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Automated Railway Level Crossing using Arduino

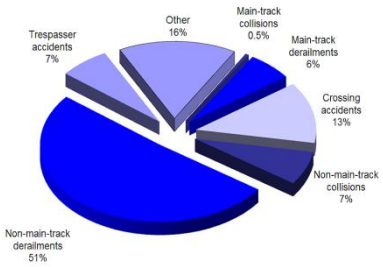
[1]Lavanya M, [2]Meghana Gowda V

[1] BE Student, ECE Dept., KSIT, Bangalore, [2] BE Student, ECE Dept., KSIT, Bangalore
[1]lavanyam041@gmail.com, [2] meghanagowda2000@gmail.com

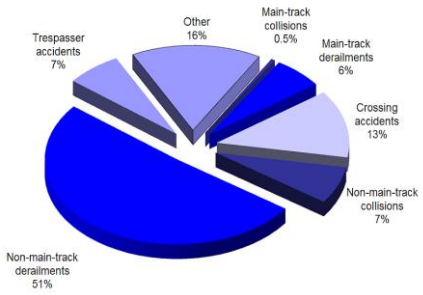
ABSTRACT

In the fast enlarging country like ours, accidents in the level crossings are increasing day by day. No fruitful steps have been taken so far in these areas. our paper deals with automatic railway gate operation (i.e.,) automatic railway gate at a level crossing replacing the gates operated by the gatekeepers, It deals with two things, Firstly it 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. By employing the automatic railway gate control at the level crossing the arrival of the train is detected by the sensors placed near to the gate. Hence, the time for which it is closed is less compared to the manually operated gates. The operation is automatic; error due to manual operation is pre vented. Automatic railway gate control is highly arduino based arrangements, designed for use in almost all the level crossing in the train.

Keywords: Railway gate, level crossing, Arduino



lway road organizes. More than several rails running on track each day. As all realize that it is doubtlessly lroads have given rail line gates to well-being at the level intersections. These entry ways are shut for street track. The entryways are opened for street clients once the prepare leaves the intersection. Level intersection



Kept an eye on level intersections are those which are protected by a gatemen as representative of Railways. The gate restrains the street activity by shutting the entryway on the receipt of drawing nearer; prepare data from control lodge through a phone line. Likewise in this framework the motor driver acquires a green flag just when the railroad entryways shut. A large portion of the level intersections closer to Railway station or in country zones are kept an eye on. Unmanned level intersections are spots which are un-protected. In this way a slight measure of carelessness with respect to street clients prompts mischances at such places. The greater parts of the intersections in remote territories or towns with low populace thickness are unmanned sort. It might be worth saying here that the vast majority of prepare mishaps prompting loss of property and life happened at unmanned level intersections. To caution at all level intersections in the immeasurable system of Indian Railways is for all intents and purposes inconceivable .Accidents occurred even at kept an eye on level intersections because of the blunders submitted by gateman .The Indian Railway systems with a course length of 62,495km has a sum of 40,445 length crossing, or a normal of one each

1.5km of this aggregate, 16, 1332 intersections are kept an eye on with some type of boundary security confronting street utilizes 20,528 are open intersections with settled street cautioning sign, 948 are street intersections nearby trenches without obstruction insurance, however with street notices signs, and 2,837 are basic open intersections with neither hindrance assurance nor settled street cautioning signs.

2016 Survey Report

Main-track derailments and collisions accounted for 7% of all accidents in 2016, the same as in the previous year. In 2016, 13% of rail accidents involved vehicles or pedestrians at rail crossings, slightly down from 16% over the previous five years. The proportion of other accident types (16%) in 2016 is up from the previous five-year average (11%). In 2016, 108 accidents involved dangerous goods.

