AUTOMATIC DETECTION OF SQUATS IN RAILWAY TRACK

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Abstract- ***Safety violations due to 'human errors or limitations' and 'equipment failures' occasionally result in Train accidents. We know that the railway network of India is the biggest in south Asia and perhaps the most complicated in all over the world. Although the time table is perfect it is not at all possible to maintain it. And that's why the train accidents are becoming more and more usual. So why not we add a kind of intelligence to the train engines itself so that it tries to avoid accidents. The main reason for this is due to the accidents that occur in the train. Though the railway department is trying to take actions to reduce such informal things but couldn't see the face of success. To help out the department, we have designed this system. This approach is designed by a small guard trolley that runs in front of the train, consisting of crack sensor to identify track discontinuity. This information along with its location in the form of latitude & longitude is sent to the nearest control station through ZIGBEE and also to the authorized mobile through GSM. The trolley is equipped with LCD display which displays the GPS co-ordinates (latitude and longitude co-ordinates).***

Keywords- ***ZIGBEE, Global Positioning System(GPS),Global Systems for mobile(GSM),Liquid Crystal display(LCD).***

INTRODUCTION

The Transportation of train always depends on the railway tracks (rails) only. If there is a track in rails, it creates the biggest problem. Most of the accidents in the train are caused due to cracks in the railway tracks, which cannot be easily identified by our naked eyes. Also it takes time to rectify the problem, we are using the crack detector robot, which will detects the crack in the rails and gives alarm. A robot is an apparently human automation, intelligent and obedient in nature but an impersonal machine. The robots have started to employ a degree of Artificial Intelligence (AI) in their work and many robots required human operators, or precise guidance through their missions. Slowly, robots are becoming more autonomous. In the advanced system, the robot designed for finding the crack in the railway track with the help of sensor and the exact location of the railway crack information is send to the control section using Global System for mobile (GSM) and Global Position System (GPS) technology. The model explained over here increases safety and minimizes the accidents. The squats sensing circuit designed using IR sensors attached in front of the wheels to the guard train (trolley) detects the track discontinuity and informs to the control circuit i.e., controller which in order controls the movement of the guard train using DC motor and also reads the co-ordinates (latitude & longitude) data from the GPS receiver. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same information is transmitted to the nearest monitoring station through the ZIGBEE technology and also to the authorized person's mobile in the form of SMS through the GSM modem

LITERATURE REVIEW

In [1] The development of an efficient Weigh-In-Motion (WIM) system, with the aim of estimating the axle loads of railway vehicles in motion, is quite interesting from both an industrial and academic points of view such systems, with which the loading conditions of a wide population of running vehicles can be verified, are very important from a safety maintenance perspective. The evaluation of the axle load conditions is fundamental especially for freight wagons, more likely to be subjected at risk of unbalanced loads that may be extremely dangerous both for the vehicle running safety and the infrastructure integrity.

In [2] squats and corrugation cause large dynamic forces between wheel and rails, leading to rapid deterioration of rapid quality. There is a strong need for improved detection and maintenance methods to treats such defects at reduced costs, and for better track design to avoid or retard occurrence of them. In [3] the prediction of impact forces caused by wheel flats requires the application of time-domain models that are generally more computationally demanding than are frequency-domain models.

In [4] The development of an efficient Weigh-In-Motion (WIM) system, with the aim of estimating the axle loads of railway vehicles in motion, is quite interesting from both an industrial and academic point of view. Such systems, with which the loading conditions of a wide population of running vehicles can be verified, are very important from a safety and maintenance perspective. In [5] Today the railway are facing exposure of heavy loads, higher speeds and a very dense traffic. These days, for safe operation of rail traffic non-destructive inspection techniques with combined ultrasound and eddy current testing methods are used to detect damages on rails.

