Automatic Railway Track Detection using GSM

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ABSTRACT - *In India, railway network plays a major role in transport from one place to another place. If any problem occurs it create a loss in economical side. In today scenario Indian railways has one of the largest network in the world. However based on reliability and safety Indian railways have been not reached the standard levels. One of the main factor is cracks in the railway track. Manual detection of track is not fully effectively in time consumption. So in this paper it is aimed towards the solution to the problem of railway track by using IR sensors to detect the crack and it is implemented using 2500 Microcontroller using GSM based GPS.*

INTRODUCTION

Depending on the fast developments in railway systems, high-speed trains are used, and rail transportation is increased day by day. Today's most of the people uses railway for transportation, it is essential for transferring the goods and passengers from one place to another place. And also the railway system are provide facility such as high speed, with economical, environment friendly, safety, and better characteristics of railway systems. These characteristics can be performed by time to time maintenance and control measurements. But depending on different factors, deformations and derailment may occur on the superstructure of railways.

Improper maintenance and the currently irregular and manual track line monitoring mistake from workers also a problem in railway. Such deformation and derailment are determining on time and taking precautions is very important for the safety of railway systems. Therefore effective solution system is design on this problem is introduced in this paper.

For providing protection to the railway accident because of cracks occur in the rail road, we design a detection system of cracks in the track based on IR sensor which is operated with GSM & GPS technology.

It is used to determine the exact location of railway deformations and send message to the controlling station and signal system of railway will be stop automatically. This system also used in another application where cracking problem is occurs.
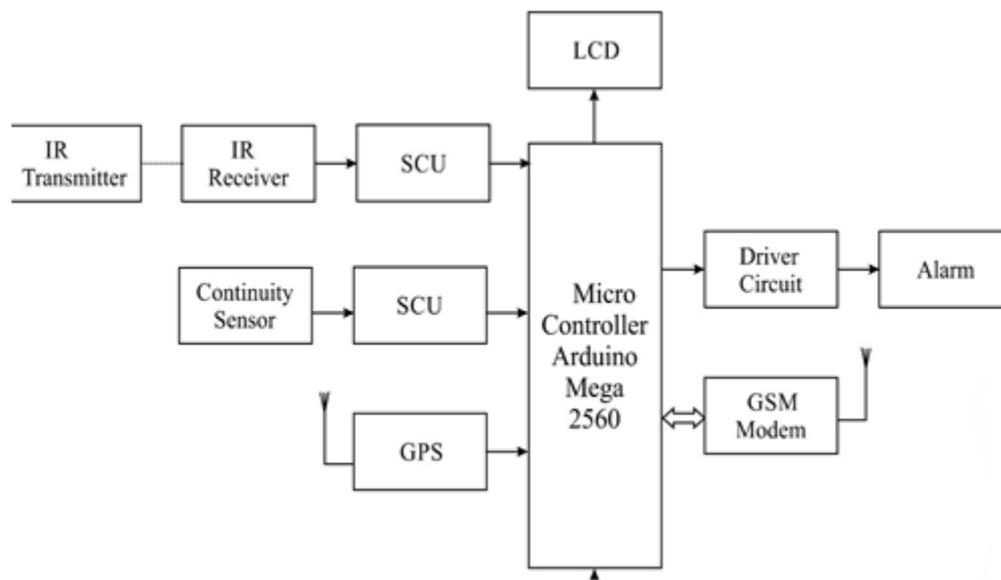
BLOCK DIAGRAM

Fig1.1:Block Diagram of Railway track Detecting system

PROPOSED SYSTEM

Continuous sensors will sense the crack that signals will send to the microcontroller. Microcontrollers will send signal to the GPS. Again the information that is collected by the GPS modem is passed to the microcontroller. The information provided by the GPS system contains Longitudinal and latitude positions. That longitudinal and latitude message will send to the control room LCD display and simultaneously rise the buzzer with the help of GSM.

IR sensors will sense the object that signals will send to the microcontroller. Microcontroller message will send to the control room LCD display and simultaneously raise the buzzer sound GSM.

The crack can be easily detected & it does not produce the false output. GSM base crack detection system automatically detects the faulty rail track without any human interface. This method having many advantages on traditional detection techniques.

REQUIRED COMPONENTS

MICROCONTROLLER

The ATMEGA 2560 is the microcontroller based on Arduino Mega 2560 Microcontroller. ATMEGA 2560 has 16 analog inputs and 54 digital input/output pins , 4 UARTs , a 16 MHz crystal oscillator, a USB connection, a power jack, an CSP header, and a reset button. To get started USB cable or power is connect it to a computer with a AC-to-DC adapter or battery. The Mega is designed for the Arduino Duemilanove or Diecimila. The Arduino Mega2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. The adapter is to be connected by plugging a 2.1mm center positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. It can operate on an external supply of 6 to 20 volts. If voltage level is below 5V,board may be unstable. The voltage regulator may overheat and damage the board, if we are using more than 12V. The recommended range is 7 to 12 volts. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter

IR SENSOR

IR denotes Infrared sensor which is used to detect some components in surroundings. IR sensor detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. All the objects radiate in some form of thermal radiations. These radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED . The resistances of the photodiode is directly proportional to the strength of the IR light received.