2 LITERATURE SURVEY

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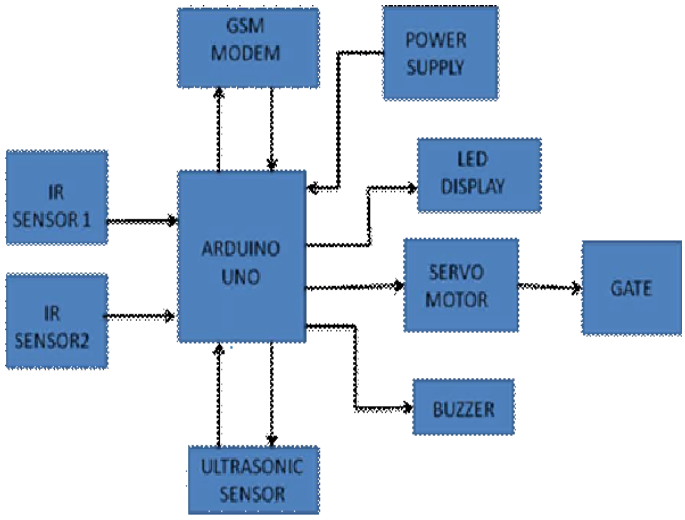
EXISTING SYSTEM

In India the Railway Crossing stations are manually operated by the railway gate operator. The railway gate operator is responsible for operating the gates according to the train arrival and departure. The Train arrival and departure information is sent to the gate operator by using the communication devices. The present system is very error prone and which leads to many accidents at railway level crossings. The train information is shared from one crossing system to another when the train leaves the crossing station. Over 50% of train accidents occur at railway level crossings due to many errors present in the existing system used by the Indian Railways. The method adopted by the Indian railway system is not safe and which is causing more accidents every year

BLOCK DIAGRAM METHODOLOGY



We proposed a reliable System which can reduce the number of accidents occurring at railway level crossings and reduce the time which the vehicles have to wait at crossing stations. In our system we use 4 ultrasonic sensors and a pair of ultrasonic sensors are used to detect the train arrival in both the directions and the other pair of sensors are used to detect train departure in both the directions. In India there are many types of rails travelling on the railway track daily like goods, passenger and express etc , the maximum speed of a train is approximately 97Km/Hr and the minimum speed of a train is approximately 50 Km/Hr . By considering all the trains types and train speeds the Ideal distance to detect the train by Ultrasonic sensors is about 6Km to 7Km from the crossing station and similarly the Ideal distance to detect the train departure by ultrasonic sensor is about 2Kms to 3Kms from the railway crossing. The System is composed of Ultrasonic sensors, Servo Motors, LED Signals , Buzzer , Arduino Uno and Nano The Ultrasonic sensors are used to detect the train arrival and departure. The Servo Motors are used to open and close the railway gates. The LED lights are used as traffic signals at railway crossing and the Buzzer signal is used to warn the vehicles about the train arrival.

The proposed system uses the ultrasonic sensor to detect the train arrival and which is to be placed at a distance of 7 kms from the railway crossing , when the train is detected by the arrival sensor and it sends signal to microcontroller to perform the following operations sequentially, the passengers at the level crossing are warned with buzzer signal and the LED signal turns to RED and the the railway gates to closed. In the same way when the train leaves the station the departure ultrasonic sensor detects the train departure and it sends a signal to the microcontroller to perform the following operations sequentially , stops the buzzer signal , turns Green LED signal and opens the railway gates.

