MYMENSINGH ENGINEERING COLLEGE

DEPARTMENT OF COMPUTER SCIENCE

AND

ENGINEERING

CSE 702

Peripherals & Interfacing
(Project Report)

Project On: Railway Gate Controller Using ARDUINO and Sensor.

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Abstract

The objective of this project is to create an automatic railway gate control system which can be implemented easily in roads. Generally there are manual gate control system which are maintained by person. As vehicles are increasing day by day it has become more difficult to control the gate manually. As a result often accident occurs and many people become injured badly and sometimes it become very serious when people died due to this type of accidents. This project can help us to reduce accidents in our country by introducing automatic railway gate control system.

1. Introduction:

Most of these accidents are caused due to carelessness of people and unmanned level crossing. In our country it happens often due to the country's vast population, mainly it is happening in rural areas. At least 1/3rd of the railway crossings goes unnoticed due to remote placement and less traffic, which results in accidents. Currently present railway crossings are not advanced and safe. Therefore, these accidents cause serious damage to human life. The most common rail accidents occur due to collision of trains and human errors. The level crossing depends on humans for operating the opening and closing of railway gates. Hence for accessing the gates without man power, a new system is developed using Arduino. So, we are implementing this wherever it is possible to make sure all the people are safe during level crossings with less manpower, which is automated.

This project is to manage the control system of railway gate using the arduino & sensor. When Train arrives at the sensing point at the railway crossing point so that the People get intimation that gate is going to be closed. Then the control system activates and Closes the gate on the track. Once the train crosses the other end control system automatically lifts the gate. For mechanical operation of the gates servo motor is employed.

1.1 Our Proposed System:

Our Proposed System is a practically working system. Our idea is very simple and effective. The idea is to close the railway level crossing gates automatically and to open them automatically, during the time of train's arrival and departure respectively. Automated concept is to reduce the number of accidents with less manpower. In our system, we are placing ultrasonic sensors near the railway tracks. Ultrasonic sensors are used in this system, because it has a very high range of 4 meters (which is better than other sensors). At a certain distance before the level crossing and after the level crossing, these ultrasonic sensors are placed. The reason for sensor placement is to sense, both the train's arrival and departure correctly and effectively. As soon as the train reaches

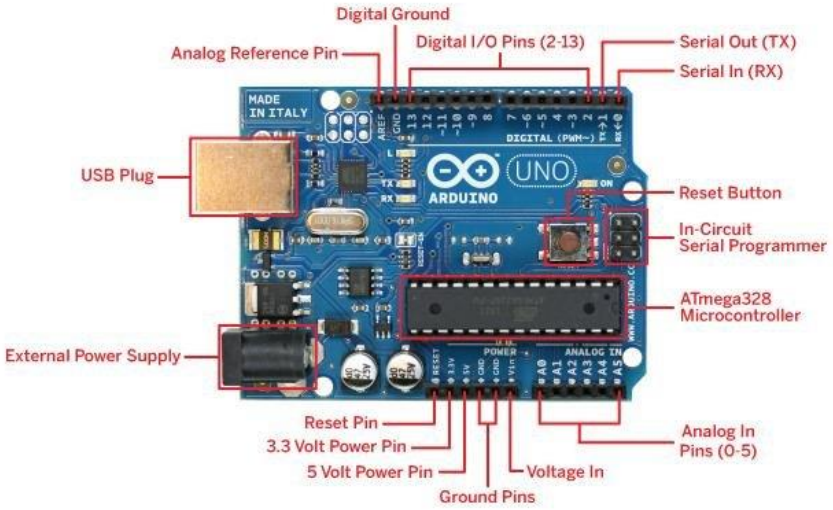
the sensor which is been placed before the level crossing, senses or detects the train, it sends a message to the Arduino connected, the servo motor connected with the level crossing gates will close them automatically. The reason to use servo motor in our system is that it is working is based on Angular Rotation which means that at first the gates will be at 90° which is open, at then during the time of train's arrival the gates will be at 0° (closed), and after the train passes by it will return its original position which is 90°(opened). The proper working of the level crossing gates are because of the attached servo motor (with angular rotation).

