International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

IOT BASED RAILWAY TRACK CRACK DETECTION

[1]Dr.P.Suneel Kumar, [2]S.Vineela Sai, [3]M. Sravya, [3]J. Ashwini
[1]Professor, Department of Electronics and Communication Engineering,
[2,3,4]Student, Department of Electronics And Communication Engineering,
Sridevi Women's Engineering College, Telangana, India.
psunilkumar.ece@gmail.com
vineelasai2002@gmail.com,
measravya2002@gmail.com,
ashwiniyadavashwini70@gmail.com

ABSTRACT
Nowadays, transportation is a crucial need. Humanity is the fourth-largest network of railway links in India. This essay explores how to spot a break in a railway track. GSM hardware and the GPS module were employed in earlier techniques. High costs are the result. A radio frequency transmitting and receiving device, an LED LDR setup, and other basic components are used in the efficient railway fracture detecting system. In comparison with other techniques, it is inexpensive. In this study, a rail track fracture is located using an LED and LDR combo. As RF enables faster, longer-distance transmission of more data, it is a logical choice for information transmission. In this instance, the sensor data is sent to a management center or surveillance system. Using an LED LDR circuit, RF transceiver, and independent power unit with a solar powered battery, we suggested an IoT based crack considered a key factor in this study.

Keywords: Railway track, GSM hardware, GPS module, LED-LDR setup, RF transceiver.

1. INTRODUCTION

The most important means of transportation in our nation is the railway, however the fact that our country's railway lines are very susceptible to damage is a source of tremendous sadness. Due to these outdated railway lines, a significant number of accidents occur annually, resulting in a result, a significant number of human lives are lost annually. These kinds of events urge us to consider the problem and take appropriate action to safeguard their lives. We need to develop a more modern and safer railway network by implementing our suggested method. India seems to have the 7th largest railway network in the world. The likelihood of inaccuracy grows with the discovery of cracks within a vast network of 115,000 kilometers of track across the nation. When used properly, the GSM, GPS, and micro - controller based fractured railway track detection is just an effective means of identifying track fractures and preventing train derailment.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Figure 1. Crack in Railway Track.

The adoption of Internet of Things (IoT), a technology that is now increasing quickly, is employed for intelligent security systems. Using ultrasonic sensors that send sinusoidal voltage for an ideal track, this method is employed between two stations to find track breaks. The GPS receiver should turn on if the ultrasonic sensor detects a fracture and sends a signal to the Arduino Uno board. The specific location would be pinpointed by the GPS receiver and communicated to the police. The controller will start the camera as soon as the ultrasonic sensor provides a response to that as well.

In India, rail transit is expanding quickly. Although being a popular means of transportation, our infrastructure is not up to pace with international norms in the areas of accuracy or safety. According to an online study, derailments seem to be to blame for 60% of all railway accidents, and new data indicates that rail cracks are to blame for 90% of those incidents. It is thus not safer for humanity. The importance of this demand's attention immediately. They are ignored, and the tracks are not adequately maintained. The task is now performed manually, but the planned system incorporates a robot that will operate autonomously along the rails.

The project goal is to develop a reliable railway crack detection system (RRCDS) that uses an LED IR SENSOR installation system to prevent traffic collisions. Moreover, the system has the capability of being controlled via IOT, GPS, and GSM. The system uses an LCD panel to deliver visual notifications.

Figure 2: Traditional Railway Track Crack Detection.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
IJARST
ISSN: 2457-0362

GPS is an abbreviation of Global Positioning System. The geographic coordinates of the area where this GPS receiver was located can be used to pinpoint its exact position. The boat drivers may be informed with these details, which is quite helpful. The GPS delivers the received information as from satellites. The GPS talks including at least three space-based satellites to gather this data. This project describes a robot-based car geolocation system that uses GSM, SMS, and GPS communications. The technology enables the localization of the car and, upon his request, the transmission of the status to the regulators by short message (SMS) on their mobile phone. Also, when an accident occurs, this technology automatically sends alarm messages to predetermined numbers. An autonomous Robust robot system that interfaces with DC motors and relays as DC motor drivers makes up the project.

2. THEORY

An embedded system combines hardware and software to carry out a specific purpose. Microprocessors and microcontrollers are a couple of the common components found in embedded goods.

