Retraction

Retraction: Ultrasonic sensor enabled smart automated railway gate control system (J. Phys.: Conf. Ser. 1916 012137)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Ultrasonic sensor enabled smart automated railway gate control system

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Abstract. Railways is the most preferred modes of transport system for freights as well as passengers. Among the accidents occurring in railways, the accident due to unmanned railway crossing are predominant. This article focuses in providing a smart automatic solution for vigilant monitoring in avoiding the accidents in railway crossing, system is provided with extra features to perform superior to raw conventional automatic railway gate, instead of blind closing of gates, gates are provided with the sensor which detect any persons or vehicle beneath it when it is operated. Along gate, pop up projection are recommended in this system which will be effectively restricting the movement across railway crossing during the operation of gates. Additionally, a monitoring system is provided which gives signal to train drivers if any vehicle/ living being got stuck in between the railway gate, well in advance which aids train drivers to act accordingly. Along with all these additional features conventional alarm feature is also available to alert. The prototype designed with the above feature effectively gives a solution in avoiding accidents by strongly enforce the restriction in movement across the gates when train crossing the unmanned railway crossing, reaction time of the monitoring system in giving alert to train driver, if any vehicle/ living being got locked between the gates is very low.

Keywords: Arduino, Ultrasonic sensor, Accident avoiding system, Automatic railway gates, alert system.

1. Introduction

Indian Railways is one of the world’s largest railway networks. There are 13530 unmanned level crossings in India. According to NCRB (National Crime Records Bureau) statistics, there were 1788 level crossing accidents in 2019, up from 1408 in 2018[1]. Of all forms of accidents, unmanned level crossings account for 61 percent. This is shown in the figure 1. A level crossing accident occurred on April 26, 2018 in Dudhinaga, Uttar Pradesh, when a passenger train collided with a school bus, killing thirteen children and seriously injuring eight others. Where there is no manned system, an automatically operated railway gate system is needed to prevent these types of accidents.

Automatically controlled railway gate means when the train arrival is detected by the sensor, the railway gates will automatically get closed and when the departure of train is detected by another sensor, then the railway gates get opened automatically [2]. Here when gates are operated blindly without sensing the vehicle/living being beneath it or if any vehicle stuck between the gates even these
things cause serious accident, hence it becomes important to develop an intelligent smart automatic system to control the operation of gates taking into account above requirement to avoid the accident caused.

2. Research background
In most of the previous proposed systems, they proposed automatic railway gate system where only closing and opening of gates is done automatically by the IR sensor. Also, the sensors are placed very near to the railway gate on both sides[3]. After sensing the train arrival, the gates are closing automatically without checking that any vehicle/person are crossing the gates. Here there is a chance for occurring accidents[4].

After closing the gates, some people try to cross the gates by passing under the gate. Here also there are possibilities for accidents. If suppose, any vehicle/person got struck in between the two railway gates then the train may crash. So, this type of accidents should be avoided. Using IR sensor for train arrival and departure arises a problem. If any bird or animal pass through the IR sensor, as it is a straight-line sensing sensor it considers as train and may open or close the railway gates. It is the drawback of using IR sensor[5].

PLC based automatic railway gate system means it’s cost is high and also it has a problem with number of inputs and outputs. If the number of inputs increases, then the cost also increases in parallel[6].

3. Proposed system
All the draw backs addressed above in the existing system are resolved in this system by ultrasonic sensors instead of IR sensor for detecting train arrival and departure. Ultrasonic sensors are placed on both sides of the railway gate about two and half to three kilometres apart from the railway gate. This will reduce the manual errors. In addition, while closing the railway gates we must check whether any vehicle/person are passing through the gates or not. This is also done by ultrasonic sensor. If any obstacle is detected, then some delay is given again the process resumes. Most of the people after closing the gates will try to cross the railway gates by moving under the gates. Because of these so many accidents are happening. We are implementing a mechanism of pop-up projections. After closing the gates immediately these projections will pop-up. These will block the entry of vehicles which will try to cross the gates under the gates Figure 2.
If suppose, when the gates are closed and found that any vehicle/person got struck in between the gates then, ultrasonic sensor will detect them and give a signal to the train to stop. After some delay, again the sensor will detect and after getting confirmed that the path is cleared then it gives signal to the train to start. All these functions are controlled by the Arduino uno based microcontroller Atmega328P.

4. Circuit Diagram

Figure 3 shows the circuit diagram of proposed system.
5. Methodology
The working of automatically controlled railway gate system is displayed by the process flow diagram. The process starts with the train arrival, that is when the train arrives, it is sensed by the ultrasonic sensor. When the train is detected, then the alarm (buzzer) is ON for informing to the people that the train is arriving and the railway gates will be closed. While closing the gates, another ultrasonic sensor will check whether any vehicle/person are crossing the gates. If nothing is detected as obstacle then, gates will be closed. Else, 15 seconds delay is given and again after delay time it detects Figure 4.

![Figure 4. Process flow diagram of proposed system](image)

When the gates are closed after confirming of no vehicle/person detection, then immediately projections will pop-up interior to the level crossing nearer to the gate in centimetres. The distance can be given as per the level crossing width. After projections are popped up, another ultrasonic sensor will detect for any vehicle/person in between the two railway gates. If yes, then a signal is given by led to the train to stop. After 2 mins delay (delay time can be changed as per the requirement), again it goes to the procedure of checking any vehicle/person crossing the gates while closing the gates. It repeats and gates gets closed [7]. If the other ultrasonic sensor which is connected to the railway gate detects the departure of train, then projections will pop-down and gates are opened. The process comes to an end.

6. Result and Discussion
Effectiveness of the system is validated by the reaction of each sensor for various predefined conditions and the reaction time is very low for the alert system which seems to be superior feature compared to the existing system. For predefined condition-1 arrival of train in end 1 detects the train activate the alert buzzer to people moving across the level crossing, motors of gates are operated to close the gates, simultaneously sensor in the gate delays (predefined condition-2) the operation of gate in case any vehicle beneath it. In case of predefined condition-3 if any vehicle got stuck between the two railway gates, alert message is sent to train driver rapidly, for him to react well in advance. Under predefined condition-4 if train cross the end point, motor is operated to open the gate.

7. Conclusion
Implementation of this system attest its effectiveness in providing a smart solution for the automation of railway gate control, with its intelligent discussion making while in operation. Reaction time of the system seems to be very low compared to the distance where sensor is placed, which provide ample of time for the driver to react for the alert received from the system in avoiding accidents, if any vehicle got stuck.

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