Automated Railway Crossing Gate using IOT

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ABSTRACT

The Automatic Railway crossing using Arduino Project uses Arduino UNO to manage the whole circuit. .The objective is to shut the railway gates when the train approaches near the sensor placed 5km away from the gate, and block vehicles from going across the track. Accidents in the manual gate crossings are increasing day by day. No necessary steps are taken in these areas. This project will be controlling railway gate automatically and replacing the manual operation of gate by the gatekeepers.

INTRODUCTION

India is the country which has world's largest railway network in the world and more than hundreds of railways running on track everyday. As we know it is nearly impossible to stop the running train instant in some critical or emergency situation. Therefore, in sub urban areas and crossings there is a need to install a railway gate in view of preventing accident. Obviously at each and every gate there must be an gatekeeper to operate and maintaining it. Railways which is the cheapest mode of transportation are preferred mostly by all public in our country. When we read daily newspapers, we read many railway accidents happening at manual railway crossings. This happens due to the careless in manual operations or lack of workers or irresponsible public who break law by crossing a gate which is closed. I have come up with a solution by using simple electronic components, we have tried to automate the control of railway gates. As a train approaches the sensors placed at a certain distance from the gate detects the train and controls the operation of the gate.

RELATED WORK

Bharti Dhande, Utkarsha Pacharaney: "Unmanned Level Crossing Controller and Rail Track Broken Detection System Using IR Sensors and Internet of Things Technology". International Conference on Inventive Communication and Computational Technologies (ICICCT 2017) [1] this project proposes the automation in gate control and crack detection using IR sensors and stepper motor based on LPC 2148 microcontroller. The advantage includes less cost, low power, high accuracy, low power consumption, less analysis time and main advantages in crack detection is that the system can be centrally managed using internet of things technology and the exact location of the faulty track can be found out using hosted website (IOT) so that many lives can be saved.

ACYM Kottali, Abhijith S., Ajmal M. M., Abhilash L. J., Ajith Bab, "Automatic Railway Gate Control System'' International Journal of Advanced Research in Electrical and Instrumentation Engineering,Vol.3,Issue 2, February 2014 [2], this paper proposed crack detection on train track using ATmega 16A microcontroller. The circuit for the project is designed and set up in a breadboard. It is found to be very reliable and stable. The circuit is able to control the railway gate precisely. By using ATMEGA 16 it is enabled to achieve a fast response. The project is a necessary tool for today's railway crossings due to the increased number of accidents and also due to the problems occurring to the road passenger's while waiting a longer time when the train is passing.

Pranav lad, Mansi Pawar: "Evolution of Railway Track Crack Detection System" [3], this paper proposed ultrasonic and solid works based train track crack detection. It shows a great impact on safety and maintenance. This paper has shown how to perform flaw detection using USFD machine. It is reliable and accurately detected and signals are transferred immediately. Ultrasonic waves collaborated with IR sensors and solid works has given an effective solution in the case of automated train track crack detection.

Randeep Kushwah, Brij Bihari Chaubey, Jyotindra Kumar Singh, Prashant Kumar Dubey, Mr. Rahul Jaiswal , "Automatic Railway Gate Control System ": IJECS Volume 05 Issue 5 May 2016 Page No.1659916602 [5], this project proposed a system where it deals with two things. Initially, it deals with the reduction of time for which the gate is being kept closed and then, to provide safety to the road users by reducing the accidents. It has combined the IR sensors and transmitters with the Servo components giving a reliable and safe circuit with more accuracy in locations.

Sr. No	Title of the Paper	Author	Year of Publishing
1.	"Unmanned Level Crossing Controller and Rail Track Broken Detection System Using IR Sensors and Internet of Things Technology"	Bharti S.Dhande , Utkarsha S.Pacharaney	2017
2.	"Automatic Railway Gate Control System''	Acym Kottalil, Abhijith S,Ajmal M, Abhilash L ,Ajith Bab	2014
3.	"Evolution of Railway Track Crack Detection System"	Praav lad, Mansi Pawar	2014

4.	"Programmable logic controllers for Automatic of the Level Crossing''	M.kornaszewska	2010

