Automatic Railway gate control with traffic signal indicator

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Abstract—In India, railway transportation is the most common, convenient and cheapest mode of transportation. India stands the world’s fourth largest railway networks, which carry out commercial as well as passenger transportation. Nowadays train transportation is more preferred because of its high speed, economic, environmentally friendly and safety. The main cause of the accidents occurred in railways are railway track crossing, unrevealed cracks in railway tracks, obstacles on the track. Therefore, there is a need to have improved technology which will be robust, efficient and stable to overcome the above issues. This paper discusses an Alerting System for Railway Crossing using sensors and it is effective approach which combines the use of sensors, This project aims to design an automatic railway gate controller with traffic signal indicator using Arduino UNO which will be helpful for preventing accidents at unmanned level crossing where large number of accidents happening every day. In previously existing system the work is done manually. But the proposed system has a robot which will run automatically on the track. In this project that ultrasonic sensor sensors are used to detect train on the track. The existing system is slow, tedious and time consuming so the proposed system is more advantageous and accurate.

Index Terms—Arduino UNO, Ultrasonic sensor, Servo motor, buzzer, traffic signal indicator

I. INTRODUCTION

Transportation plays a prominent role to carry passengers and goods from one place to another. The improved transportation leads to more trade. Country’s Economic level mainly depends on increasing the capacity and level of transport. The railway network is also perfect for long distance travel and movement of vast commodities, apart from being an energy efficient and economic mode of conveyance. Indian railways are the preferred carrier of automobiles in the country. India has the fourth largest railway network with a total route length of 67956 kms, consisting of 22593 operating trains in that 9141 is for freight and 13452 is for passengers with a daily passenger count of 24 million passengers and 203.88 million tons of freight from 7349 stations. India's railway network is recognized as one of the largest railway systems in the world under single management. Indian rail network is still following the increasing trajectory to fulfill the commutation requirement of large population economically. Indian railway network is growing at a healthy rate. In the next five years Indian Railway Market will be the third largest, accounting for 10% of the global market. Indian railways, which is one of the country's biggest employers, can generate 1 million jobs, according to, Union Minister for Railways.

The rail network traverses every length and breadth of the country. In spite of that in terms of the reliability and safety parameters, we are yet a bit away from true global standards. Though rail transportation in India growing fast but due to inadequate safety measures, there have been frequent derailments that have resulted in severe loss of valuables and human lives. Major causes of rail accidents according to statistics are level crossing accidents which may occur due to absence of gate control and negligence of the operators. The basic objective of the proposed work involves gate control which automatically closes when the train arrives near.
II. OBJECTIVES
The objectives of this project are listed below:
1. To introduce automatic gate control at level crossings with traffic signal indicator.
2. To reduce the accidents due to the railways gate cross controller.
3. To reduce the waiting time of track crosser.

III. BLOCK DIAGRAM AND DESCRIPTION

![Block diagram for automated gate control system](image1)

***Fig 2.1a: Block diagram for automated gate control system***

The main aim of project is to design the automatic gate control system at the unmanned level crossings to avoid accidents. The information for the mechanism of gate is provided by Ultrasonic distance sensor. Here two ultrasonic distance sensors are used. When the train arrives nearer distance at level crossing it is sensed by ultrasonic distance sensor 1 the red led traffic signal and buzzer alarms indicates that the train is arriving near and then the gate closes automatically. When the train departs goes away distance from the level crossing it is sensed by ultrasonic distance sensor 2 the yellow led traffic signal indicates to get ready to go the train departing and gate opens automatically with green led traffic signal indicates that the train is departed.

IV. CIRCUIT DIAGRAM

![Implementation of Hardware Components](image2)

***Fig 3.1.2a: Implementation of Hardware Components***
• Initially the gate is open and traffic signal indicating green. When Train arrives near to the level crossing the ultrasonic distance sensor senses and the traffic signal indicator indicating red, buzzer starts beeping and gate gets closed.
• When train departing the traffic signal indicating yellow. Then when train departed the buzzer stops beeping, signal turn green and gate opened.

V. WORKING PRINCIPLE
First of all, we need to place the components correct position for the perfect work of this system. Two ultrasonic Distance sensors are placed on both sides of level crossings and the distance between the two sensors is dependent on the length of the train. Two Servo motors are placed on both sides of the railway track. When the train comes nearer of the sensor-1, then sensor-1 detects the arrival of the train and produces output from its Data Pin. But, on the other side, when the Arduino gets this signal from sensor, then the Arduino sends the PWM signal to the servo motors. As a result, servo motors start working and close the gate. At this time, the Arduino sends commands to turn on Red LED and the buzzer starts to generate beepbeep sound, which means that the train is coming. When the train crosses the level crossing and the train away from sensors-2 and it detects the departure of the train. So, When the Arduino gets this signal from two sensors, then again the Arduino sends the PWM signal to the servo motors. As a result, the servo motors back to the first position, and automatically open the gate. This time Yellow LED will turn on and the buzzer will stop, it means that the train is gone. When sensor 1 and sensor 2 does not detect the train, In this condition, the gate is open and the Green LED will turn on and the buzzer will stop, it means that the train departed.

VI. RESULTS

ADVANTAGES/DISADVANTAGES/APPLICATIONS

Advantages
• Very accurate detection.
• Alerting signals transfer immediately for safety measures.
• Automatic gate control eliminates involvement of operator
• Reduces accidents.

Disadvantages
• To build the entire network is quite a cost task as these are the issues of the government cost doesn't add up to much.
• The Arduino board is a delicate device so it needs to be handled with care.

Applications
• To provide automatic gate control at level crossing.
• Traffic signal indicator for Vehicle’s.
VII. CONCLUSION
As mentioned in the objectives, the number of deaths caused due to railway accidents are shocking and it is observed that the major causes of railway accidents are due to negligence and absence of gate at railway crossing. This model avoids railway accidents at railway crossing by introducing automatic gate control at unmanned level crossings with traffic signal indicator.

VIII. FUTURE SCOPE
In our project, we have introduced an automatic control system at railway crossing with Traffic signal indicator. The main motive of the project is to provide control for gate at unmanned level crossings. As the construction and working of the model is simple it can be implemented in all the areas possible. It is of less cost and the simple coding is all it takes. Arduino is one of the best thing to include into the system which helps in performing numerous automation control. The system can work without much loss of human physical energy. The system is provided with an Arduino control.

REFERENCES