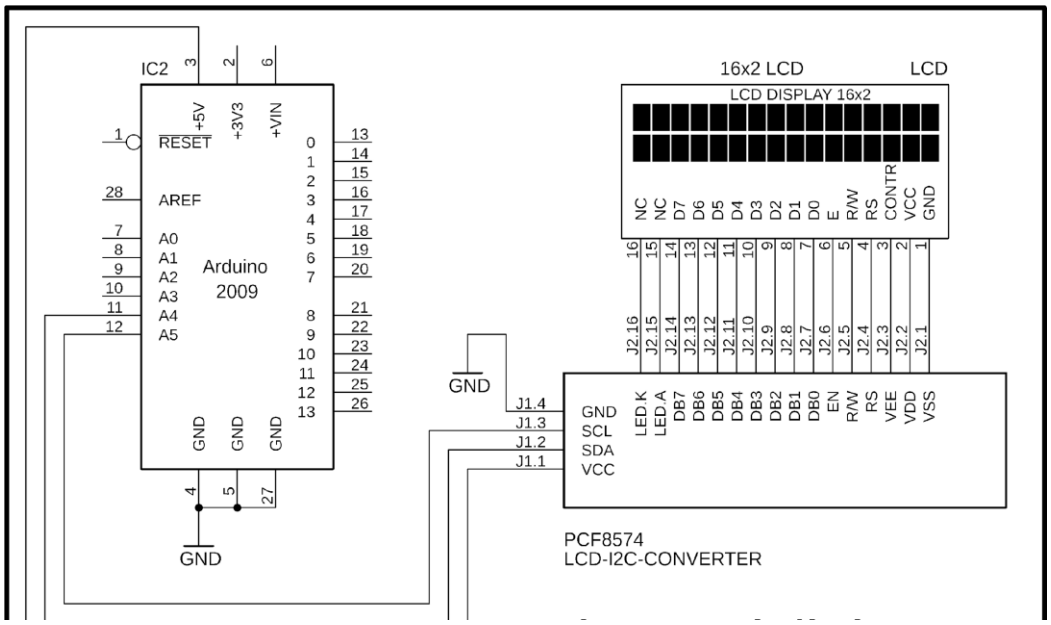

Figure 2.14.2 I2C Circuit diagram

2.15 IR Sensor:

An infrared(IR) sensor is such a device that ejects so that it can sense some aspects of its all-around. It is able to volume the temperature of any object and also identify the movement. Another kinds of sensors can measure infrared divergency without ejects it is named a passive IR sensor. Generally, the infrared spectrum radiates all the objects by using thermal radiations. These radiation is not visible to our glance at all.

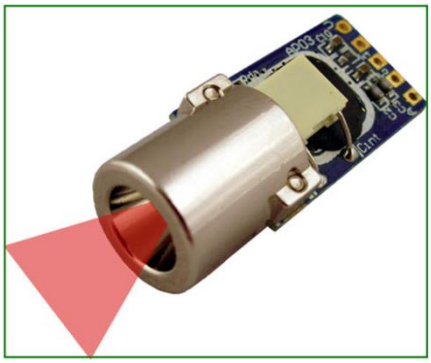

Figure:2.15:IR Sensor.

APPLICATION:

- ✓ It is used in proximity sensor.
- ✓ In item counter it is also used.
- ✓ In Burglar Alarm It is used.
- ✓ It is also used in radiation thermometers
- ✓ To detect human body
- ✓ To analyses gas

Working components of IR Sensor:

An IR sensor circuit is very popular and most useful sensor module for any hardware based project. It is very similar to visionary senses of human, that is able to identify barrier & it has most operable and familiar appliance in tangible life. It has the following components.

- ✓ It has IR transmitter & receiver pair.
- ✓ The resistors have a range of kilo ohms.
- ✓ It has variable resistors.