Table 1: Literature survey table

METHODOLOGY

The principle operation behind the working of this project lies in the functioning of Infrared Sensor. A Reflective type of Infrared Sensor is used in this railway project. In Reflective Type of Sensor, the Infrared transmitter and receiver are placed along side by side. When there's no obstacle in front of the sensors, the Infrared rays transmitted by the Infrared transmitter will travel undetected as there is no rays falls on the Infrared Receiver. If there is an obstacle or object in front of the Infrared transmitter and receiver , the Infrared Rays gets reflected off from the surface of the obstacles and are incident on the Infrared receiver. This type of setup can be configured to detect an object/obstacles like a Train and it can be used to switch ON or OFF the loads like motors with the help of controller. A System has been proposed which can reduce accidents numbers which occurs at railway level crossings and it also reduce the time which the vehicles have to wait long at gate crossing. In this system we use mainly two Infrared sensors and a pair of US sensors which are used to detect the arrival of train in both the directions. In India there are different rails travelling on the railway track daily like goods, passenger and so on, the maximum speed of a train is approximately 98Km/Hr and the minimum speed of a train is approximately 50 Km/Hr . By considering all the trains types and train speeds the Ideally distance to detect the train by infrared sensora is about 4Km to 5Km from the crossing gate. The System is composed of Infrared sensors, Servo Motors, LED Signals , Buzzer , Arduino Microcontroller. TheIR 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 by making a beep sound.
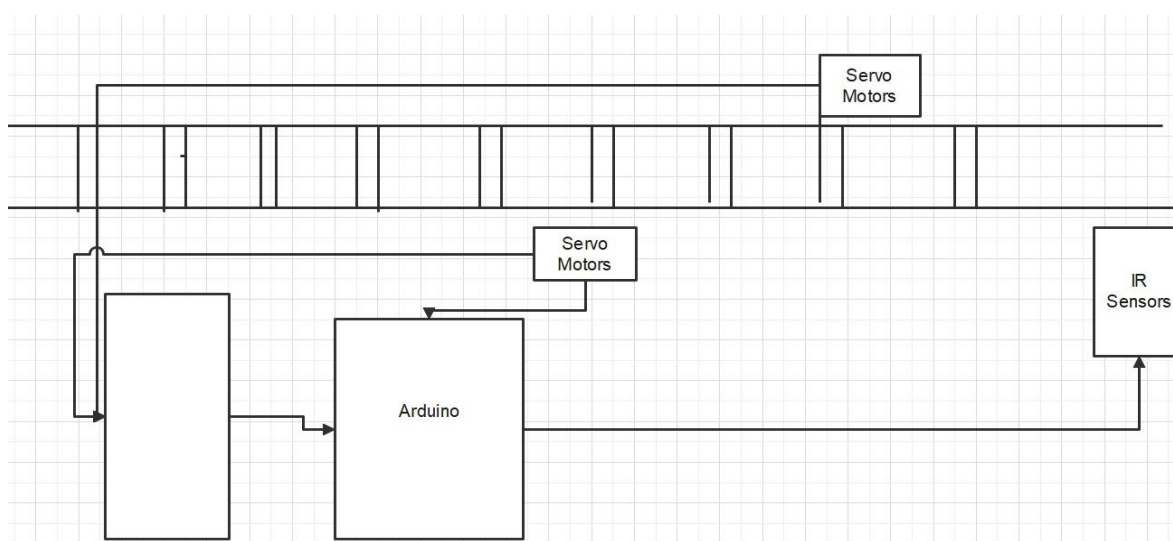

Fig : Block diagram of proposed system.

WORKING OF BLOCK DIAGRAM

1. Initial signal display:-

Signals S1, S2 are placed near the gate at a   specified distance. The S1 and S2 are placed at 5Km on either side of the gate where as both servo motors are placed near the gate for opening of railway gate automatically. The train may be approaching the gate in either direction so all four signals are made RED just to indicate that gate is open and Vehicles are passing through the gate. The road user signals are made GREEN so that they can freely move through the gate without any fear.

2. Train arrival detections:-

For detection of a train two IR sensors are required. Infrared1 for arrival and 1nfrared2 for departure of train by the sensors. It will Detect arrival of the train and will close the gate immediately.

3. Gate closing operation:-

Once the sensor which is placed near the servo motor senses that there is no vehicle inside, then it automatically give signal to operate the motor through circuit and hence close the gate for the train to cross. When any presence of obstacle is detected, AT89S52 controller gives signal for obstacle which is detected to clear the path and once the path is cleared, servo motor is operated to close the gate

4. Signal for train:-

When the path is clear or no obstacles are detected inside the gate, GREEN signal is used for the train when there is any obstacle found; signal is made RED for the train in order to slow down its speed before 5 Km from the gate. Another signal which is placed at 180 m before the gate, when it is still RED showing when train approaches it should be stopping the train.

5. Gate operating:-

When the train departure/arrival is sensed by the sensors, signal is given to the Microcontroller which operates the servo motor in reverse direction and the gates are opened. Once the gate is opened signal for road users are made GREEN so that the vehicles can pass through the gate without any hesitation. .

