STM JOURNALS

International Journal of
Electro-Mechanics and Material Behavior

Volume 1, Issue 1, 2023
DOI (Journal): *10.37591/IJEMB*

https://journals.stmjournals.com/ijemb

Review IJEMB

Arduino Uno Based Automation of Railway Gate Controller

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Abstract

A railway gate is crucial for security reasons. If the system has a flaw, it will endanger one or more lives. The goal of this project is to install an automatic railway gate at a level crossing to replace the gatekeeper-operated gates. It covers two topics. First, it deals with reducing the amount of time the gate is kept closed, and second, it aims to give road users safety by lowering the number of accidents. In the current arrangement, once the train has departed the station, the stationmaster telephones the gatekeeper to let them know the train has arrived. The gatekeeper closes the gate based on the time the train arrives after receiving the information. As a result, if the train is delayed for a particular reason, the gate will remain closed for a long time, creating traffic around the gates. By using the automatic railway gate control at the level crossing, the sensor installed close to the gate detects the arrival of the train. As a result, it closes for a shorter time than manually operated gates, which also decreases the need for human effort. This type of gate can be employed in an unmanned level crossing where the chances of accidents are higher and reliable operation is required. Since the operation is automatic, error due to manual operation is prevented.

Keywords: Railway gate, sensor, automation, Arduino, traffic control

INTRODUCTION

Railway Gate at railway crossings is very essential for the safety purpose of everyone.

Every year, thousands of incidents at railway crossings result in thousands of fatalities. Here, a circuit is being created so that the gate can work on its own. This initiative will improve the system's accuracy and dependability. Over the previous five years, around a million people have perished at unattended railway crossings around the world. As a result of their isolated locations and low traffic, at least one-third of the railway crossings are unmanned. Systematic traffic control of railway gates, both manned and unmanned, is the emphasis of the Automatic Railway Gate Control System using IR Sensor & Arduino. This project would not only improve the accuracy and dependability of the system but also spare the government money on hiring additional workers. You may take it as a one-time investment [1]

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Received Date: July 03, 2023
Accepted Date: July 18, 2023
Published Date: December 1, 2023

Citation: Navneet Kaur, Neha Malviya, Sahil Makode, Mayank Dhote, Lavkesh Deshmukh. Arduino Uno Based Automation of Railway Gate Controller. International Journal of Electro-Mechanics and Material Behavior. 2023;1(1): 1–5p.

The Automatic Railway Gate Control System project concept is very simple. The key components of the project are the IR sensor, Arduino microcontroller, servomotor, and Buzzer. In this project, two IR Sensors detect the train position. Two Servo motors are used to open and close the railway crossing gate. Also, we will use the Arduino microcontroller board, which is the brain of the project. It controls the whole system. Finally, buzzers are used as an indicator.

Railway transit is an essential component of contemporary society since it helps connect people and products over great distances. It is crucial to

ensure the effectiveness and safety of railway operations, particularly when it comes to railway crossings. As a result of human error and delays, manual railway gate control systems have historically presented risks and accidents. The Arduino Uno, a flexible and popular microcontroller, serves as the suggested automation system's central processing unit [2]. The system can correctly identify the presence of trains and make judgements on how to operate the gate in real-time by utilizing a variety of sensors, such as infrared sensors or ultrasonic sensors. To ensure that any potential faults do not jeopardies the safety of rail users, the system also includes fail-safe measures. This automation system's probable cost-effectiveness is one of its main advantages because it eliminates the need for on-site gate operators. Furthermore, the system may broadcast the gate status to a central monitoring station or online application thanks to the installation of communication modules, enabling real-time oversight and quicker response to emergencies.

LITERATURE SURVEY

The details of previous research work which has worked on related problems are discussed below:

- This project provides an automatic railroad gate at the level crossing to replace the manually operated gates manned by the gatekeeper. Creating the appropriate alert signal and operating the gate. A train detection module, stuck detection module, signal light module, alarm module, railway gate controller, and controller module are developed as the solution [3].
- The design of a pressure sensor-based quick reaction anti-collision system for automatic railway gate control is presented in this paper as an original project. At the level crossing, an automatic system has been developed to take the place of the manual system, which senses the arrival and departure of trains to manage the gate. This project-based paper's unique feature is the integration of a pressure switch into the railroad's anti-collision system [4].
- The main goal of this project is to construct an automatic railway gate control system that makes use of a microcontroller. This project builds up a model of an entry way at the level intersection that runs consequently by utilizing a microcontroller [5]. Among the activities involving a microcontroller that coordinated with other circuits were power supply, IR sensor, motor, motor driver, and LCD, for instance. The simplest tasks you can think of are those for which you merely need to know true or false about the physical world [6]. Since train collisions on the same track can be caused by both big and minor factors, this effort is focused on preventing them. The Proteus software aids in railway route planning and guidance. Our anti-collision system's major objective is to locate these collision spots and communicate any errors to the main control room and substation [7].