2.15.1 IR Sensor Circuit Diagram

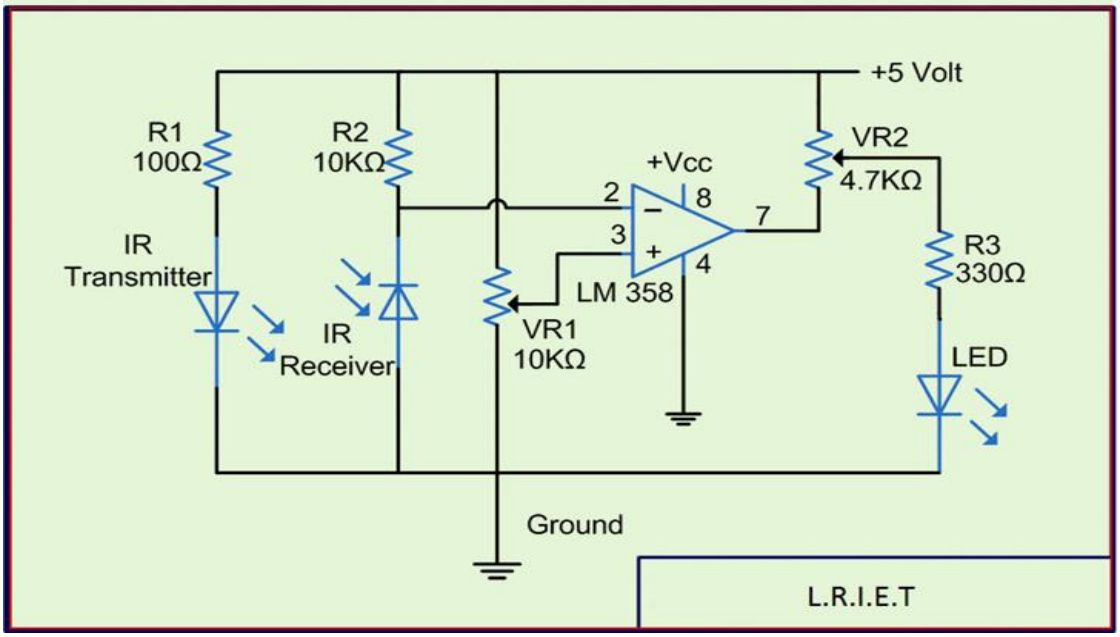

Figure: 2.15.1: IR Sensors Circuit.

2.16 RX and TX Sensor:

Specification of the TX & RX sensors:

- TX RX size is about 5milimeter.
- Its LED current rating is 30mA nominal, 600mA pulse loading
- Its wavelength is 940 Nanometer.

Figure:2.16: RX & TX Sensor.

2.16.1 Working principle of RX & TX Sensor:

The transmitter is defined as TX sensors and receiver is defined as RX sensors in the IR. Their color is separate from each other. But one may be not able to detect which is TX and which IS RX although the color is same or different. To find it, he needs a multimeter to separate. These sensors can be used in Robotics, Pulse Oximeter and many others applications

.

APPLICATION:

- The most common is used of IR sensors is in the field of Robotics.
- In creating Pulse Oximeter it is also used,
- To detect obstacle.
- In flame detection it is also used.

2.17 Buzzer:

Buzzer is well known as beeper. It is operated by a wavering electronic circuit or may be any other voice signal. A whistle or beep indicates someone or something has pressed the switch of it.

Figure: 2.17: Buzzer

APPLICATION:

- ✓ It is used in alarm devices.
- ✓ In timers it is also used.
- ✓ In mouse click for confirming of user input
- ✓ Joy Buzzers

2.18 LCD Display: LCD stands for liquid crystal display. It is generally used with Arduino to display data. Calculators, ovens and many others devices use this for displaying data.