RESULT AND DISCUSSION

Two IR sensors are placed at the both sides of railway crossing. They are placed 5Km. away from level crossing. The arrival and departure of train is sensed by the sensors and transmitted to the Arduino uno. There's a loop that keeps running in the Arduino that always checks the IR sensor output .If the IR sensor outputs the signal ,the Arduino instructs the L293D to close the gate using Servo Motor .The Servo motor exactly rotated at 90 degrees and the railway gate gets closed .After passing the train the departure is sensed by the another IR sensor which is placed at the opposite side of the other IR Sensor .When the departure is sensed by the another IR sensor the Arduino gets the acknowledgement signal to open the gate via L293D module. Same process happens if the train is coming from another side. The delay between sensed signal and closing of gate is kept small here (500 ms). But in real life the delay is kept more.
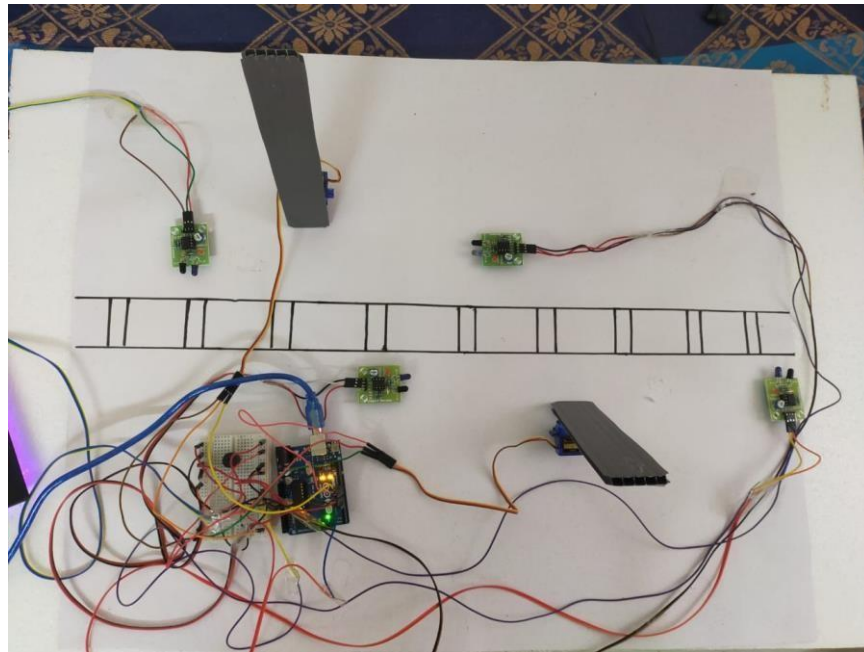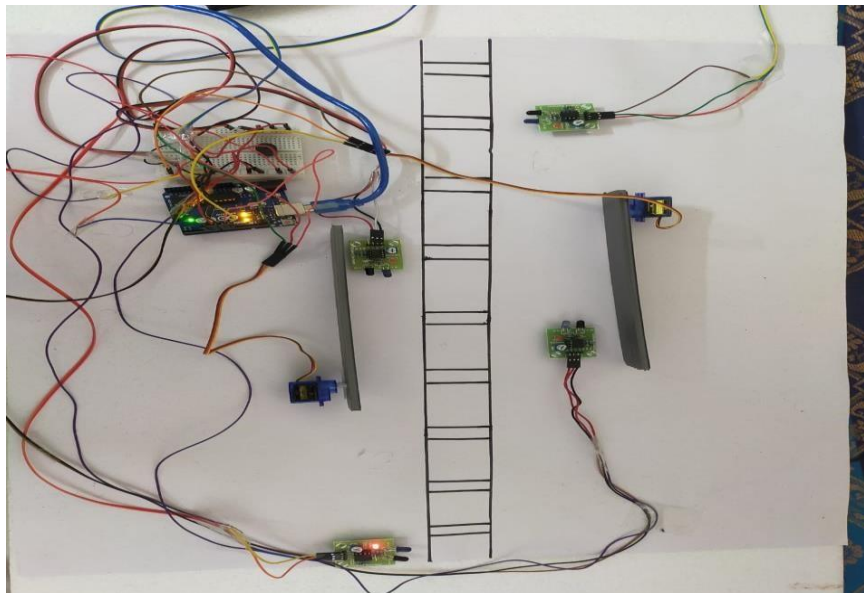
Fig result 1

Fig result 2

Conclusion

The system proposed has been a very reliable one. This system can prevent heavy loss of life using internet of things technology and IR Sensor based system. The proposed unmanned railway gate crossing system performs automatic opening and closing gate function without any human participation and also railway track broken system automatically detects faulty railway track without human intervention. There are many advantages with the proposed system when compared with the traditional system. The advantages include less cost, high accuracy, low power consumption, less analysis time and main advantages in crack detection is that system can help to centrally manage everything using internet of things technology and help to find the exact location of the faulty track using hosted website (IOT) so that many lives can be saved.

Future Work

The problems indicated above can be overcome by adding some extra modules/work on it, like we left the GSM module for future scope. After adding this module, upon arrival and departure of train ,the GSM module will send an SMS to registered phone number for acknowledgement and safety. Also adding a pair of pressure sensor increases the chance of fault triggering of gate as well as alarm. After adding the pressure Sensor , the Arduino closes the gate after receiving both signal from IR sensor as well as pressure sensor and if a car get stuck inside the train the gate will not closed unless the car or bike cross the railway gate

References

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