As we know that the millions of people died over the past 5 years in unmanned railway crossing all over the world. The gates at the railway crossing were not closed at the time when the train was arriving due to which accident takes place. So, to avoid accidents we have created a project named Automatic railway gate controller using Arduino uno [8].

Before the train arrives, this automatic railway gate controller will operate automatically. The buzzer and IR sensors are utilized in this project. The IR sensor detects the train when it is 5 KM from the railway crossing, and the buzzer begins to beep. People stop moving when they hear this buzzer, which makes them alert. The gates at railway crossing are closed with the help of the servomotors. As soon as the train passes the second sensor, the gates automatically open [9].

PROBLEM STATEMENT

- One of the transport systems that has many difficulties because of human error include level cross accidents, collisions, etc.
- The goal of this work is to provide an automatic railway gate at a level crossing in place of the gates operated by the gatekeeper. A level cross is an intersection of a road and a railway line. Human coordination, a lack of which results in accidents.
- The project deals with the reduction of time for which the gate is being kept closed, and secondly, to provide safety to the road users by reducing the accidents [10].

By the presently existing system once the train leaves the station, the stationmaster informs the gatekeeper about the arrival of the train through the telephone. Once the gatekeeper receives the information, He closes the gate depending on the timing at which the train arrives. Hence, if the train is late due to certain reasons, then the gate remains closed for a long-time causing traffic near the gates [11–12].

PROPOSED METHODOLOGY

The sensor next to the gate in the automatic railway gate control system detects the approach of the train at the level crossing. As a result, it closes in less time than manually controlled gates, which also decreases the need for human labor.

The methodology for the proposed work is explained below using flowchart given in Figure 1:

For this system to function perfectly, we must first align the components correctly. The distance between the two IR sensors, which is based on the length of the train, is positioned on either side of level crossings. The railway track has two Servo motors on either side of it.

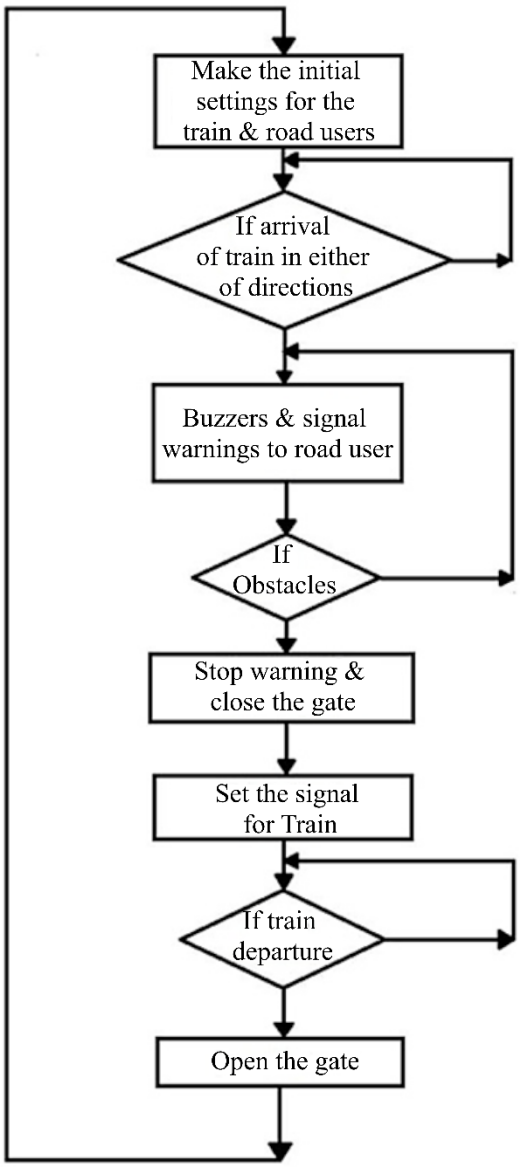

Figure 1. Flow Chart of IR Sensor.

hen the train approaches the IR sensor 1 in front of it. Then, when the train arrives, IR sensor-1 detects it and outputs Low (0) on its Data Pin. However, the output of the IR Sensor-2 is HIGH (1) on the other side since the train was not detected this time. The Arduino delivers the servo motors a PWM signal when it receives this signal from two sensors.

