

# Automatic Railway Gate Level Control System

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**ABSTRACT--** Nearly thousand people being injured and/or killed by suburban trains every year. In India, railway gate is operated manually by liver pulling method to open and close the gate. We are going to use the arduino and RFID sensor to open and close the railway gate automatically. This technique helps to reduce accident rate occurring in many country. Arduino is an open-source electronics platform. Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. The hardware features with an open-source hardware board designed around an 8-bit Atmel AVR microcontroller or a 32-bit Atmel ARM. Current models consists a USB interface, 6 analog input pins and 14 digital I/O pins that allows the user to attach various extension boards. To do so we use the Arduino programming language and the Arduino Software IDE, based on Processing. We fix the rfid card at the first box that is in the engine and last box of the train, which is sensed by the rfid reader. Since the radio frequency has very small range to sense the rfid reader is placed less than 10 meters. Servo motor is connected to the arduino which is used to open and close the gate when the rfid card is sensed by the rfid reader, the information goes to the arduino. The arduino runs the motor to open and close when detected. To indicate the arrival of train we use led light and buzzer which is operated by the arduino. When the train is sensed the arduino activates the buzzer which produce sound.

**Keywords:** Arduino, RFID sensor, ARM, AVR, Servo motor.

## I. INTRODUCTION

Railway source said that there were 45 unmanned railway gate level crossings in the Ernakulam-Alappuzha-Kayamkulam section that are critical and all are to be manned this year itself. The mounting accident taking place in the level crossings is a cause of concern for the railways as many as 321 were killed in 67 accident in the level crossing in the railway network in 2009. Railway officials said the work load of the station master will increase once the 71 level crossing are manned and it is estimated that the division needs another 77 station master this fiscal year. The division is awaiting the nod from the railway board for commencing the recruitment process. Indian railways have a huge employee base of 1.3 million, which includes powerful workers' unions. The Railways is only ministry at present which gives back dividend on Gross Budgetary Support. Last year, they paid Rs 7,000 Cr to the finance ministry. In microcontroller, to establish the entire network it is quite costly task. Bluetooth is a short-range wireless data network. Bluetooth is alternative to the messy tangle of computer accessory wires. GSM provides limited data rate capability, for higher data rate. GSM uses FDMA access scheme. In rfid, train should go slow for reading the tag.

The main purpose of our project is to bring automatic gate opening and closing system in the railways level crossing without the manual intervention. At present there are 35,363 level crossings and out of which 17,954 level crossing are unmanned and to reduce the accident in the unmanned railway gate.

Railroad is one of transition mode, which has an important role moving passengers and freights. However, rail road-related accidents are more dangerous than other transportation accidents. Therefore more efforts are necessary for improving it safety. This system is to manage control system of railway gate using the microcontroller. The main purpose of this system is about railway gate control system and level crossing between railroad and highway for decreasing railroad-related accident and increasing safety. In addition, it also provides safety road users by reducing the accidents that usually occur due to carelessness of road users and errors made by the gatekeepers.

## II. RELATED WORK BASED ON LITERATURE SURVEY

### 2.1 RAILWAY LEVEL- CROSSING GATE OPERATION REMOTELY BY AN ANDROID DEVICE

This project is designed to control railway level-crossing gate through an Android application by the station master. This system uses Android application device for opening and closing the level-crossing gate, remotely.

Remote operation can also be achieved by any smart phone or tablet with an Android-OS with a Graphical User Interface, based on Touch Screen Operation. This system uses a microcontroller as the heart of the project, and is programmed in such a way that any control signal from the Android phone controls the motor for operating the gate.

A Bluetooth device is interfaced with this system to achieve remote operation. Station master or driver of a train can send a command from the Android application, and therefore, the Bluetooth on the mobile phone sends the signals to the Bluetooth device attached to a control circuit. At the receiver side, this Bluetooth device receives these signals and sends them to the microcontroller.

Therefore, based on the microcontroller's program, it sends the signals to the motor driver to operate the motor. For the operation of the motor in both the clockwise and anti-clockwise directions, a motor driver is used. This system displays the message in response to the commands given by the Android applications, such as opening and closing of the gate, in the LCD. Here, this microcontroller based project is developed by using an Android application, and it can be further improved with a provision of sending an acknowledgment about the status of the gate to the sender and including a buzzer for alerting the persons at the gate. In this way, either the driver of the train or the station master is able to send the open or close commands to the gate remotely, through an Android portable phone.