2. Components required for Railway Gate Project:

1) ARDUINO UNO R3
2) Ultrasonic Sonar Sensor SR04
3) Servo motor SG90
4) Jumper wire 40 PCS Set
5) 9v Battery Connector
6) Toy train

2.1 Arduino Uno:

The arduino uno is a microcontroller. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, 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 an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. “Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version1.0 will be the reference versions of Arduno, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.



FigNo-2.1.1

2.2 Servo Motor:

Servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servo motors. Servomotors are not a specific class motor although the term servomotor is often used to refer to a motor suitable for use in a Closed-loop control system.

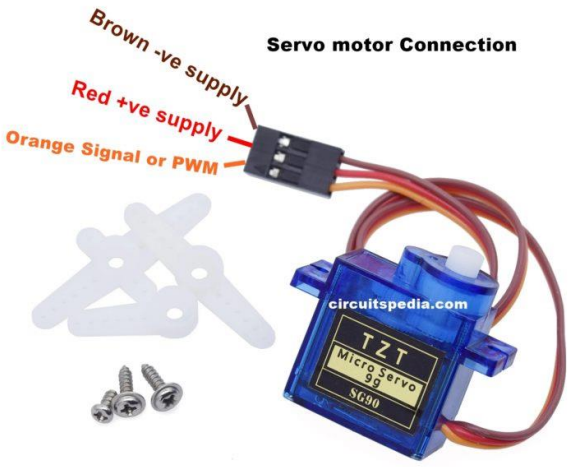


Fig No-2.2.1

2.3 Ultrasonic Sonar Sensor:

Ultrasonic sensor, also known as an ultrasonic transducer that is based on a transmitter and receiver and mainly used to determine the distance from the target object. These sensors are very easy to use. First connect the VCC and GND pins to the Arduino's +5V and GND pins. Next connect the Trigger and Echo pins to two digital pins on the Arduino, perhaps pins 2 and 3 for example.

Setting the Trigger Pin to HIGH for 10 microseconds will activate a measurement reading and then the pulse In() function can be called on the Echo Pin to determine the distance. The length of the incoming pulse is proportional to the distance measured.

However, rather than writing this code yourself, we recommend using the excellent New Ping library for the Arduino.