In [6] Eddy current technique has been developed to enable identification and evaluation of rolling contact fatigue (RCF) defects. The ultrasound technique is aimed at measurements in the rail bulk volume, which are not feasible using through eddy current technique. In [7] Corrugation can be detected by simpler measurement with this method using a microphone in the cabin. It was also confirmed that the extent of corrugation can also be diagnosed by this method, in an experiment using a commercial railway line.

In [8] Detection of rails defects are major issues for all rail workers around the world. Some of the most defects include worn rails, welding problems, internal defects, corrugations and initiated problems such as surface cracks, head checks, squats. If undetected or untreated these defects can lead to rail breaks and derailments.

PROPOSED WORK

The model explained over here increases safety and minimizes the accidents. The squats sensing circuit designed using IR sensors attached in front of the wheels to the guard train (trolley) detects the track discontinuity and informs to the control circuit i.e., controller which in order controls the movement of the guard train using DC motor and also reads the co-ordinates (latitude & longitude) data from the GPS receiver. The GPS modem gives many parameters as the output, but only the NMEA data coming out is read and displayed on to the LCD. The same information is transmitted to the nearest monitoring station through the ZIGBEE technology and also to the authorized person's mobile in the form of SMS through the GSM modem.

In order to interface ZIGBEE, GSM modem and GPS Receiver to the controller, switching transistors are used. The design uses RS-232 protocol for serial communication between the modems and the microcontroller. A serial driver IC is used for converting TTL voltage levels to RS-232 voltage levels. A Program has been developed which is used to locate the exact position of the trolley on Google Map when squats have been detected.

GPS provides highly accurate position information and can be used for a variety of land, sea and air applications. GPS, which began as a military application, has become a viable tool for many commercial and personal applications. One such application has been a vehicle location tracking system (VLTS). These tracking systems incorporate a GPS receiver and a wireless transceiver that allow a remote unit to track the vehicle's position. GPS Tracking device acquire GPS signals from GPS satellites and calculates its position on the earth. To acquire GPS information, a wireless receiver capable of the civilian L1 frequency (1575.42 MHz) is required. The GPS receiver measures distances to four or more satellites simultaneously. Using triangulation the receiver can determine its latitude, longitude, and altitude

The power supply to the motor to drive the guard (trolley) is provided through the relay. Likewise the sensing circuit designed will detect the squats in the railway tracks and information is sent automatically along with location details by which accidents can be avoided.