As they merely receive input, analyze it, and output, micro-processors are frequently referred to as general purpose processors. On the contrary, a micro-controller not just takes the data from entry but then also maintains it, controls it, interacts towards other components, and eventually produces the final result.

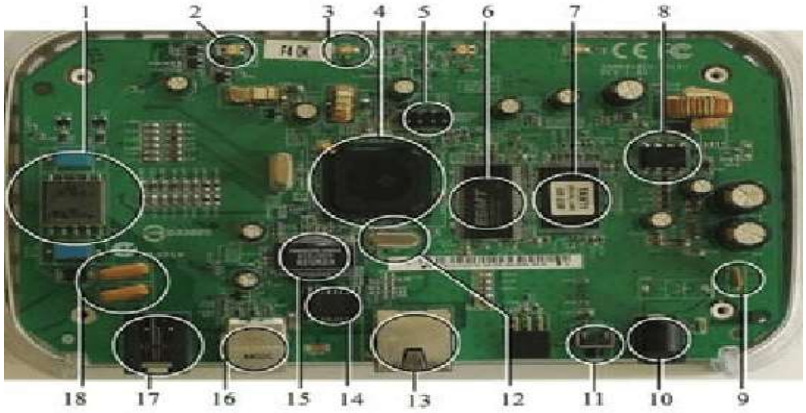

Figure 3: Modern Embedded System.

The "IOT Railway Crack Detection Module" project, whose uses a PIC microcontroller, is unique in that it identifies track fractures, sends SMS notifications to users' mobile devices with position information, and updates them in the Thing speak cloud with times and dates using esp-8266 Wi-Fi.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

2.1 Embedded systems

An embedded system is designed to do a limited set of predetermined tasks, often with actual computational constraints. It's integrated into a whole device, typically with mechanic and physicochemical parts. On the opposite side, a summary computer, like a PC, is designed to be flexible and to meet a range of user needs. Today gadgets are managed by embedded systems. The management of an embedded system is overlooked by many main computing cores, frequently microcontrollers or digital signal processors. The most important attribute is dedication to a work, which may need an exceptionally strong CPU. Design engineers may maximize the embedded system performance and durability while reducing the product size and cost since it is dedicated to certain functions. Usually, embedded systems are mass produced to capitalize on scale advantages.

Embedded systems may be found in everything from modest, portable devices like MP3 players and smartwatches to large, permanent installations like traffic signals, industrial applications, and nuclear plant controller systems. Many components, connections, and networking placed in a big chassis or enclosures have an extremely high degree of complexity, while a single microcontroller chip has a very low complexity rating.

The flash storage, RAM, and CPU are all identified by numbers. Coding for embedded systems is different from programming for standard PCs. In many cases, writing code for embedded systems is like writing code for personal computers 15 years ago. To keep the cost of the device cheap while maintaining efficiency, system equipment is commonly selected. Spending an extra $1 per unit to make anything simple to program can result in millions of dollars in expenses. On the other hand, paying a programmer for an additional month is affordable. This suggests that the programmer must overcome a performance constraint that isn't available in many PC programs as well as a slow CPU and limited storage.

2.2 ESP8266

Figure 4: ESP8266 Model

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

The ESP8266 is a low-cost Wi-Fi microprocessor manufactured by Chinese company Espressif Systems in Shanghai. It has a full TCP/IP stack and microcontroller capabilities. The ESP8285 is an ESP8266 with 1 MiB of integrated flash, enabling single chip Wi-Fi-capable devices.

2.3 GSM Module

Its accurate address, and hence that of its own carrier, are periodically determined and detected using the Global Positioning System (GPS) depicted in Figure. The monitored movement can also be stored there in a tracking system/broadcast to a central location database or Network computer through a cell phone (GPRS/SMS), radio, or satellite technology incorporated into the unit.

Figure 5: GSM Model

2.4 System software

To program and manage the system, software applications including Python v2.7, BLYNK, and VNC viewer are utilized. For programming the Raspberry Pi microcontroller, Python v2.7 is utilized. Python is a high level software program that promotes a sense of readability and ensures less coding than that of other high level languages like Java, C, and C++.

2.5 Disadvantages of Existing system

• The fundamental problem lies in the absence of low-cost, effective equipment to identify issues with rail tracks including, of fact, the insufficient maintenance of railways, which has led to the development of rail fractures.