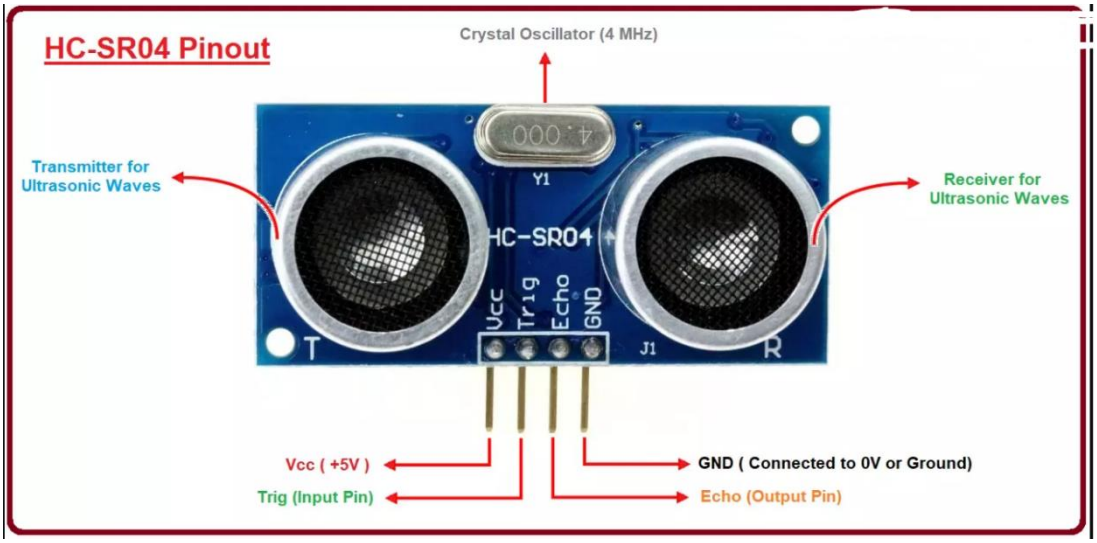


Fig No-2.3.1

3. Design:

3.1 Circuit Diagram:

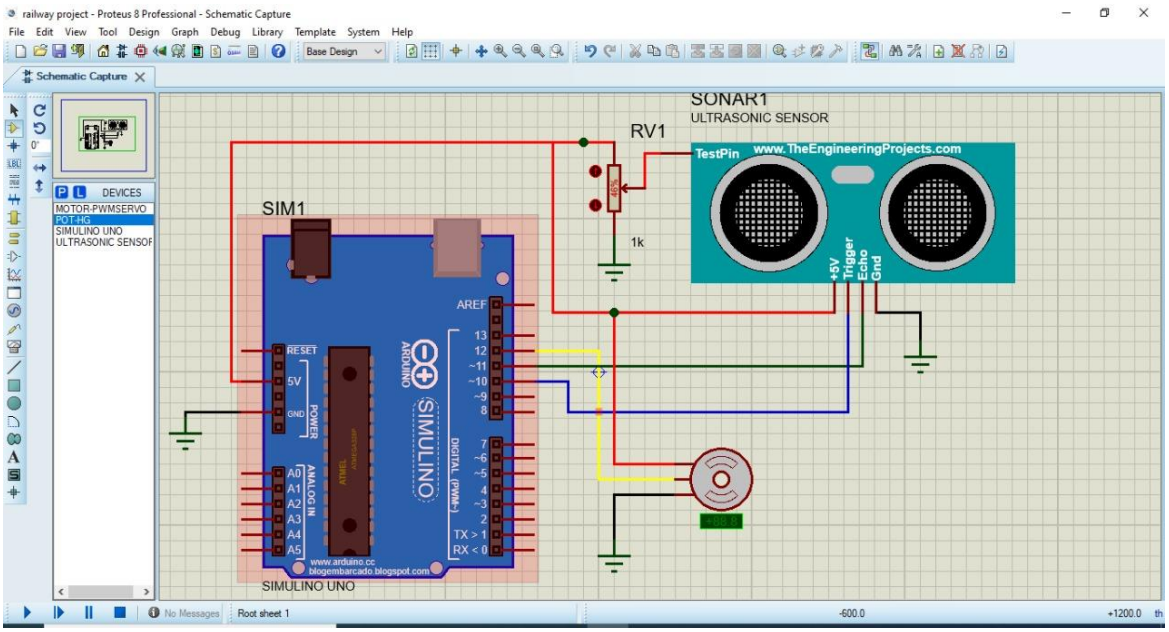


Fig No-3.1.1

3.2 **Circuit Implement**:

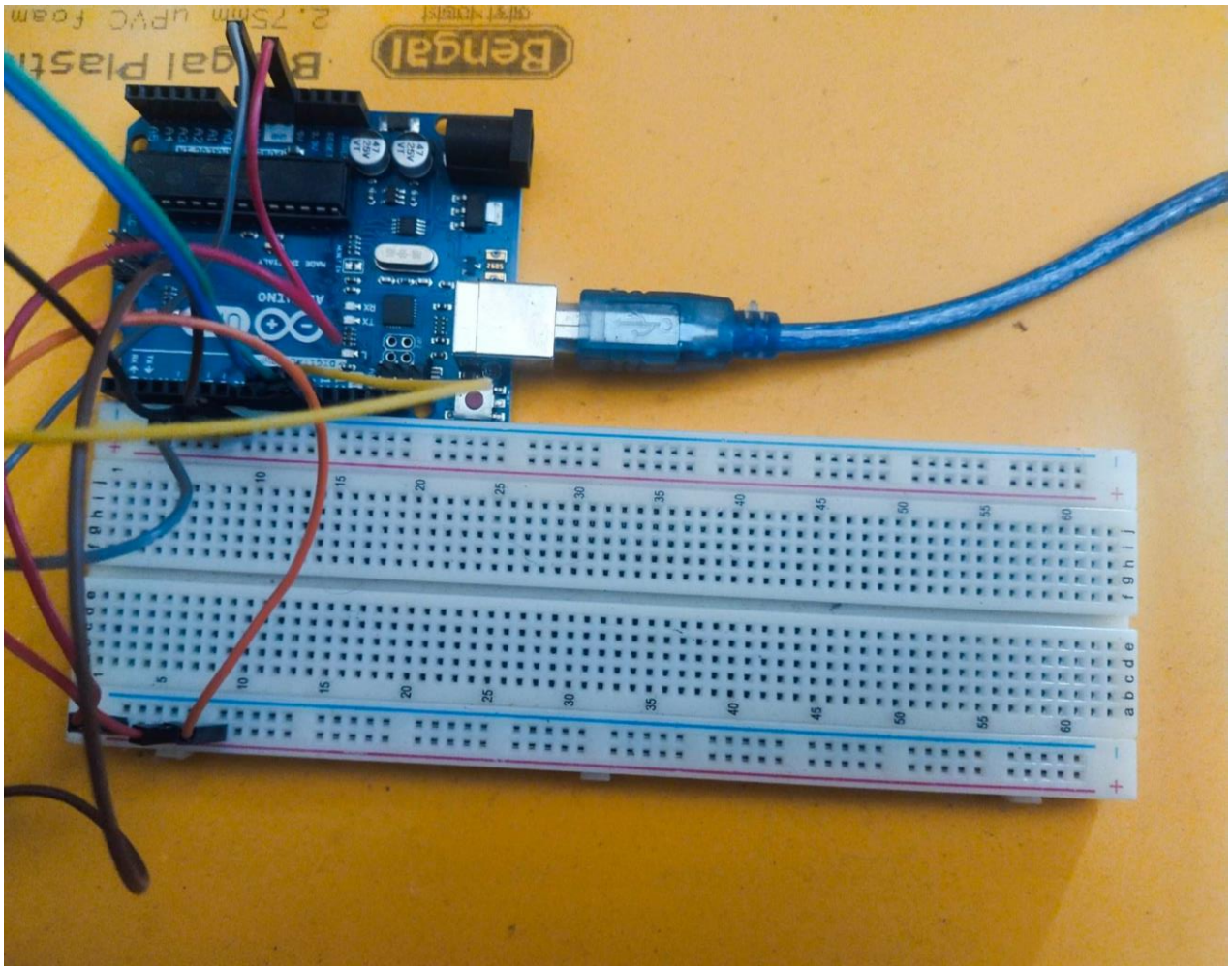
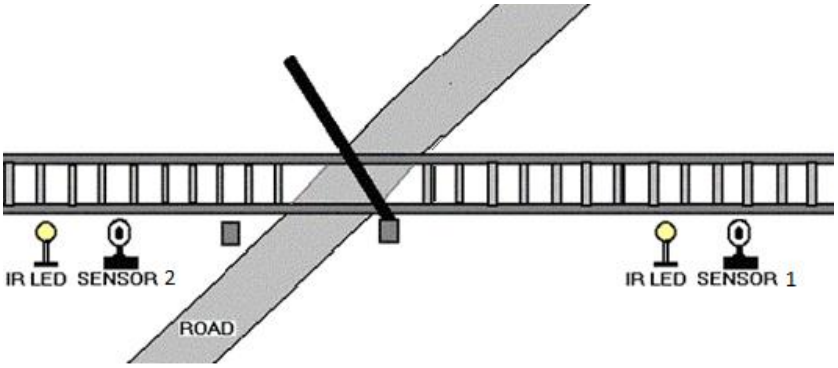


Fig No-3.2.1

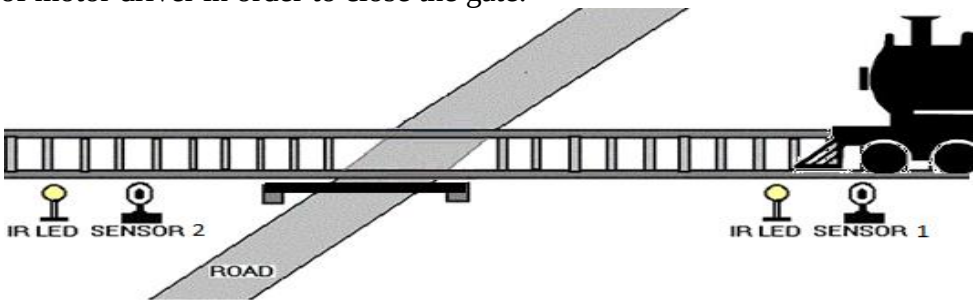
4.Working Procedure:

The working of the project is very simple and is explained here.

