CRACK DETECTION ON RAILWAY TRACK BY USING VOLTAGE SENSOR

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ABSTRACT

Now a days the railway accidents are increasing mainly due to cracks on the track.Previously a number of methods had been proposed to reduce these accidents in which all of them were complex and expensive.We designed a new simple and cheaper method to avoid the previously proposed methods.We used a voltage measurement sensor,aurdino board,GSM module and a buzzer.Whenever there is a crack,the flow of voltage becomes nullified as there is a discontinuity made by that crack. As the voltage sensor is on its duty to measure the voltage along the track continuously the discontinuity(crack) is measured as zero volts.As soon as the crack is identified an immediate message will be send to the loco-pilot through the GSM module with exact location by means of GPS.

I. INTRODUCTION

Nearly 53 per cent of the 586 train accidents in the last five years were due to derailments with the Utkal Express derailment being the latest. Not with standing the railways' attempts to upgrade the safety apparatus, many such accidents continue to occur. Over 20 people died and 97 were injured after 14 coaches of the **Utkal Express derailed** near Muzzafarnagar in western Uttar Pradesh on Saturday evening. According to official figures, of a total of 586 rail accidents in the last five years, nearly 53 per cent were due to derailments. Since November 2014, there have been 20 rail accidents, many of them minor.

The worst accident was the November 20, 2016 derailment of the Indore-Patna Express nearKanpur which resulted in 150 deaths and over 150 injuries. The train pulled out of Pukhrayan station, on the outskirts of Kanpur, and derailed soon after. Several causes, including overcrowding and fracture in the railway line, were attributed to the accident. On September 12, 2015, a narrow-gauge train, the Shivalik Queen, a chartered train from Kalka to Shimla, derailed on Sept'12'2015.36 British tourists and a tour guide were on the train. Two of the tourists died in the accident and 15 were injured.Nine coaches of the Secunderabad Junction-Mumbai LokmanyaTilak Terminus Duronto Express derailed near Karnataka's Kalburgi town on September 12, 2015, resulting in two deaths and seven injuries.

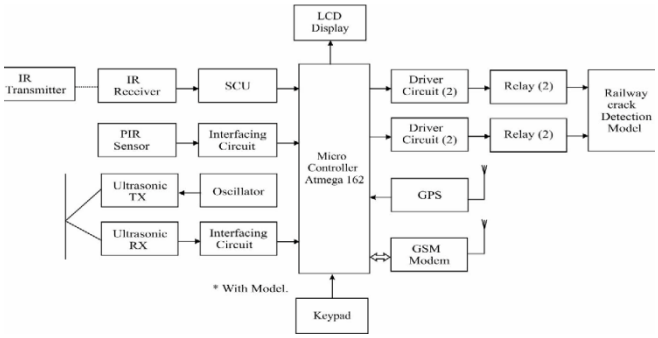
A new method to prevent the train accidents has been developed for the same which is discussed in this paper.

II. LITERATURE SURVEY

(A) The existing system portrayed in Figure 1 uses a microcontroller for the manipulation of the other peripherals attached to the system. The sensing system used in this technique is an IR transmitter and receiver. If light is incident on the IR transmitter, the intensity of light is directly proportional to the intensity of the crack present in the tracks. The IR receiver will then give a signal to the GPS receiver which will pin point the latitude and the longitude coordinates and sends them to the GSM module which will send a message to authorities.

The complete system is placed on a four wheeler robot which travels along the rails. Using commands, the bot moves along the track. The bot is able to move forward and backward and can progress in all four directions of up, down, right and left. An arduino board is incorporated in the model which acts as an interface between the ultrasonic sensors and the GPS, GSM.

(B) In another existing system, it is designed by using IR sensor, PIR sensor and ULTRASONIC sensor. The crack is detected using IR sensor. The IR transmitter and receiver should be placed in a straight line.



PIR sensor (passive infrared sensor): PIR sensor is the motion detector used for sensing the movement of people, animal or other objects.the burglar alarms and automatically activated lightning system consists the PIR sensors.

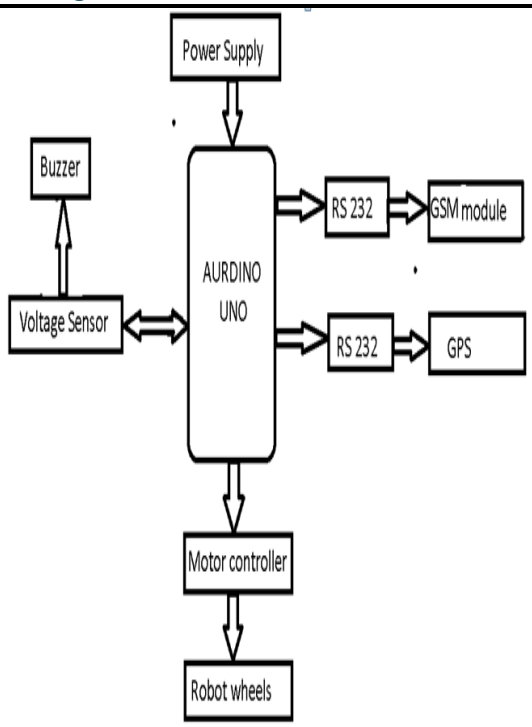
Ultrasonic sensor: The flaws in the form of cracks, blowholes, porosity in metallic pipes can be detected using the ultrasonic waves. The ultrasonic sensor works on the principle of reflection of waves. The crack can be detected by measuring the time interval of reflected beam.