### 2.2 AUTOMATIC RAILWAY GATE CONTROL SYSTEM USING IR AND PRESSURE SENSORS WITH VOICE ANNOUNCEMENT

Whenever any train is coming on the track, the IR signal will be disturbed due to the interruption of the train. Thus the microcontroller identifies the arrival of the train. Before closing the gate, the microcontroller activates the siren to alert the people who are on the track. After 30 sec, the controller closes the gate by rotating the DC motor. The microcontroller should know whether the train left the crossing or not to open the gate. For this purpose, the second IR pair is used. This IR pair identifies the train since the IR signal is interrupted when the train comes in between the TX and RX. The microcontroller will wait for the last compartment to leave the IR pair and after leaving, the receiver again gets IR signal. Till this time the gate is closed. Now, after the train had left the crossing, the microcontroller will open the gate by rotating the DC motor.

For the software implementation, we deploy two software packages. First one is the Keil  $\mu$ Vision 4.0. Second one is the Flash magic simulator. The Keil  $\mu$ Vision Debugger accurately simulates on-chip peripherals (I<sup>2</sup>C, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of ARM7 device. Simulation helps to understand hardware configurations and avoids time wasted on setup problems. With simulation, we can write and test applications before target hardware is available. The system program written in embedded C using KEIL IDE software will be stored in Microcontroller. Keil development tools for the Microcontroller Architecture support every level of software developer from the professional applications engineer to the student for learning about embedded software development. The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single board Computers, and Emulators support all ARM7 derivatives. The Keil Development Tools are designed to solve the complex problems facing embedded software developers. Flash magic is used to dump the code to microcontroller from PC. Flash Magic is a free, powerful, feature-rich Windows application that allows easy programming of Philips FLASH Microcontrollers. Build custom applications for Philips Microcontrollers on the Flash Magic platform! Use it to create custom end-user firmware programming applications, or generate an in-house production line programming tool. The Flash Memory In System Programmer is a tool that runs under Windows 95/98/NT4/2K. It allows in-circuit programming of FLASH memories via a serial RS232 link. Computer side software called Flash Magic is executed that accepts the Intel HEX format file generated from compiler Keil to be sent to target microcontroller. It detects the hardware connected to the serial port.

### 2.3 RAILWAY LEVEL CROSSING GATE CONTROL THROUGH GSM BY SMS

The project is designed to achieve control over the railway level crossing gate through SMS sent by the station master or driver. Opening and closing of railway level crossing involves manpower, which could be often erroneous leading to accidents.

The proposed system rules out the need of any human involvement at the railway level crossing. This system involves opening and closing of the level crossing gate with help of an SMS. A GSM modem is interfaced with the system. When the driver or station master sends an SMS “close” (when the train is approaching at the level crossing) to the modem then the microcontroller interfaced to the modem sends an output signal which activates a mechanism to switch on the motor to close the gate. To open the gate, another SMS “open” needs to be sent for the microcontroller to open the gate with help of motor driver IC. In this project we use a microcontroller of 8051 family, and the input to it is a GSM modem which receives the SMS from the user. The output to microcontroller is given to a motor through a motor driver IC for required operation. The status, whether the gate is open / close is displayed on an LCD display interfaced to the microcontroller. Further the project can be enhanced by sending an acknowledgement to the sender about the status of the gate via SMS.

## III. EXISTING WORK

Before our system, there was plenty of system to open and close the railway gate. For example, gate can be manually pulled and release the gate but this consume man power and other system use IR sensor and microcontroller to open and close the railway gate automatically. Some system use pressure sensor and microcontroller to open and close the railway gate automatically.

## IV. PROPOSED WORK

To solve this problem, we introduce a new technique to open and close the gate automatically that is we are going to use RFID sensor and arduino board to control the railway gate automatically to open and close the gate. It will overcome the some drawback from the previous system like voltage breakdown problem in IR sensor.

## V. SYSTEM DESIGN

### GATE CONTROLLER ARCHITECTURE:-

The train will have two RFID tags in the first box of train that is in the engine and the last box of the train. The RFID reader will be placed near the side of the train track. While the train cross the RFID reader, the tag will be read by the RFID reader. Each RFID tag will have unique number that will be read by RFID reader. The RFID tag unique number is already stored in Arduino UNO. If the unique number is correct for the first tag, then the gate will be closed by the servo motor. If the unique number is correct for the last tag, then the gate will be opened by the servo motor.

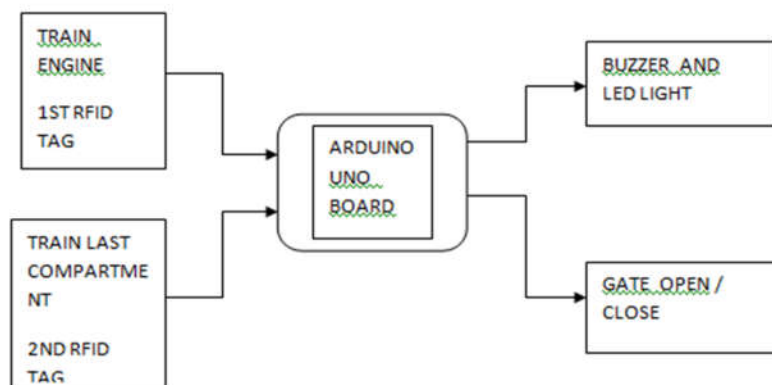


Fig. 1 Gate Controller Architecture

## VI. MODULES DESCRIPTION

The various modules of the proposed system includes detecting, gate,close ,gate open and second reader.