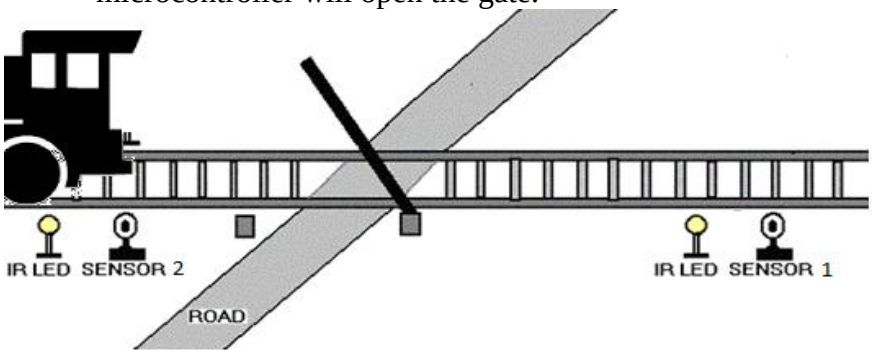
- Practically, Ultrasonic sensors is placed at one side of the railway gate. The distance between the Ultrasonic sensors is dependent on the length of the train. In general we have to consider the longest train in that route.
- Now we'll see how this circuit actually works in real time. In this image, we can see the real time representation of this project.



If the sensor detects the arrival of the train, microcontroller starts the motor with the help of motor driver in order to close the gate.



- The gate remains closed as the train passes the crossing.
- When the train crosses the gate and reaches second sensor, it detects the train and the microcontroller will open the gate.



4. Arduino Code:

```
int sensor1 = 3;
int sensor2 = 4;
int sensor3 = 5;
int motor = 9; // potentiometer wiper (middle terminal) connected to
analog pin 3
 // outside leads to ground and +5V
#include <Servo.h>
Servo myservo;
int e = 0;
int c = 0; // variable to store the value read
int x = 0;
void setup()
{
 Serial.begin(9600); // setup serial
 pinMode ( sensor1 , INPUT );
 pinMode ( sensor2 , INPUT );
 pinMode ( sensor3 , INPUT );
 pinMode ( motor , OUTPUT );
 myservo.attach(9);
}
void loop()
{
 e = analogRead(sensor1); // read the input pin
 c = analogRead(sensor2);
 x = analogRead(sensor3);

 Serial.println(e);
 Serial.println(c);
 Serial.println(x);

 int pos = 0;

 if (e>1000 && c<1000)
 {
 for(pos = 0; pos <= 90; pos += 1) // goes from 0 degrees to 90 degrees
 { // in steps of 1 degree
 myservo.write(pos); // tell servo to go to position in variable 'pos'
 delay(10);
 break; // breaks the loop
 }
 }

 if (x>1000)
 {
 for(pos = 90; pos >= 0; pos -= 1) // goes from 90 degrees to 0 degrees
 { // in steps of 1 degree
 myservo.write(pos); // tell servo to go to position in variable 'pos'
 delay(10);
 break; // breaks the loop
 }
```

```
}

Serial.println(e);
Serial.println(c);
Serial.println(x);
delay(1000);
}
```

