Designing an Unmanned Railway Gate Control System Using Vibration and Proximity Sensors

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Abstract

The Automatic Railway Gate Control System is a very useful concept which helps toautomatically open and close the railway gate automatically when a train arrives or leaves. Railway gates in India are often manually operated.

Information on the arrival of the train is given to the individual working in such control rooms for closing doors at nearby stations. There are still chances for mistakes due to manual intervention. Apart from this, some railway crossings are entirely unmanned and at these unmanned level crossings several railway accidents occur. We need to automate the process of railway gate control in order to fully eliminate human interference at level crossings. The purpose of this paper is the "Automatic Railway Gate Control" design. It is based on a scheme for radio control and signaling. In which, the railway gate is controlled by sensing the arrival and departure of the train itself and removing the chances of human error, the automatic railway gate controller is special. As this results in collisions leading to the loss of precious lives, level crossing cannot be used concurrently by both road traffic and trains. This suggested design could help to control gates and prevent accidents.

Keywords: Automation; Railway Gate Control; Sensors; Arduino

1. INTRODUCTION:

Level crossing occurs where, without recourse to a bridge or tunnel, a railway line intersects with a road or path at one level. It's one of the intersections at grade level.

If a light rail line with a different right-of-way or reserved track crosses a road in a similar way, the term often applies. Such common names include railway crossing, railroad crossing, and road through railroad, train crossing or grade crossing.

In earlier times, level crossings had a flagman in a nearby control room that would, on the approach of a train, wave a red flag or electric torch to stop all traffic and clear the tracks. Electrical closable gates that barricaded the roadway were later introduced. The function of such gates was to provide a complete barrier against intrusion of any road traffic onto the railway.

Most road transport was horse-drawn or involved animals in the early days of the railways. Therefore, a real barrier had to be provided.

J. A. J. Backs, J. A. Nychka and C. C. St. Clair [1] emphasized on having precise train detectors at those points of such intersections. They suggested to rely on more than one type of such sensors to avoid missing any train.

In their paper, they used 5 different sensors to ensure that no train or signal to be missed.

In their work, Evangelos Ntotsios, David Thompson, and Mohammed Hussein [2] have shown that there are multiple parameters of track which affects the vibrations generated. Hence, it's wise to collect the data according to make of railway track and the train wheels to decide upon a frequency range to be detected by the sensors. Sensing, a train approaching is highly depending on the accuracy of such data. It ensures the accuracy of information about the approach of a train.

2. PROJECTS COMPONENTS:

Following are the components used to make a low scale working model for the *Automatic Railway Gate Control System:*

H.X711 MODULE
MICRO LOAD CELL (0-5KG) - CZL 635
ULTRASONIC SENSORS
VIBRATION SENSOR

Motor Driver IC (L293D)
ARDUINO

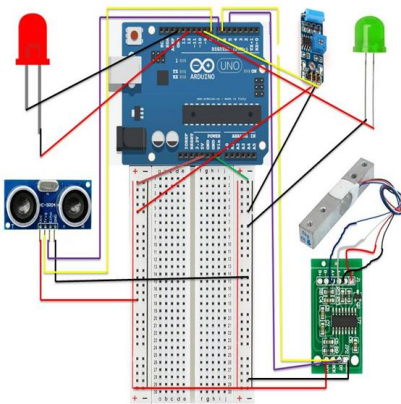**Circuit:** Fig 1 shows the circuit diagram for different connections with Arduino.

Fig 1: Circuit diagram

3. PROGRAMMING:

The programming on Arduino was done for following things:

1. Program for ultrasonic sensor to measure distance
2. Program for vibration sensors to detect vibrations
3. Program for load cell calibration

4. Program for load cell to measure load Final Program (Combining All)

RESULT AND DISCUSSION:

Data that are taken from calibrated sensors show that the model produces vibration on the track as well as load is detected by the load sensors which are placed just below the track.

The train was allowed to run on the track with different speed and the following readings were recorded.
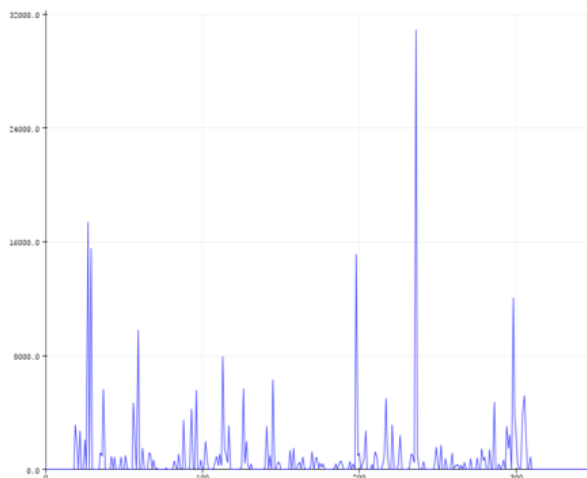

Fig 2: Readings of Vibration Sensor

CONCLUSION:

The circuit for *Automatic Railway Gate Control System* was developed and mounted on a breadboard. The designed system is found steady and reliable. The circuit was able to precisely regulate and control the railway gate. The circuit was tested and found functioned perfectly in both directions.

Due to the increased number of accidents and also due to the problems that occur to the road passengers when waiting for a longer period unnecessarily during passage of train, the Automated Railway Gate Control System is very required tool for today's railway crossings.

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