• Unlike the proposed system, which contains a robot that would travel autonomously along rails, the pre-existing system requires that the task be performed manually.

• The primary drawback of the system LED and LDR sensor combination is that it requires a flawless atmosphere and that the LED and LDR be situated in opposition to one another to detect the track.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

• The current system is complicated, time consuming, and slow.

3. PROPOSED SYSTEM

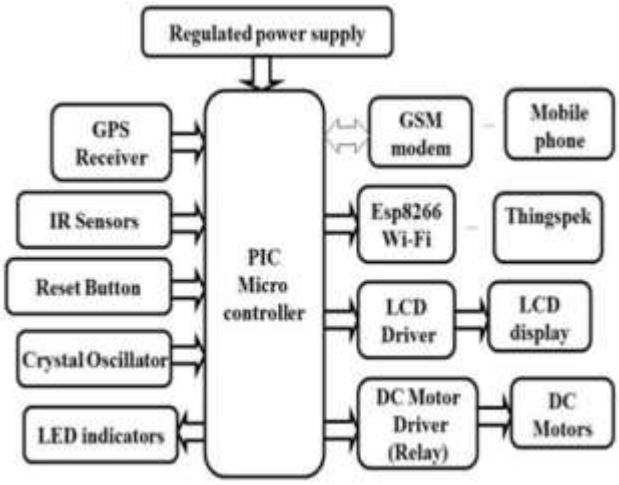

Figure. 6. Block diagram of Proposed system

Railroad track crossings and hidden track cracks are the primary causes of accidents on the railroads. Thus, the industry requires technological advances that would be reliable, effective, and reliable for both item recognition and fracture detecting in railway track. With the help of an Ultrasonic Sensor, GPS, and NodeMCU ESP8266 Wi-Fi module, our project intends to create a railway crack detection system (RCDS), whose installation is a reliable approach to find track cracks and prevent train derailment. By using this technology, cracks may be found both in the daylight and at night, and the precise position of the fault could be determined.

• Sensors are employed in this instance to address the drawbacks since they will correctly identify the break.

• The GPS module in this equipment would locate the closest train station instantaneously.

• A 12-volt battery serves as the power source for the checking track model.

• Cloud computing and http protocol for data transport.

4. RESULTS AND CONCLUSION

4.1 RESULT

The "IOT Railway Crack Detection" project used an IR obstacle manufacturing system to create a reliable railway crack detection system that prevents train accidents. Through GPS & GSM, it will send the user mobile device an SMS notification and include their current location. With the ESP-8266 WI-FI modules, this would update the track information as well as the date and time in the Thing speak cloud.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

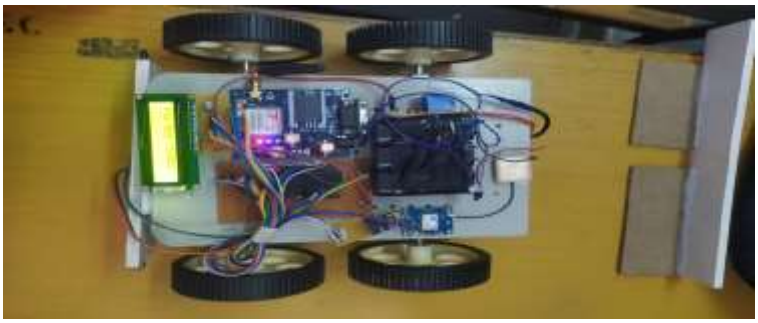

Figure 7: Device Waiting For START Message.

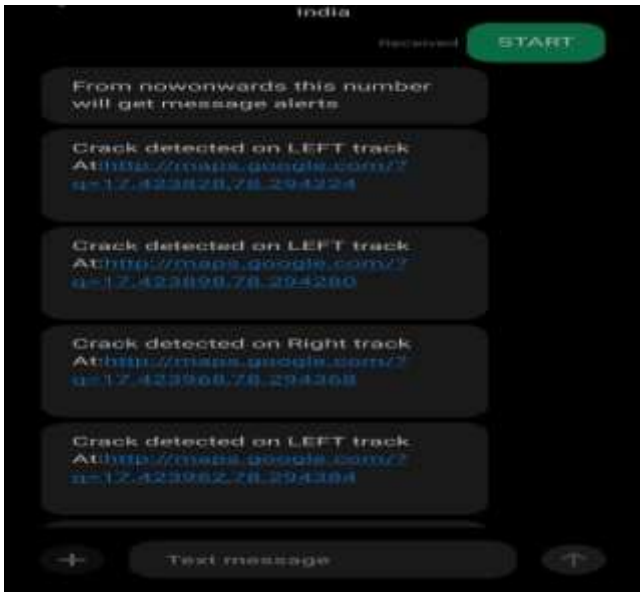

Figure 8: Crack Status is Sent to Authorized Mobile.