5. Output:

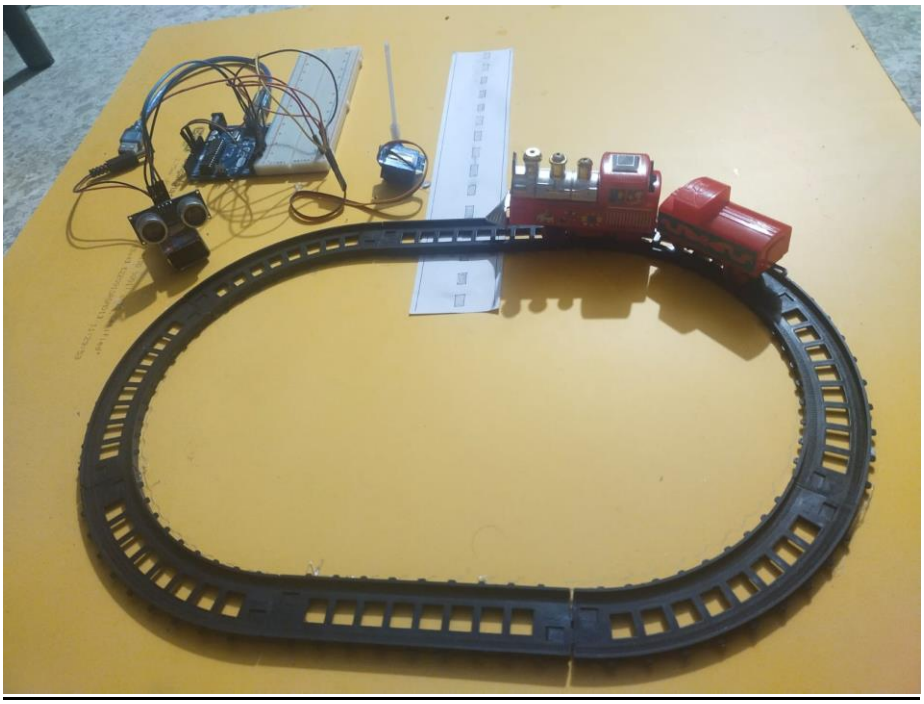


Fig No-5.1

6. Applications:

- An Automatic Railway Gate Control is implemented with very simple hardware and easy control.
- Human intervention at level crossings can be removed with the help of this project and many railway level crossing accidents can be prevented.
- Relay circuit can used to realize logic functions
- They also provide safety critical logic
- Relays can be used to provide time delay functions
- They are used to control high current circuits with the help of low current signals

7. Future Scope:

The rail industry needs innovative solutions that address the challenges of growing urbanization, climate change and other factors putting pressure on public transport.

That is why we are championing the push towards automated train operation from metro to heavy rail solutions. Equipped with digital tools, cutting edge sensors, powerful software, and deep experience in driverless transport, Alstom is at the forefront of the development of autonomous systems and has its eye set on making the highest automation level, GoA4, on regional train lines a reality by 2025.

8. Limitation:

Working in this project, some problems have been faced by us .The problems are
Given below:

- First of all, the value of resistances should be changed as the voltage Changes with the change of light .It is very difficult to vary the resistance for the perfect operation.
- Another problem is IR sensor easily damages so that the operation hampers.
- IR sensor is light dependent sensor. It varies with the change of light so it is not applicable for all environment.
- IR sensor works at a certain distance .If the distance is increased the IR will Not work which is a drawback of this project.

9. Cost Estimation:

Description	**Quantity**	**Unit Price**	**Amount**
ARDUINO UNO R3	1	990	990
Ultrasonic Sonar Sensor-SR04	1	110	110
Servo Motor SG90	1	195	195
Jumper Wires 40 PCS Set	1	95	95
9v Battery Connector	3	40	120
Toy Train	1	150	150
		Total	**1660**

10.Conclusions:

The proposed work has many major advantages it will reduce the accidents occurring at the railway level crossing, it will increase the accuracy and reduce errors occurring due to manual operations. It will reduce the collision of train and will also manage the route of a particular train to avoid any delay in reaching its destination.

Train will always be on time at the station no delay will be caused which occurs in manual Operation. Security can be implemented by placing tracker in the train in order to monitor the location of the train in case of any issue. Solar panels can be used to generate power for the system there by increasing the efficiency of the system. As the system is completely automated, it avoids manual errors and thus provides ultimate safety to road users.

11.References:

1. **Based Automatic Railway Gate Control** by Dwarakanath S K, Sanjay S B, Soumya G B, Arjun V, Vivek R,Arduino , International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

2. **Sensor based automatic control of railway gates** By, Karthik, Krishnamurthi, Monica Bobby, Vidya V, International Journal of Advanced Research in Computer Engineering & Technology.