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Railway Track Crack Detector

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A B S T R A C T

In India railway transportation service is the cheapest and most convenient mode of transport as well as for long distance and suburban traffic. Almost 80% of the transport in India is being carried out by railway network. The main cause of the accidents happened in railways are railway track crossing and undefined crack in the tracks. About 60% accidents are happened at railway track crossing and due to crack in railway tracks resulting in loss of precious life of passengers and loss of economy. Therefore , there is a need to have new technology which will be robust , efficient and stable for both crack detection in the railway track as well as object detection. This project discuss a railway track crack detection using sensors and its dynamic approach which combines the use of GPS tracking system and GSM module to send alert message and geographical coordinate of location. Node MCU is used to control and coordinate the device..

Keywords:Railway track crack,obstacles,GPS,GSM,Node MCU.

1. Introduction

The Indian Railway has one of the largest railway networks in the worldcrossing over 1,15,000 km in distance all over India. A recent study revealed that over 25% of the track length is in need of replacement due to the development of cracks on it.Inthe rapidly flourishing country like India, accidents in the rail road railings are increasing day by day.timely detection and identification of faults in railway track circuits are crucial for the safety.Project deals with one of the track monitoring method to avoid train accidents.To avoid accident and to safeguard the people.It is high time to replace existing manual inspection of tracks with modern technology.It will also reduce inconvenience to passengers with efficient functioning of railway and maintaining scheduled train timing.This system also proposes a real time system which can monitor landslides and send warning signals to the concerned authorities.

Railway is one of the most used mean of transportation.For the railway system to operate constant monitoring and inspections of railway track is required.Currently railway track inspection done manually which is time taking and not accurate,due to high chance of human error occurrence. To avoid the accidents we proposed this system which is an e3fficient method for railway track monitoring system.Our present model is a minor attempt to find out how the aforesaid idea can be implemented.Though the model will not serve the purpose of actual commercial use,yet it is sufficient to show the way through which we can proceed to make the train system completely automatic with the aid of Electronics.The detection of cracks in rails is challenging problem, and much research effort has been spent in the development of reliable, repeatable crack detection methods for use on in-service rails .While crack detection in the rail head and shear web is reliably achieved using ultrasonic sensor and eddy current methods, neither technique is particularly effective for the detection of cracks in the rail foot.

In our "Indian railway system" all the control system are done through Manpower. In this present condition we must have faced the following problem.

- Wastage of time
- Wastage of energy
- Difficulty for a manual operator

To overcome these problems we are going to proposed a system which gives best method for prevention and safety of passengers..

2. Literature Survey

1 Detection of Crack in Railway Track Author- Anushree B.S, PriyashaPurkayastha Anjali Girgire, Anjana K,Ruma Sinha. Published-May 2017 This paper a crack detection system is proposed which detects the crack without human intervention and sends the location of fault to the authorized personnel using GSM. Crack detection by this method can be done during both day and night time and exact location of fault can be obtained

. 2 Designing of Improved Monitoring System for Crack Detection on Railway Tracks Author- Nilisha Patil1 ,Dipakkumar Shahare1 , Shreya Hanwate1 , Pranali Bagde1 Karuna Kamble1 , Prof. Manoj Titre2. Published-April 2021 In this paper, we present an automated system based on microcontroller and sensors to overcome the problem of faults in tracks and to identify the moving object or animal on the tracks. The system designed is an autonomous robot consist of PIR and Ultrasonic sensors, coupled with GPS and GSM for providing the real time alert.

3 Automatic Railway Track Crack Detection System Author- Rahul Singh, Leena Sharma, Vandana Singh , Vivek Kr. Singh. PublishedMay 2020. Aims of designing a railway crack detection system (RCDS) using Ultrasonic Sensor, The GSM (Global System for Mobile Communications), GPS (Global Positioning System) and Arduino based module whose implementation is an efficient method of detecting the cracks which is present in the tracks and thus avoiding derailment of the trains.

4 Railway Track Crack Detection Author- Arun Kumar R, Vanishree K, Shweta K, Nandini C, Shweta G. Published2020 This project discusses a Railway track crack detection using sensors and is a dynamic approach which combines the use of GPS tracking system to send alert messages and the geographical coordinate of location. Arduino Microcontrollers used to control and coordinate the activities of this device. The main aim of the project is to design the railway crack detection using ultrasonic sensors..

3. Proposed System

In proposed system our project is used to detect the crack in the tracks by means of sensor and Node MCU, measuring distance for two rail road . In this project we use ultrasonic sensor to detect the crack. It uses to measure the distance between the two track. If any crack are occurred in the track means longitude and latitude coordinates of the place are to be sent to the ubidot and ultrasonic sensor measured the distance between the two track if there is any small variance found the message which contains coordinates of that particular place will be sent to the nearest station or control room with the help of GPS and GSM module. This project is to be made in order to change the system of crack detection in railways which can be resulted out as not only cost-effective but also with good accuracy and time saving facility.

