International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 06 | June 2019 www.irjet.net p-ISSN: 2395-0072

Automatic Gate Crossing and IoT based Train Track Crack Detection System using IR Sensors

Vaishnavi H. Bavikar[1], Apurva V. Deshmukh[2], Vishaka Koul[3], J. S. Kharat[4]

[1,2,3]Student, Dept. of Computer Engineering, JSPMNTC College, Maharashtra, India
[4]Assistant Professor, Dept. of Computer Engineering, JSPMNTC College, Maharashtra, India

---

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: (Size 10 & Bold) Key word1, Key word2, Key word3, etc (Minimum 5 to 8 key words)…

INTRODUCTION

In all the transport systems, especially like railways, safety and reliability are important and considered the most. In recent years, as the railways have been the most effective transportation system in case of the 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 number of accidents.
To avoid these situations it is necessary to have an accurate system which will act as an effective solution over this problem.

The proposed system consists of two sub modules:
a) Automated Gate control
b) Automated Crack detection

LIST OF MODULES

- Power supply
- LPC2148 Microcontroller
- GPS module
- GSM module
- IR sensor as a Transmitter and receiver
- IR sensor for Departure and arrival
- LCD Display
- Stepper Motor
- Stepper Motor Driver
  And website based on PHP and MYSQL.

DESCRIPTION OF MODULES

A. IR TRANSCEIVER:

IR transceiver is used here for determining the arrival and departure of train. This is done by using IR sensor in which presence of train is detected as logical zero.

B. STEPPER MOTOR:

Stepper motors convert electrical energy into mechanical energy. These motors rotate a specific distance per each step which is incremental. The number of steps executed by the stepper motor controls the degree of rotation of the motor's shaft. This quality makes step motors excellent for positioning applications. The number of steps the motor executes is equal to the number of given pulse commands. A step motor rorates a distance at a rate that is proportional to the number and frequency of pulse commands given to it. [5]

C. GPS:

The Global Positioning System (GPS), originally Navstar GPS, is a satellite-based radionavigation system owned by the United States government and operated by the United States Air Force. It is a global navigation satellite system which efficiently provides geolocation and time information to a GPS receiver anywhere on the Earth or near it. More the obstacles such as mountains and buildings block the relatively weak GPS signals.

D. GSM:

GSM is a mobile communication modem which stands for global system for mobile communication (GSM). A GSM is all about digitizing and reducing the data and then sending it down through a channel with two different streams of client data, each in its own particular time slot. GPS has an ability to carry 64 kbps to 120 Mbps of data rates.

E. LPC MICROCONTROLLER:

This project relates to find the crack in the railway tracks. Project uses a LPC microcontroller from 2148 series family. It is a 64-bit microcontroller. It is connected to various modules like GSM, GPS, stepper motor, IR sensors.
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.

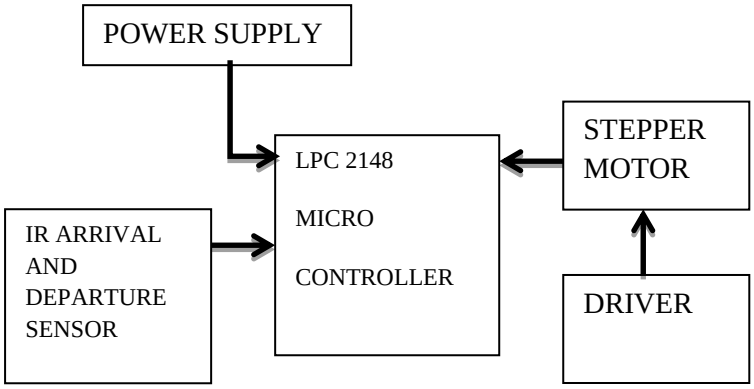

Figure 1: Block Diagram of Automated Gate control

To understand the architecture of the automatic gate crossing system, it is must to understand all the basic modules included in it. Figure 1 shows the block diagram of automatic gate crossing system. It includes LPC2148 Microcontroller, stepper motor and driver and IR sensor for departure and arrival of train.

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 detection of crack, GPS

receiver is used whose function is to receive the current latitude and longitude data and this latitude and longitude date will be send by GSM to 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.

