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A Review on Automatic Gate Crossing and IOT based Train Track Crack Detection System using IR Sensors

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Abstract - *Railway system is the most commonly used transportation system especially in India. But due to miscommunication about the railway schedules and lack of coordination, accidents happen. According to survey, 60 % of the accidents happen either at crossings or cracks in railway tracks. To avoid these situations it is necessary to have an accurate system for both of them. This paper proposes a system which includes automated railway gates at crossings and also automatic crack detection in railway tracks and also to avoid the collision of two trains due to the same track. This model is implemented using sensor technique. The sensors are placed at a certain distance from the gate and they detect the approaching train and accordingly control the operation of the gate. After detecting the crack, the coordinates are tracked and sent back to control room for further actions.*

This system includes IR sensors, LPC2148 microcontroller (64 pin) along with GPS and GSM modules. This system is going to be developed by using Internet of Things (IOT) technology. This will help in detecting the cracks and functioning of gates get done without any human intervention.

Key Words*: *IOT, LPC, GPS, GSM, Stepper motor.

1 INTRODUCTION

In all the transport systems, especially like railways, safety and reliability are important and considered the most. In recent years, as railways have been the most effective transportation system in case of populated countries like India, management regarding the highly increased traffic and transportation is mandatory. But this high density of traffic leads to the increase in the number of accidents.

The railway system is a commonly used transport mode in India. It is also one of those systems that face a lot of challenges due to human errors such as level cross accidents, collisions that happen due to broken track etc. A level cross, an intersection of a road and a railway line, requires human coordination, the lack of which leads to accidents also the main problem about railway analysis is detection of the crack in the location. If these problems are not controlled at early stages they might lead to a number of derailments resulting in heavy loss of lives and properties.

There were gatekeepers used to work in traditional system level crossings to manage the level crossing and the gatekeeper used to be instructed by the means of telephone at most of the level cross from the control room. But the amount of manual errors that could occur at these level crosses was high because they are unsafe to perform without actual knowledge about the train time table. Delay in the opening and closing of the gate could lead to railway accidents To avoid the errors that could occur because of human intervention during the operation of gates and derailment due to crack, the proposed paper introduces the concept of automation of railway gates and crack detection system has been modified by using IR sensors and IOT (Internet of Things) technology which performs automatic gate operation and helps in the detection of the cracks in the track.

It is necessary to understand the fact that transportation system plays a key role in any country's development agenda and aspects. Railway system is the heart of the transportation. When it comes to the populated countries like India, maintenance and governance of Railway system can be quite a bit complex. These complications surely lead to accidents and such tragedies happen during the Gate crossing and because of the cracks between rail tracks. To avoid such tragic incidents and to save precious lives a system is being proposed which will include the automated gate crossing and detection of cracks in between the railway tracks by using sensors and microcontroller which will make a precise, feasible and effective system along with the highly considered safety and reliability of the transport where the precious lives will be valued and saved.

2 LITERATURE SURVEY

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

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 paper 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 InstrumentationEngineering,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.16599-16602 [5], this paper 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.

3. PROPOSED SYSTEM

The proposed system consists of two parts:

a) Automated Gate control

b) Automated Crack detection

3.1 Automated railway gate control:

Gate control will be done using stepper motor where this stepper motor will mainly control the gate rotation. Track is scanned before the arrival of the train and IR sensor will sense the arrival and gate will closed for other vehicles and kept open for the train arriving on that track.

3.2 Automated train track crack detection

In the Crack detection system, before the start of the railway line scan the IR transmitter and receiver are activated. After calibration, the GPS module starts reading the correct geographic coordinates. Both IR transmitter and receiver will be placed straight line to each other on rail. During operation, when the light from the transmitter does not fall on receiver so that it gives result NO Crack found. And when light from the transmitter fall on receiver i.e. light deviates from the path because of the crack in the railway track then it gives result as a crack found. To detect current location of the train in case of crack detection, GPS receiver is used whose function is to receive the current latitude and longitude data. This latitude and longitude date will be send by GSM to the IOT website.

This crack detection system is managed using Internet of things technology. On IOT website the information about train will be shown in terms of latitude, longitude, crack YES or NO and date.

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.

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