3.1 Hardware:

The major components used are Node mcu,UltrasonicSensor,GPS,GSM and Relay.The controller used hereb is Node mcu has a powerful processor and larger memory .It is an low cost IOT platform.Components include motor , supply wires are also used.
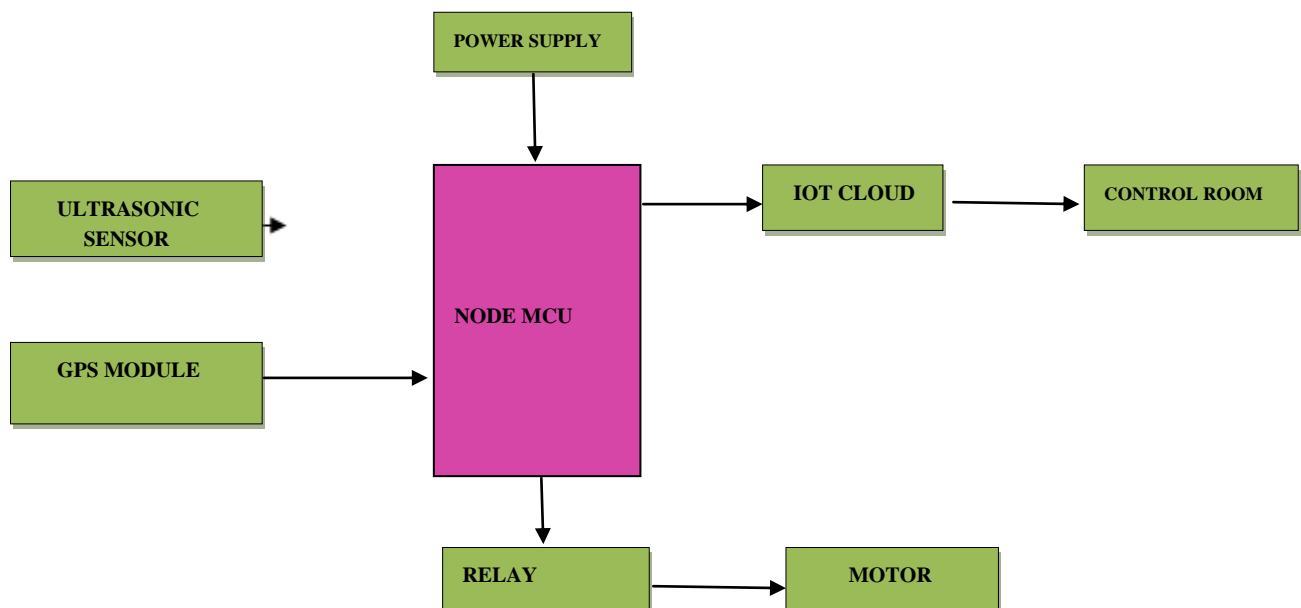

Fig 1 - Block diagram

A)Node MCU: It is used to control and coordinate the device.Node MCU is an open source platform based on ESP8266 which can connect objects and let data transfer using the wifiprotocol.Italso has inbuilt wifi module in it which gives us flexibility.

B) Ultrasonic Sensor: An ultrasonic sensor is a sensor that measures distances through ultrasound which travels through the air.If the ultrasound hits an object or obstacles on its path ,it will then bounce back towards sensor.

C) GPS (GLOBAL POSITIONING SYSTEM): GPS module finds the location (longitude, latitude, altitude) by comparing the time taken for receiving signals from satellites in its area. GPS offers great accuracy and also provides exact position coordinates. In this system, we used a GPS module to track the exact location of the bus.

D) Relay:A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

3.2 Software:

The basic software requirement are Arduino IDE and UBIDOTS.

4. Results and Discuss

As stated here the device will detect the cracks and obstacles in the railway track .when the obstacle or a vrack is detected by the ultrasonic sensoer the Node Mcu which acts as controller sends to GPS and The tracked location is send to UBIDOT.
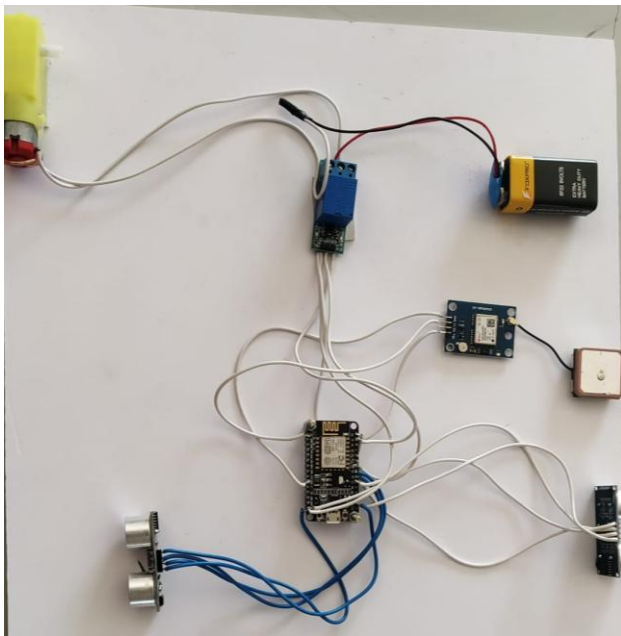

Fig 2-Hardware implementation

Fig 3- Software Implementation

5. Conclusion

The approach taken is capable, if there are any, of detecting flaws and obstacles on the surface. The method proposed has lots of advantages over conventional detection approaches that include minimal cost, reduced energy consumption, efficient detection system without human involvement and shorter analytical times. With this prototype, train collisions and derailments can be easily prevented to save many lives. It is also very beneficial for railroad operations testing units. And we can also notice the position failure and the system used in this, and also the location data is sent to the default mobile number. So that this enables us in rail line preservation and control as well. When we use the detector model for monitoring and we can claim that it is a fusion energy vehicle. The result shows that this exciting new technology will keep increasing the efficiency of the safety features for rail infrastructure. We can prevent accidents of up to 70% by enforcing these functionalities in the real-time implementation. Areas where manual testing is not feasible with this vehicle, such as in shallow coalmines, mountainous areas and thick and deep forests regions, can be easily carried out. When this vehicle is used for railway inspections and breakage detection, automatic SMS will be sent to a predetermined mobile number if cracks or abnormalities are identified by the device sensors..

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