### A.DETECTING

In this module, the train will have two RFID tags in the first box of train that is in the engine and the last box of the train. The RFID reader will be placed near the side of the train track .While the train cross the RFID reader, the tag will be read by the RFID reader. Each RFID tag will have unique number that will be read by RFID reader.

### B.GATE CLOSE

In this module, the RFID reader will have the unique number which is read from the RFID tag that is transferred to the Arduino UNO board. The RFID tag unique number is already stored in Arduino UNO. If the unique number is correct, then the gate will be closed by the servo motor.

### C.GATE OPEN

In this module, the RFID reader will have the unique number which is read from the RFID tag that is transferred to the Arduino UNO board. The RFID tag unique number is already stored in Arduino UNO. If the unique number is not correct, then the gate will be opened by the servo motor.

### D.SECOND READER

In this module second RFID reader will be placed at opposite side of the track. Same first three module operation will be performed in this module.

## VII. EXPERIMENTAL RESULTS

The proposed method is implemented using arduino board to control the railway gate automatically to open and close the gate by using RFID sensor and servo motor.The experimental setup is shown in the following figures.

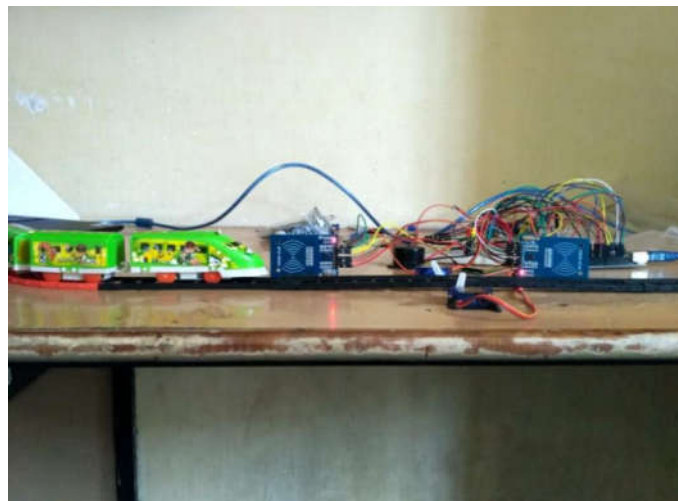


Fig. 2 Train crossing the first RFID sensor

In the above figure 2, as the train cross the RFID sensor the gates are closed.

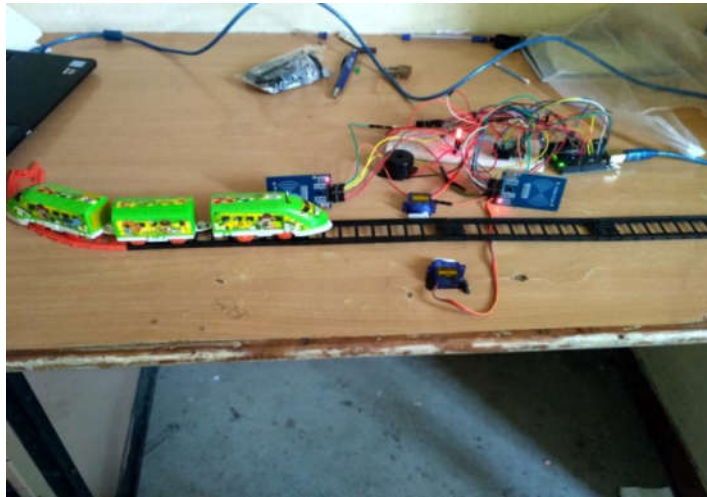


Fig. 3 sensing of first RFID tag by RFID reader

In the above figure 3, At the level crossing an alert is also given by producing sound using buzzer and the gate is closed .