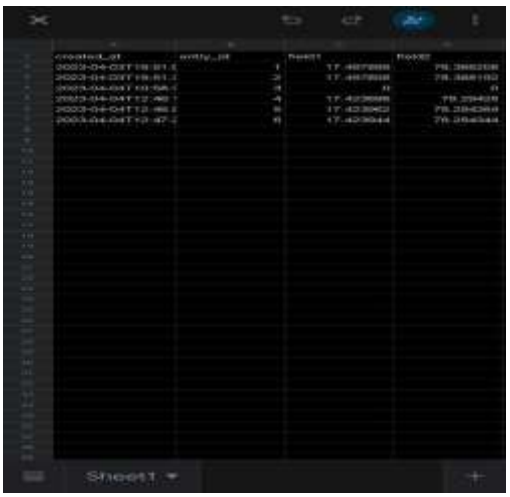

Figure 9: Excel Sheet Containing Information About Crack With Date And Time.

4.2 CONCLUSION

The proposed solution combines traditional crack detection techniques and Internet of Things techniques. The complete apparatus is mounted on a four-wheeled robot that moves along tracks. The suggested system is a novel method that lessens the load on the regulators and increases the precision of crack detection especially compared with the present system, which employs an IR transmitter and receiver. To inspect for fractures and completely avoid calamities, the process is repeated periodically. The model was built including combined characteristics for all the mechanical components used to ensure that faulty rails may be recognized in time to stop trains from derailing, saving lives and property. The placement of each module has now been thoroughly thought out and coordinated, allowing the unit to operate as efficiently as possible. Second, the project was recently successfully completed with the aid of emerging technology by using cutting-edge ICs. The proposed project and evaluation were successful consequently.

5. FUTURE SCOPE

By connecting a camera to that same system, we observe the route taken by the track and preserve images of the crack for more inspection.

REFERENCES

[1] Henrique Oliveira Member, IEEE, and Paulo Lobato Correia, Senior Member, IEEE ``Automatic Road Crack Detection and Characterization", IEEE TRANSACTION ON INTELLIGENT TRANSPORTATION SYSTEM, VOL.14, NO. 1, MARCH 2013.

[2] Lad, P., & Pawar, M.(2016) " Evolution of Railway track crack Detection system" 2016 2nd IEEE International Symposium on Robotics and Manufacturing Automation (ROMA). doi:10.1109/roma.2016.7847816.

[3] Rijoy Paul, Nima Varghese, Unni Menon, Shyam Krishna, "Railway Track Crack Detection Rijoy", International Journal of Advanced Research and Development, Volume3, Issue 3(2018), www.ijarnd.com.

[4] Rizvi Aliza raza, Khan Pervez Rauf, Ahmad shafeeq, "Crack Detection Railway Track Using Image Processing", International Journal of Advanced Research, Ideas and Innovations in Technology, volume3, Issue 4 (2017).www.ijariit.com.

[5] Mr. Anand S. Muley, Mr. Siddhant B. Patil2, Prof. A.H.Shelar, "Railway Track Crack Detection based on GSM Technique", International research journal of engineering and technology (IRJET), Volume: 04 Issue: 01/jan-2017.

[6] Kim, N.Stubbs " Crack Detection in beam type structures using frequency data" Elseveir volume 2592,January 2003.

[7] Akhil N,Dinu Mohan,Fayis P,Sija Gopinath, "Railway Crack Detection System" ISSN 2395 0056 International Research Journal of Engineering and Technology Volume3,Issue-5,May 2016. [8] Prof.P. Navaraja. "Crack Detection System For Railway Track By Using Ultrasonic

and PIR Sensor" ISSN 23489928 International Journal of Advanced Information and Communication Technology Volume- 1, Issue-1, May2014.