GSM

GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is very useful in communication system in the world. It is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

The main concept used in GSM is TDMA Technique(Time Division Multiple Access). It digitizes the data and reduce, then it sends down through a channel with two different streams of client data, each in its own particular time slot. Datarates to carry the information from 64 kbps to 120 Mbps .

There are various cell sizes in a GSM system such as macro, micro, pico and umbrella cells. There are various different cell sizes in a GSM network like macro, micro, pico and umbrella cells. The coverage area of each cell varies according to the implementation environment.

BRIDGE RECTIFIER

A bridge rectifier can be constructed using four individual diodes, but it is also available in packages. It is called a full-wave rectifier because it uses the entire AC wave (both wave positive and negative sections). Alternate pairs of diodes conduct, this pairs changes over the connections so the alternating directions of AC are converted to the one direction of DC.

REGULATOR

Regulator ICs are available with various fixed values like (typically 5, 12 and 15V) or variable output voltages. They are also rated by the maximum current they can pass. Some negative voltage regulators are also available, and it is useful in dual

supplies. Some automatic protection of regulators from excessive current that is overload protection and overheating denotes thermal protection.

RESULTS
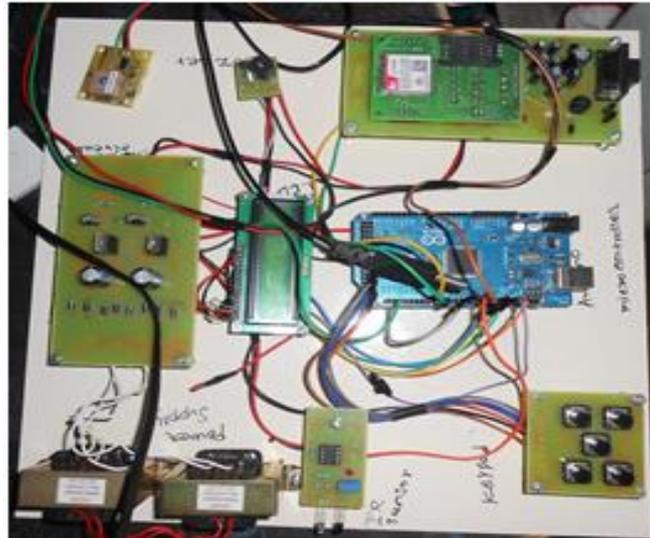
This system is made by using IR Sensor and Continuous sensor.IR sensors sensed the objects on the track and processed the signals with GPS module and then sent the message of object location with longitude and latitude information to the control room with the help of GSM module and giving information on LCD display board and simultaneously rise the buzzer sound.

Continuous sensor sensed the crack on the track and processed the signals with GPS module and then sent the message of crack location with longitude and latitude information to the control room with the help of GSM module and giving information on LCD display board and simultaneously rise the buzzer. sound. As the objects on the track identified in advance, we can prevent train collisions by giving advance alerts and save the lives. And because of continuity sensing system we can prevent train accidents by identifying cracks on the tracks.

CONCLUSION

The model of Automatic Railway track deducts developed partially to some content. Considering the cost and time constraints the train engine and control room (nearest railway station) have been developed and also we have just created a database using visual basic in pc and we are in process of linking together the train engine and the server. Future developments will be made by using the CCTV systems with IP based cameras for monitoring the visual videos captured from the track, will identify and alert the cracks well in advance to the control room itself and increase of efficiency of Railways by taking precautionary steps to rectify the cracks on the track and reschedule the train timings well in advance. The main advantages of this system like less cost, low power consumption, on time data operation.

REFERENCE

[1] I. Milev and L. Gruendig, ─Rail track data base of German rail─The future automated maintenance, in Proc. INGEO FIG Regional Central Eastern Eur. Conf. Eng. Surv., Bratislava, Slovakia, Nov. 11–13, 2004.

[2] J. Trehag, P. Handel, and M. Ögren, ─Onboard estimation and classification of a railroad urvature,IEEE Trans. Instrum. Meas., vol. 59,no. 3,pp. 653–660, Mar. 2010.

[3] L. Beales, ―Track system requirements, Railway Group Standards,GC/RT5021, Railway Safety, London, Oct. 2003. [5] R. T.Lemmon, ―The influence of the number of satellites on the accuracy of RTK GPS positions, Australian Surv., vol. 44, no. 1, pp. 64–70, 1999.

[4]Ravi Shankar Shekhar, Purushottam Shekhar, Ganesan P,"Automatic Detection of Squats in Railway Track", IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems. vol. 3, iss. 6, pg. 413-413 December 2015.

[5] R. T. Lemmon, ―The influence of the number of satellites on the accuracy of RTK GPS positions, Australian Surv., vol. 44, no. 1, pp.4–70, 1999.

[6] B.Akpinar, ―A new measurement system design for determining al changes on railways, Ph.D. dissertation, Yildiz Technical Univ., Istanbul, Turkey, 2009