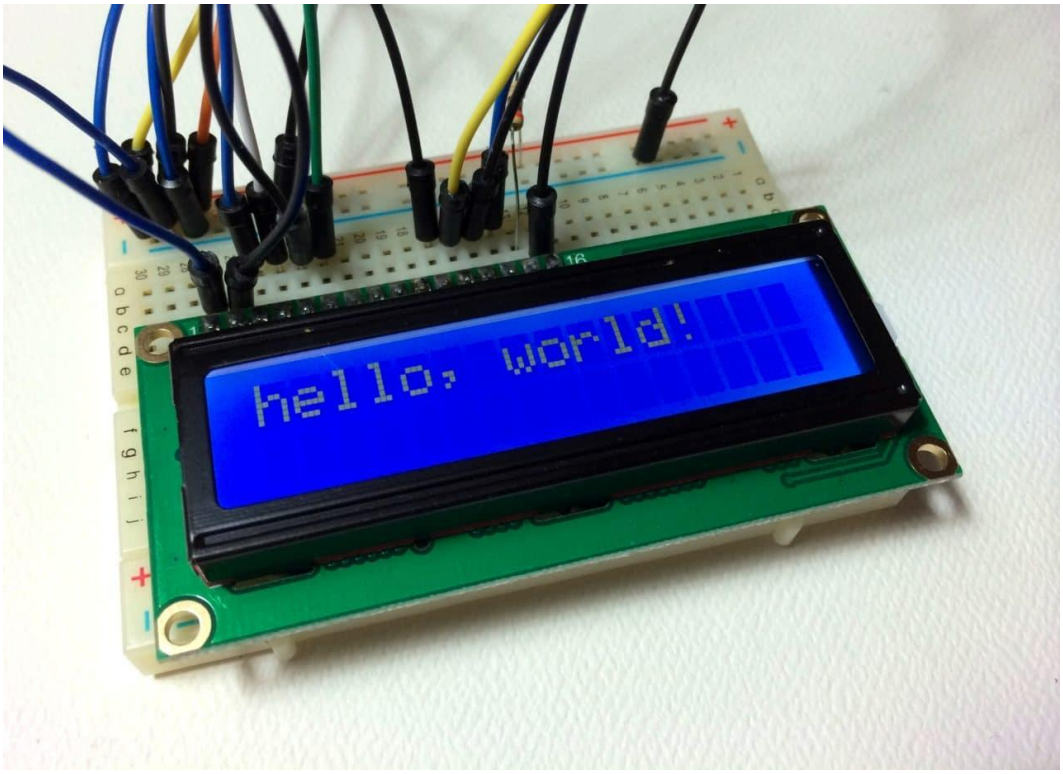

Figure 2.18: LCD Display

Chapter 3

Components and Parts

3.1 Arduino Uno:

It is a suitable and pliable board that is very small and portable in size. It is an open source microcontroller that is easy to use electronics component. It is able to read any input like light of a sensor, a finger of a button and more others then turn it into an output. Thousands of projects have been used this Arduino Uno over years.

Figure:3.1: Arduino Uno.

3.1.1 Arduino Uno Specifications:

Microcontroller	ATmega168
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328)
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

Table 3.1.1: Arduino Uno Specifications.

3.2 Working Procedure:

- ✓ Arduino IDE is used to programmed it that works both in offline and online.
- ✓ We need just a board, mini USB cable and Arduino IDE software. The program is transferred from computer to board by using USB cable.
- ✓ Individual burner is not necessary to compile the program.
- ✓ All the pin on the board has its own act connected with it.
- ✓ To covert an analog to digital analog pins can be used.

3.3 Arduino Uno Pinout:

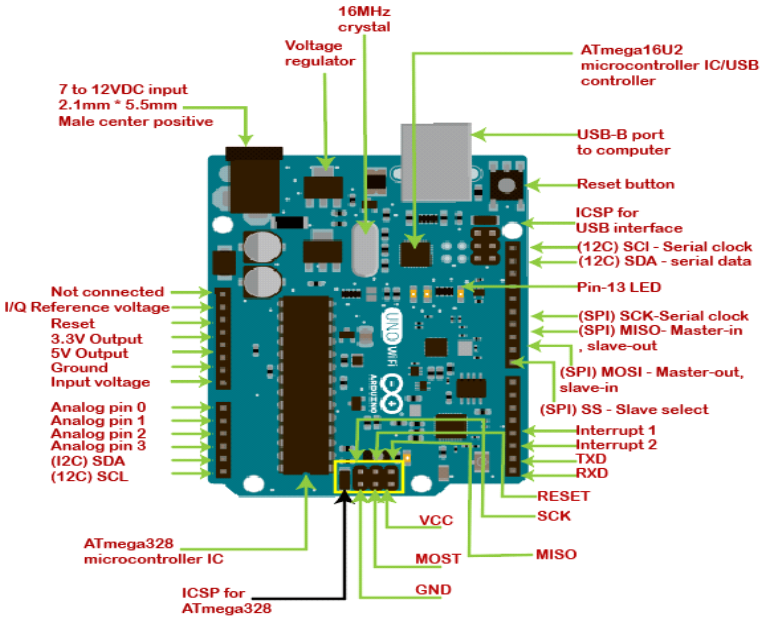

Figure:3.3 Arduino Uno Pinout.

3.4 Pin Description:

Vin: It is used to give input power on the board by using a secondary power source.