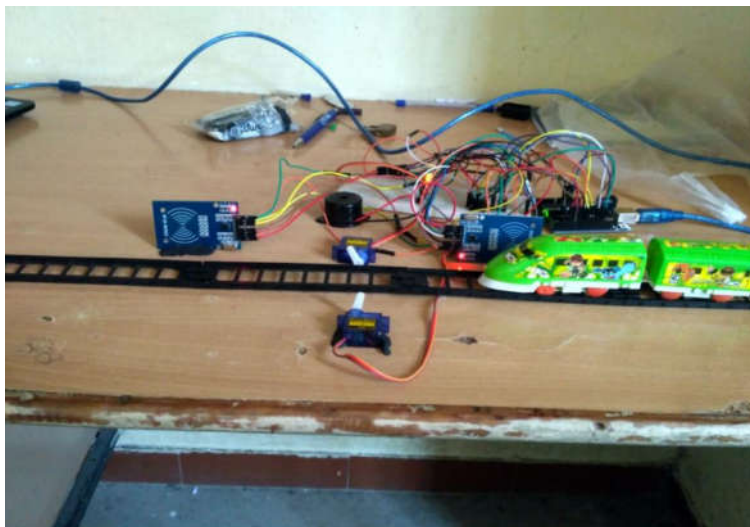


Fig. 4 Gate opening

In the above figure 4, as the last box of train crosses the RFID is detected and the closed gates are opened.

## VIII. FUTURE WORK

Some of the possible amendments and improvements in this system are:

- 1) Adding the database connection with the existing device so that we can get the general information about the train.
- 2) Establishing the scanning of train from both directions so that we can close or open the gate automatically. The DATABASE is where we can get any general information about the train. So that we can retrieve any data we want to know about the train. We can get the train starting and destination location when it is scanned by the RFID sensor. Even we can know about the arrival and departure time of the train. The connection on both sides will be done so that the scanning of RFID tags which is done in the single side is done the same operation on the opposite side.



**Obstacle detection:** Any obstacle on the track is detected by placing an RF module on the train and the presence of obstacle on the track is notified by a signal at the control room. The train movement is then controlled based on the presence of the obstacle on the track. The obstacle detection system implemented reduces the accidents which are usually caused when the railway line passes through the forest. Most of the times greater loss has been caused when animals cross the tracks.

## IX. CONCLUSION

Nearly thousand people being injured and /or killed by suburban trains every year. In India, railway gate was manually operated by liver pulling method to open and close the gate. In India, city like Mumbai, Kolkata, Delhi will have train is most popular transport for middle class person and there will more railway gate in that place. For that place, our technique will helps to reduce the accident. We are improving technologically in various fields so we liked it to do the whole process automatically which reduce the human efforts and is very easy to operate. This technique helps to reduce the future accident rate occurring in many country. Thus in future we can reduce the accident rate to the countable numbers. Automatic railway gate control system is cantered on the idea of reducing human involvement for closing and opening the railway gate which allows and prevents cars and humans from crossing railway tracks. The railway gate is a cause of many deaths and accidents. Hence, automating the gate can bring about a ring of surety to controlling the gates. Human may make errors or mistakes so automating this process will reduce the chances of gate failures. Automation of the closing and opening of the railway gate using the switch circuit reduces the accidents to a greater extend. The limitation of using RFID reader is so cost to implement in real time because reader should produce high frequency radio waves to detect the tag in the train. RFID reader which has high frequency radio wave which will read the tag in faster manner and reading range will high. So this technique is eco-friendly in nature. It will reduce man power in practical.

## REFERENCES

- [1] <http://www.mikroe.com/chapters/view/65/chapter-2-8051-microcontroller-architecture>.
- [2] [www.nevonprojects.com](http://www.nevonprojects.com).
- [3] [www.youtube.com](http://www.youtube.com)
- [4] Hnin Ngwe Yee Pwint, Zaw Myo Tun, Hla Myo Tun "Automatic Railway Gate Control System Using Microcontroller" *International Journal of Science, Engineering and Technology Research (IJSETR)*, Volume 3, Issue 5, May 2014
- [5] J. Banuchandar, V. Kaliraj, P. Balasubramanian, S. Deepa, N. Thamilarasi, "Automated Unmanned Railway Level Crossing System", in *International Journal of Modern Engineering Research (IJMER)* Volume.2, Issue.1, Jan-Feb 2012 pp-458-
- [6] <http://engineersprojects.blogspot.com>
- [7] Karthik Krishnamurthi, Monica Bobby, Vidya .V, Edwin Baby, "Sensor based automatic control of railway gates" *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET)* Volume 4 Issue 2, February 2015
- [8] <http://www.ti.com/lit/ds/symlink/l293d.pdf>
- [9] Robini Jadhav, Harshal Patil, Prof. M. S. Wagh, "Automatic Railway Gate Control System Using RFID with High Alerting System" *International Research Journal of Engineering and Technology (IRJET)*, volume-4, Issue-4, April-2017
- [10] Sayali R. More, Ruchira J. Raut, Rasika K. Tandel, Snehal D. Yendbe, "Intelligent Railway Crossing Gate Control with High Speed Anti-Collision Alerting System,"