Servo motors activate as a result, closing the gate. At this point, the buzzer starts to make a beep-beep sound, signaling that the train is approaching, and the Arduino sends orders to switch it on.

When the train approaches the IR sensor-2 and crosses the level crossing. The train's arrival is then picked up by IR sensor number two. As a result, sensor 2 output is LOW (0). However, the IR Sensor-1 output is HIGH (1) on the opposite side since the train was not detected this time. The Arduino delivers the servo motors a PWM signal when it receives this signal from two sensors. As a result, the gate opens automatically as the servo motors return to their initial position. When the buzzer stops this time, the train has left the station. The sensor output is High (1) when neither IR sensor 1 nor IR sensor 2 detects the train. When the buzzer stops while the gate is open, it indicates that the train has not arrived.

The Circuit diagram of the project is shown below in the Figure 2:

The screenshot of the project is shown below in the Figure 3

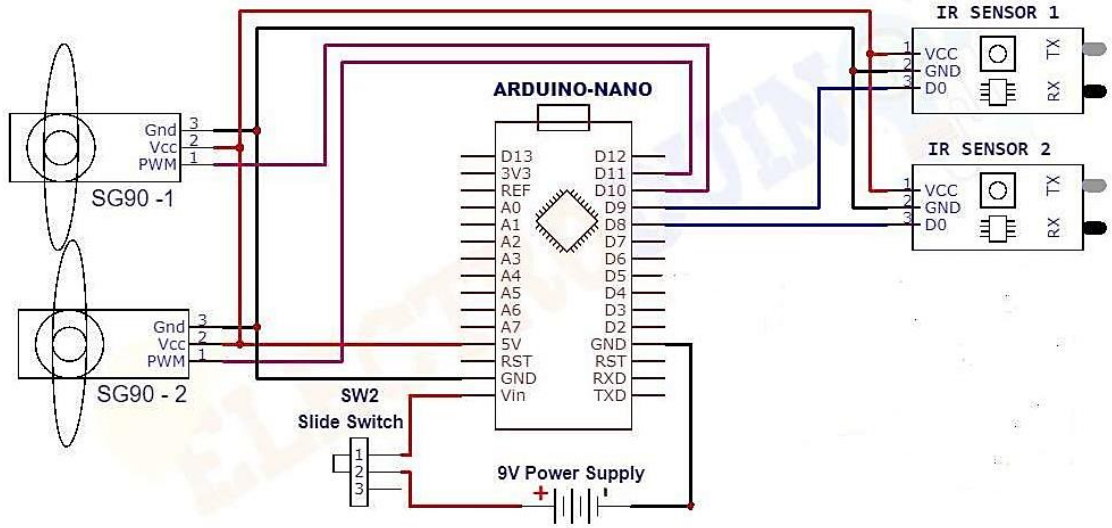

Figure 2. Circuit Diagram.

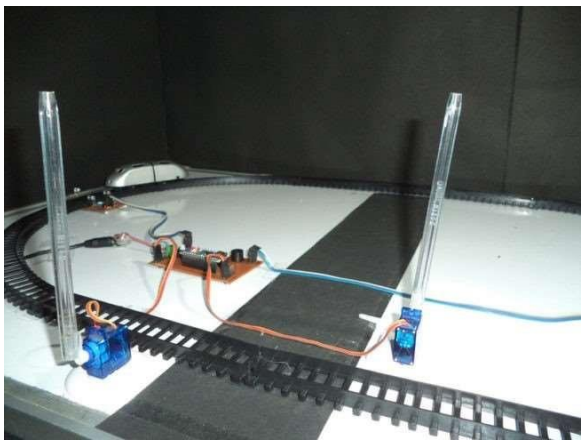

Figure 3. Screenshot of project.

CONCLUSION

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.

For increasing safety at train collisions on IR, a new phenomenon has been proposed. The primary train records of the LC inventories accident/incident report have been given formats.

Automatic railway gate control is a highly cost-effective microcontroller-based system that is intended to be used at nearly all the country's unmanned level crossings.

FUTURESCOPE

The entire track is made up of IR modules and a GSM module delivers the message when an interruption happens. The GSM module will notify the train operator if any obstruction appears on the track. We can control the railway gate system by utilizing a transmitter and receiver. We can allow drivers to communicate verbally. It is also possible to achieve LED displays at railway crossing gates.

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