Analog Pin: The arduino has six analog pins which is used as analog to digital converter.

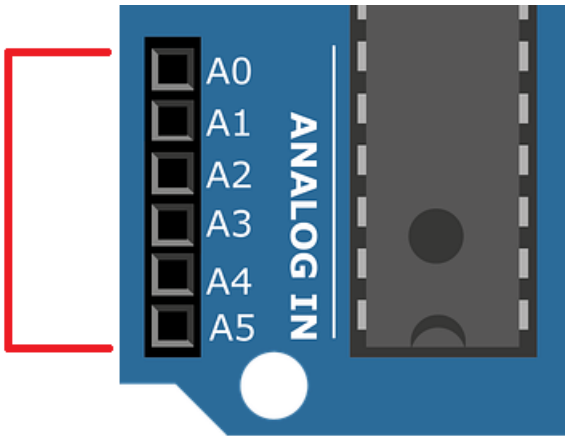

Figure 3.4.1: Analog Pin

Digital Pin: On the Arduino UNO board, pins 0-13 are used as digital input/output pins. This pin can read only two condition either voltage signal or no signal. Voltage signal is considered as 1(high) and no signal is considered as 0(low).

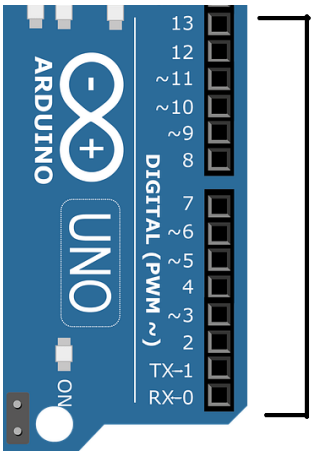

Figure:3.4.2: Digital pin.

PWM Pins: This specific pins are used to get a certain value. In Arduino, 3,5,6,9,10,11 have this pins with additional feature.

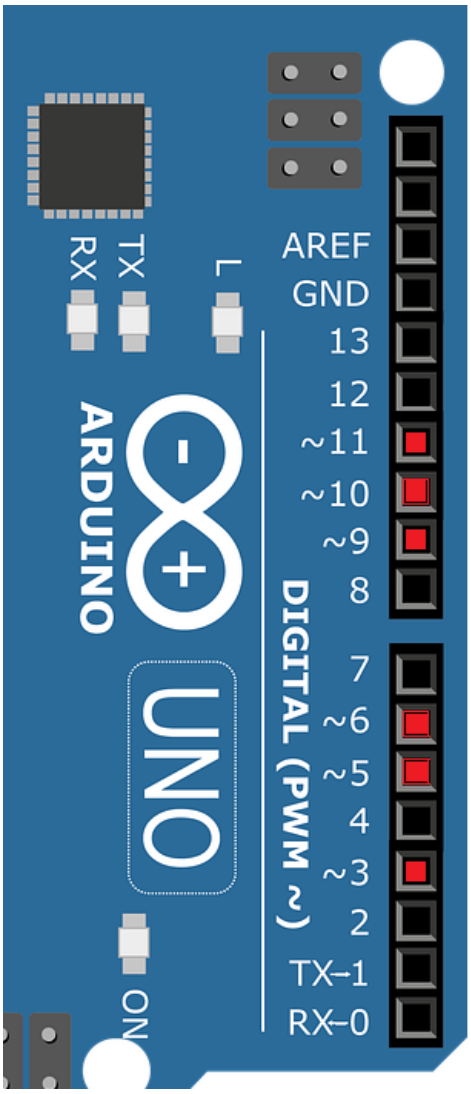

Figure:3.4.3: PWM pin.

GND: It is the located at the ground on the board. There are some GND pins on board.

Reset: It is used to reset the board. It is very beneficial when program runs for long time. When program become much critical and hangs the code then this pin is used to reset the controller.

RX, TX: TX is used to transmit data and RX is used to receive data.

13: It is used to turn On the LED.

SPI: It is used for transmitting data between microcontrollers and other components.

External Interrupts: It is used to stop the main program in the time of emergency.