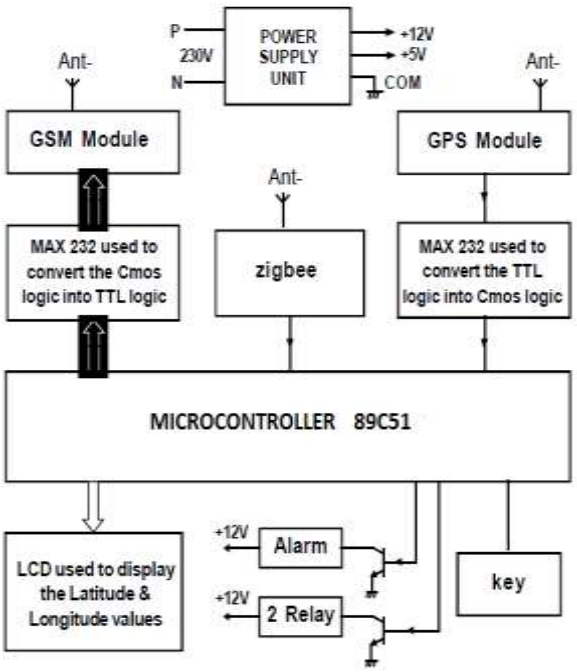

Fig 1. Transmission Bloch diagram

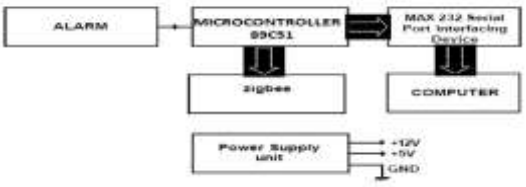

Fig 2.Receiver Block diagram

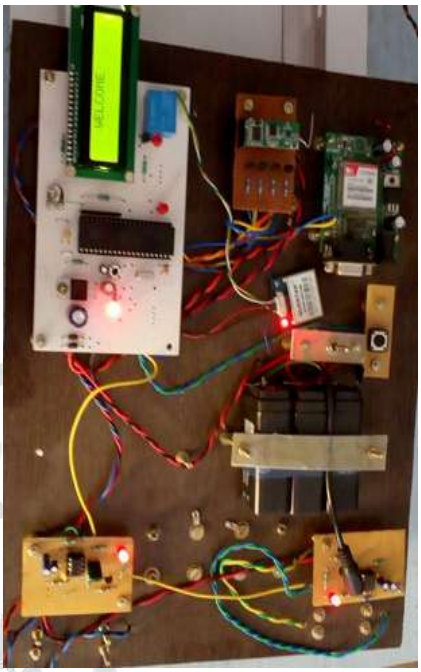

Fig 3. Transmitter

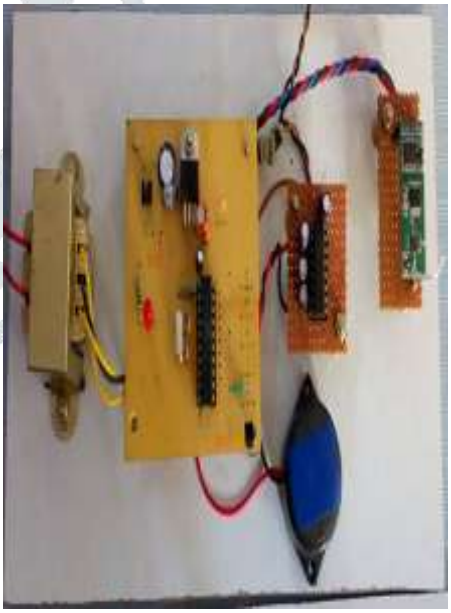

Fig 4.Receiver

- The microcontroller used here is AT89C51.It is a 40 pin microcontroller.
- The IR sensor senses the voltage variation from the cracks and gives the signal to the microcontroller. The microcontroller checks the voltage variations of the measured value with the threshold value
- MAX 232 is a converter chip mainly for the purpose of microcontroller boards. It provides two channel RS232C port. It is a serial port interface device. In asynchronous transmission when there is no transfer the

signal is high, transmission begins with the start (low) bit LSB first. Finally one stop bit (high).

- The Global Positioning System (GPS) is a U.S. space-based Global Navigation Satellite System. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS satellites broadcast signals from space that are used by GPS receivers to provide location (latitude, longitude, and altitude) .
- Global System for Mobile Communications system is the most popular standard for mobile telephony systems in the global. The GSM is one the wireless networks which has low power and low cost communication device.
- ZIGBEE is used to transmit the information to the base station.

Fig 1 shows the block diagram of the transmission part.

Fig 2 Shows the block diagram of the receiver part which is present at the base station .

Fig 3 and 4 Shows the setup of transmitter part and receiver part.

Fig 5 Result Screenshot

CONCLUSION

In this paper, the design of crack finding robot for finding cracks in the railway tracks. Here the microcontroller is interfaced with Robot, GSM, Global Positioning System (GPS), Liquid Crystal Display (LCD) and Crack Sensor. The IR sensor senses the track cut or any disturbances on the track and then it gives the signal to the microcontroller. The microcontroller receives the information from the sensor and stops the trolley and it immediately gets the exact location information using Global Positioning System (GPS) and Global System for mobile (GSM) and sends that location and crack information to the control section.

The control section displays the exact location that is latitude and longitude value in map by using .NET Software. The Liquid Crystal Display (LCD) is used to display the current status of the system. The exact location of the crack in the track with can easily be identified with the help of Global Positioning System (GPS) and Global System for mobile (GSM).

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