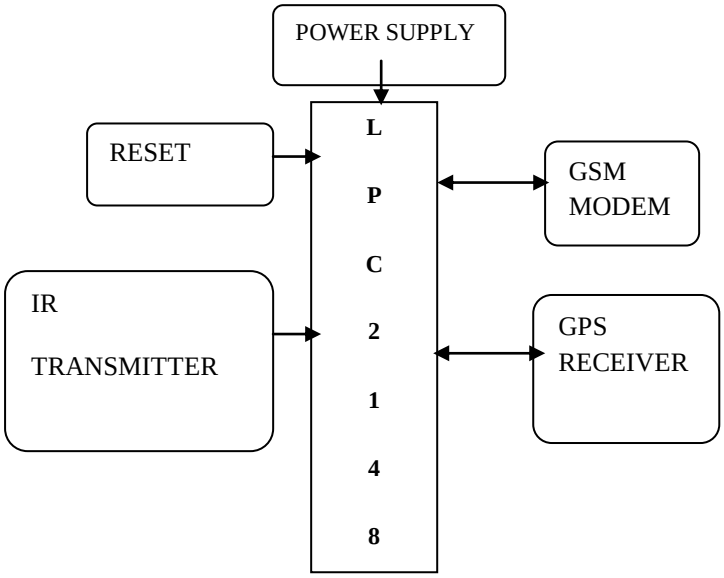

Figure 2: Block Diagram of Automated Crack Detection System

To understand the architecture of the Automatic train track crack detection system, it is must to understand all the basic modules included in it. Figure 2 shows the block diagram of automatic train track crack detection system. It includes LPC2148 Microcontroller, GSM module, GPS module and IR sensor as a transmitter and receiver.

RESULT:

The output will be seen on the IOT website developed with all the details like location map, longitude and latitude of the crack located, train details.

Also on the LCD display that is connected to the LPC 2148 microcontroller, output will get reflected as NO if there is no crack and as YES if there exists any crack along with the longitude and latitude with respect to the location of that crack.

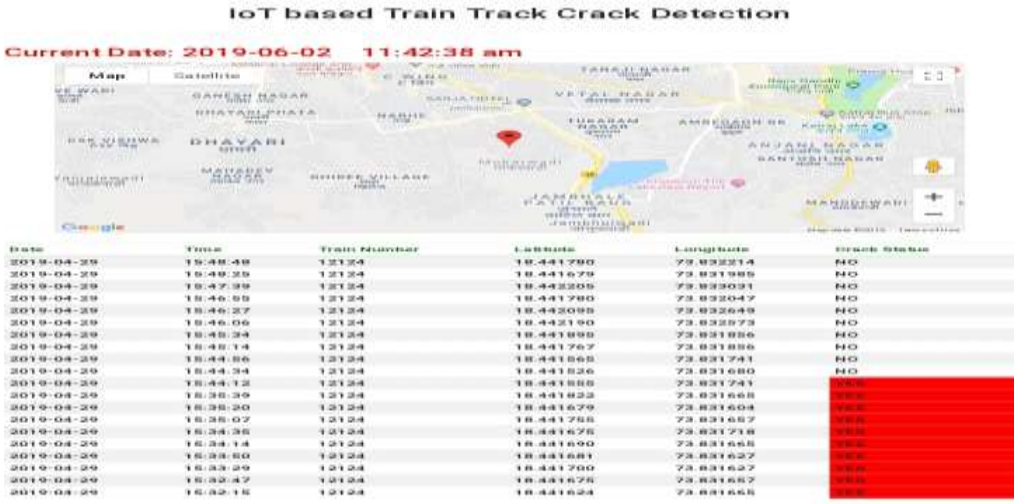

Figure 3: Screenshot of the IOT website developed.

The details regarding the location and status of crack detected are displayed on the website as shown in the screenshot above referred as Figure 3.

CONCLUSION

This system proposed has been a very reliable system of the cause. This system can prevent heavy loss of life using internet of things technology and IR sensor based system. The system performs automatic opening and closing gate function without any human participation and also railway track crack detection system automatically detects faulty railway track without human intervention. There are many positive benefits with the proposed system when compared with the traditional system. The advantages of this system are less cost ,low power, 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.

REFERENCES

[1] 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).

[2] Acym Kottalil, 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

[3] Praav lad, Mansi Pawar: "Evolution of Railway Track Crack Detection System".

[4] M.kornaszewska , "programmable logic controllers for Automatic of the Level Crossing,''Advance in system Electrical and Electronic Engineering pp-143- 146,2010

[5] 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

[6] www.wikipedia.com.