Others Pins:

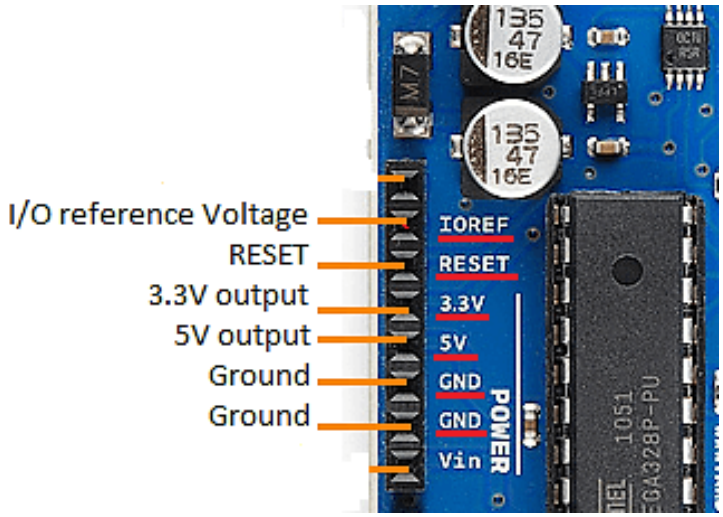

Figure:3.4.4: Others pins.

3.5 Programming & Communication:

Uno instrument has a capability to establish a connection between all others controllers & computer. The digital pins complete the serial connection. Here, RX receives data and TX transmits it. The serial monitor has to add on the Arduino software. It is used to transfer textual data. FTDI drivers are also covered in the software.

- The TX-RX pins contains an LED that blinks when the data is transferred between FTDI and USB connection.
- Arduino Software has a Serial Library that carries a serial communication among the board & the computer.
- The no board supports both I2C and SPI communication.
- Arduino board software is suitable for Windows, Linux or MAC operating system equally.

3.6 Difference among Arduino Uno and Arduino Nano:

Name	Arduino Nano	Arduino Uno
MCU	Atmega328p/Atmega 168.	Atmega328p
Power	5V	5V
Input Voltage	7 -12 V	7 – 12 V
Maximum Current Rating	40mA	40mA
Clock Frequency	16MHz	16MHz
Flash Memory	16KB/32KB	32KB
USB	Mini	Standard
USART	Yes	Yes
SRAM	1KB/2KB	2KB
PWM	6 out of 14 digital pins	6 out of 14 digital pins
GPIO	14	14
Analog Pins	8	6
EEPROM	512bytes/1KB	1KB

Table:3.7: Difference between Arduino Uno and Arduino Nano.

3.7 Applications:

Arduino Uno is highly valuable and popular technology which has a lot of use and it takes fewer place comparing other Arduino board.

- ✓ It is used to Real-Time Face Detection.
- ✓ In Medical Instruments, it is also used.
- ✓ In Industrial Automation it is widely used.
- ✓ To create hardware base android app it is also used.
- ✓ In GSM based project it is also used.
- ✓ In the field of Embedded Systems.

Chapter 4

Cost Analysis

4.1 List of Components:

Equipment	Price
Arduino	500
Buzzer	50
Bread Board	150
I2C Module	150
LCD	400
Power Supply	350
(IR Sensor)*(4)	360
(Servo Motor)*(2)	340
GSM	520
Others	825
Total	3645

Table: 4.1. List of Components.

Chapter 5

Discussion and Conclusion

5.1 Discussion:

The whole project is done by us to return railway train in a safety condition. We are really very concerned for the purpose of the safety especially for the railway train. GSM module, Servo motor, Arduino Nano, sensor and some other components have been used for the whole work. GSM is used to send SMS & get SMS. The safety system is developed using IR sensors. The other activities are maintained by a Microcontroller. This most benefits of this project is it is a global system along with SMS system that presents how to make railway system as a safe zone. Mostly benefits of this system is when any fault is detected in railway line and any emergency condition is created. Moreover, this type of safety system can be used in all kinds of railway train. Like others, railway authorities must be aware of to protect their life property safely. Our project plays a vital role for them.

5.2 Conclusion:

Our system is mainly implemented to detect the cracks in the rail track efficiently. It will also control the railway gate where the rail line cross the vehicle road automatically. It is the IR sensor based railway crack or fault detection system using GSM technology. It is cheap in cost, consumes low power. Our project is simple and has a much better security mainly in rail path so the accidents can be eliminated. This will bring back the reliability in this sector. If we are able to apply it in our railway system successfully, we can reduce the number of accidents more than 70% approximately.

5.3 Applications:

- In every railway train Line.
- Railway crossing.
- Other close loop security system.