3 FLOW CHART FOR AUTOMATIC RAILWAY GATE CONTROL

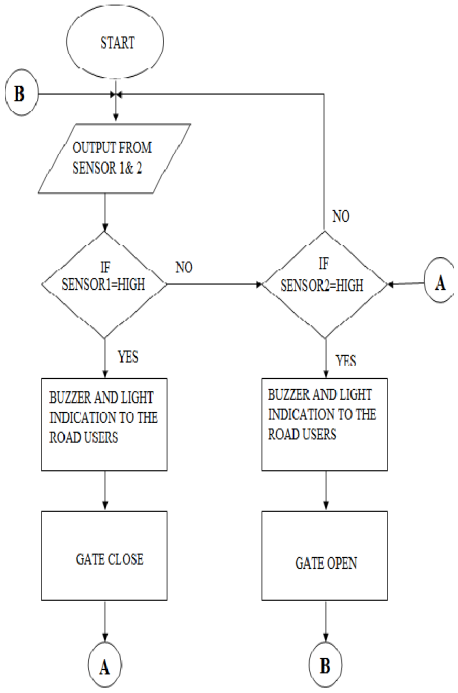


Figure-1

4 FLOW CHART FOR OBSTACLE DETECTION SYSTEM

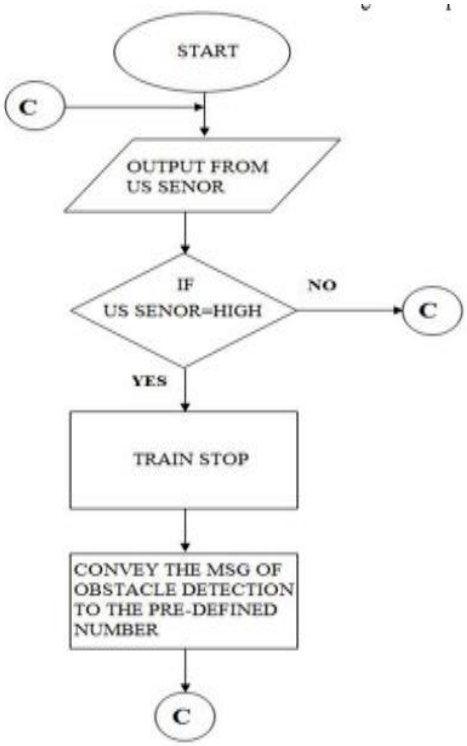


Figure-2

The Algorithm for Proposed system (Automated Railway crossing system using Arduino) working:

Step1: Start

Step2: Turn on all ultrasonic sensors and railway gates are opened (at 90 degrees)

Step3: Continuously check the arrival ultrasonic sensors (US1 and US2) for train detection.

Step4: If any one of the arrival ultrasonic sensors i.e US1 or US2 detects train then goto Step5 else goto Step3.

Step5: Activate the buzzer signal, turn On RED LED signal , close the railway gates (motors are at angle 0 degree)

Step6: Continuously check the departure ultrasonic sensors (US3 and US4) for train detection

Step7: If any one of the arrival ultrasonic sensors i.e US1 or US2 detects train then goto Step8 else goto Step6.

Step8: Deactivate the buzzer signal, turn on the GREEN LED signal, open the railway gates (motors are at angle 90 degree)

5 RESUTS AND ANALYSIS

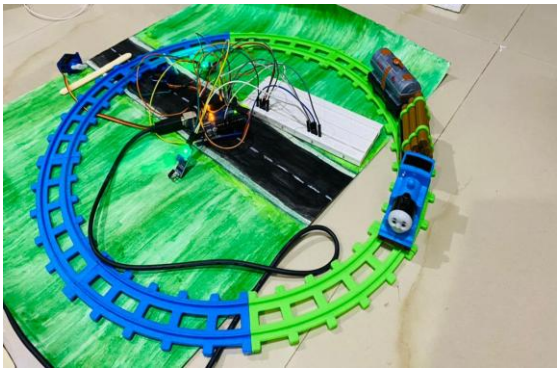


Figure -3

The proposed system is practically experimented as a working model prototype. The major components used in the model are an 80cm diameter railway tracks, a toy train, two IR sensors, Ultrasonic sensor, a servo motor with which the gate operates, 4 LEDs as the traffic signals, GSM Modem to convey message and buzzer to indicate the arrival of train to the traffic.

Gate operation: An IR sensor is placed at a distance of 25cm on either side of the level crossing. The toy train passes the first sensor and when it is detected by the sensor, a RED LED glows at the level cross indicating the traffic that the gate is about to close and closes the gate with the help of servo motors. When the second sensor senses the departure of the train the LED will turn off and the gates will open.

Obstacle detection: Any obstacle on the track is detected by placing an Ultrasonic sensor on the front end of 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 and obstacle detection message is conveyed to the nearby railway station through GSM technology.

D. Conclusion

Automated railway crossing system using Arduino is an effective and best solution to the problems occuring in the manual system used by the Indian railways. This System provides high benefits to the road users and railway management. This system reduces the accidents which are occured at railway crossings and reduces the waiting time of vehicles at railway crossing to maximum extent. As this system does not need any human resources it can be implemented in any remote areas and rural areas where there is no railway gate keeper. The proposed system uses the servo motors to lift the gates and these are very reliable and accurate to lift or down the gate by the specified angle rotation. Finally we will conclude that the proposed system will have high reliability, high performance and low cost compared to the existing system which is presently in use.

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