5.4 Future Works:

In our project some works can be done in future and improve our project with more features.

In future, a software will be added to this system. By using this software the authorities of the center control room will be able to see the current location of trains live using GPRS and they will also be able to notice the drivers about any kind of unexpected event through this app if necessary. In this way, the proposed system will be able to inspect the rail tracks and trains more easily and efficiently. After that the railway tracks will be more safe and secure.

Besides, we have also a future plan to implement the other two features of our project. They are: detecting of collision among two trains and detecting the obstacle on the rail track. We have already collected theoretical specifications and algorithms for these two features. In future, we have a plan to do the hardware implementations of this two features so that we can give a proper package system, for a new improved and secure railway track monitoring system. It will reduce the sufferings of manual monitoring of the railway tracks.

5.5 Challenges:

While building the whole system we had to face several challenges. While working on the feature of Rail line breakage fault detection, it was quite difficult to maintain the signal of Arduino Nano. To get the appropriate signal, we have to give the appropriate function for the data. Besides, we have to install the software of Arduino Nano properly to the computer to get the exact signal of it. Moreover, while using GSM shield we have faced it so tough to maintain its power management as without proper power management, it can't work properly to get message. To solve this problem at first we have used an adapter and after remove it using a fixed battery. While sending and receiving the confirmation message about the breakage we have faced some difficulties. Besides, while working on the feature of automated road crossing system, we faced more challenges like: while using the servo motor for the automatic up and down of the line bar, we faced some trouble to get the proper power supply for servo motor. To solve this issue, we have used an external power supply. Still now, we are facing a little bit problem to maintain the proper delay for the up and down of gate or line bar.

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APPENDIX

The project circuit has been implemented in Proteus Software. The microcontroller has been implemented with the following C programming code:

C Code:

```
#include <SoftwareSerial.h>

#include<LiquidCrystal.h>

LiquidCrystal lcd(12,11,10,9,8,7);


#define RLED1 4

#define YLED1 5

#define GLED1 6

#define RLED2 A5

#define GLED2 A6

#define BUZ 13


#define IR1PIN A3

#define IR2PIN A2

#define LFSP1 A1

#define LFSP2 A0

#define IR3PIN A4


int st1 = 0;
```

```
int st2 = 0;

int st3 = 0;

int IR1,IR2,IR3,LFS1,LFS2;

int pos=0;


void setup()

{


  pinMode(IR1PIN, INPUT);

  pinMode(IR2PIN, INPUT);

  pinMode(IR3PIN, INPUT);

  pinMode(LFSP1, INPUT);

  pinMode(LFSP2, INPUT);


  pinMode(RLED1, OUTPUT);

  pinMode(YLED1, OUTPUT);

  pinMode(GLED1, OUTPUT);

  pinMode(RLED2, OUTPUT);

  pinMode(GLED2, OUTPUT);

  pinMode(BUZ, OUTPUT);


  lcd.setCursor(0,0);

  lcd.print("  GSM CONTROL   ");
```

```
  lcd.setCursor(0,1);
  lcd.print(" TRAIN SECURITY ");
  delay(2000);

  lcd.setCursor(0,0);
  lcd.print("  WELCOME TO    ");
  lcd.setCursor(0,1);
  lcd.print("     DIU        ");
  delay(2500);

  digitalWrite(BUZ, HIGH);delay(500);digitalWrite(BUZ, LOW);delay(50);
  digitalWrite(BUZ, HIGH);delay(50);digitalWrite(BUZ, LOW);delay(50);
  digitalWrite(BUZ, HIGH);delay(50);digitalWrite(BUZ, LOW);delay(50);


  lcd.print("Circuit Digest");
  delay(1000);

  lcd.setCursor(0,1);
  lcd.print("System Ready");

  sendMessage1();
}
```

```
void loop()
{
  readSensor();

  ////////////////////////
  if (IR3 >100 )
  {
    redsignal();
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("  WARNING !     ");
    lcd.setCursor(0,1);
    lcd.print("   ROAD JAM     ");
    BUZZ();BUZZ();
    digitalWrite(GLED1, HIGH);
    digitalWrite(RLED1, LOW);
  }
  else
  {
    if (IR1 > 0)
    {
      greensignal();
```

```
    servoUp();
   }
   else if (IR2 > 0)
   {
    redsignal();
    servoDown();
   }

 }
 ////////////////////////
 if( (LFS1 > 200) | (LFS2 > 200) )
 {
  faultON();
 }
 else
 {
  faultOFF();
  smsf=1;
 }
}

void readSensor()
{
```

```
  IR1 = analogRead(IR1PIN);
  IR2 = analogRead(IR2PIN);
  IR3 = analogRead(IR3PIN);
  LFS1 = analogRead(LFSP1);
  LFS2 = analogRead(LFSP2);

  if (IR1 > 100) IR1 = 0; else IR1 = 1;
  if (IR2 > 100) IR2 = 0; else IR2 = 1;
  if (IR3 > 200) IR3 = 0; else IR3 = 1;
}

void servoUp()
{
  digitalWrite(RLED1, LOW);
  digitalWrite(YLED1, HIGH);
  BUZZ();
  digitalWrite(RLED1, LOW);
  digitalWrite(YLED1, LOW);
  digitalWrite(GLED1, HIGH);
  for (pos = 15; pos <= 100; pos += 1)
  {
    myservo.write(pos);
    delay(2);
```

```
  }


  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print(" TRAIN GONE     ");
  lcd.setCursor(0,1);
  lcd.print(" LINE CLEAR     ");
}
void servoDown()
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("    WARNING       ");
  lcd.setCursor(0,1);
  lcd.print(" TRAIN COMMING... ");
  BUZZ();
  for (pos = 100; pos >= 15; pos -= 1)
  {
    myservo.write(pos);
    delay(2);
  }
}
```

```
void redsignal()
{
  digitalWrite(GLED1, LOW);
  digitalWrite(YLED1, HIGH);
  BUZZ();
  digitalWrite(YLED1, LOW);
  digitalWrite(RLED1, HIGH);
}
////////////////////////////////////////
void greensignal()
{
  digitalWrite(RLED1, LOW);
  digitalWrite(YLED1, HIGH);
  BUZZ();
  digitalWrite(YLED1, LOW);
  digitalWrite(GLED1, HIGH);
}
////////////////////////////////////////
void BUZZ()
{
  digitalWrite(BUZ, HIGH);delay(50);digitalWrite(BUZ, LOW);delay(50);
  digitalWrite(BUZ, HIGH);delay(50);digitalWrite(BUZ, LOW);delay(250);
  digitalWrite(BUZ, HIGH);delay(50);digitalWrite(BUZ, LOW);delay(50);
```

```
  digitalWrite(BUZ, HIGH);delay(50);digitalWrite(BUZ, LOW);delay(250);
}
void faultON()
{
  digitalWrite(GLED2, LOW);
  digitalWrite(RLED2, HIGH);
  lcd.clear();

  lcd.setCursor(0,0);
  lcd.print("LENE FAULT NEAR ");

  if(LFS1 > 200)
  {
   lcd.setCursor(0,1);
   lcd.print("  AREA - A    ");
   if(smsf==1)
   sendMessage2();
  }
  if(LFS2 > 200)
  {
   lcd.setCursor(0,1);
   lcd.print("  AREA - B    ");
   if(smsf==1)
```

```
    sendMessage3();
  }

  int i=0;smsf=0;
  for(i=0;i<15;i++)
  {
   digitalWrite(BUZ, HIGH);delay(50);
    digitalWrite(BUZ, LOW);delay(50);
  }
  digitalWrite(GLED2, HIGH);
}
void faultOFF()
{
  digitalWrite(RLED2, LOW);
  digitalWrite(GLED2, HIGH);
}

void sendMessage1()
{
  Serial.println("AT+CMGF=1");
  delay(100);
  Serial.println("AT+CMGS=\"+8801721175349\"\r");
  delay(100);
```

```
  Serial.println("system ready...");
  delay(100);
  Serial.println((char)2);
}
void sendMessage2()
{
  Serial.println("AT+CMGF=1");
  delay(100);
  Serial.println("AT+CMGS=\"+8801721175349\"\r");
  delay(100);
  Serial.println("Rail line fault detect near the  area-A");
  delay(100);
  Serial.println((char)2);
}
void sendMessage3()
{
  Serial.println("AT+CMGF=1");
  delay(100);
  Serial.println("AT+CMGS=\"+8801721175349\"\r");
  delay(100);
  Serial.println("Rail line fault detect near the  area-B");
  delay(100);
  Serial.println((char)2);
```

```
}
```