Many methods with different techniques by using Ultrasonic sensors, PIR sensors and IR sensors (as discussed above). There are few cons like range of sensors they used is very less, unstable at high temperatures, less sensitivity

III. Proposed methodology

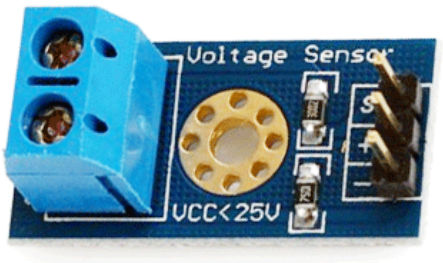
In the proposed system the crack is detected usingvoltagesensor.Since the wire and railway track are same when coming to conduction, this is designed on the basic principle of either short circuited or open circuited based on continuity and discontinuity in the flow of voltage, where the open circuit indicates crack on the track and short circuit indicates no crack. It has a plastic track on which the copper wire is connected. Whenever the voltage has supplied to the system, the voltage is passed to wire which is connected with voltage sensor through aurdinouno. The wire receives only regulated 5V because a voltage regulator IC 7805 has been placed between aurdinouno and the voltage sensor. When the wire is open circuited which indicates crack on the track, the motor controller MYS 99 328 will halt the motion of the robot with sounding the buzzer and immediately an alert message has been sent to the loco-pilot through GSM module and the GPS gives him the exact location in terms of latitudes and longitudes. In this way a huge number of lives can be saved by eradicating the railway accidents.

Coming to real time application we have to use higher voltage on the track. The tracks are to be fenced so that nothing or no one passes on it while the higher voltage is passed on it. We have to monitor the voltage flow carefully and instead of supplying only once, we hav to supply the voltage on the track before the train leaves the station to check for any new cracks.



Voltage Sensor

A voltage sensor can in fact determine, monitor and can measure the supply of voltage. It can measure AC level as well as DC voltage level. The input to the voltage sensor is the voltage itself and the output can be analog voltage signals, switches, audible signals, analog current level, frequency or even frequency modulated outputs. That is, some **voltage sensors** can provide sine or pulse trains as output and others can produce Amplitude Modulation, PWM or Frequency Modulation outputs.

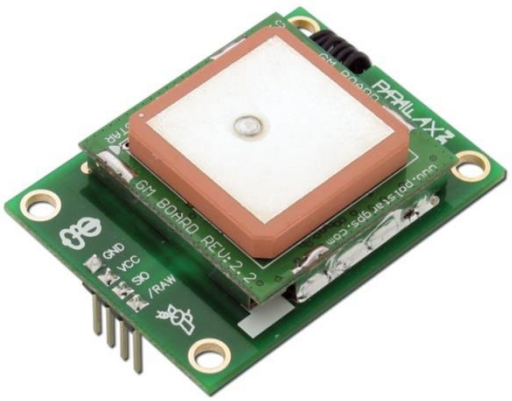


GSM (Global System for Mobile communication)

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.It operates at either the 900 MHz or 1800 MHz frequency band. It designed as a second generation (2G) cellular phone technology. One of the basic aims is to provide a system that would enable greater capacity to be achieved than the previous first generation analogue systems. GSM achieved this by using a digital TDMA. By adopting this technique more users could be accommodated within the available bandwidth. In addition to this, ciphering of the digitally encoded speech was adopted to retainprivacy.

GPS (GLOBAL POSITIONING SYSTEM)

It is a satellite based global navigation satellite system GNSS that is used to provide accurate location and time information anywhere on or near the earth. Typically GPS is able to provide position information to within a few meters,allowing accurate position to be made it is also possible to extract timing information that enables frequencies,



time to be very accurately maintained.

Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground

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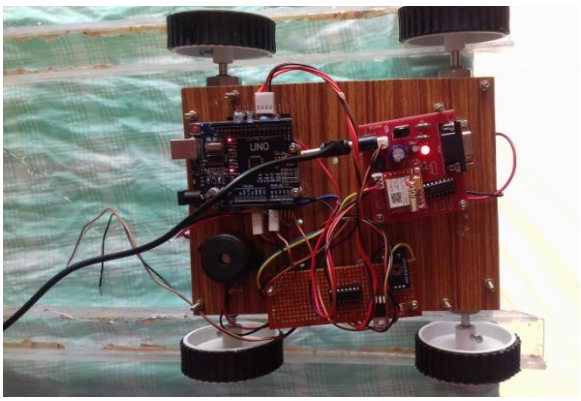
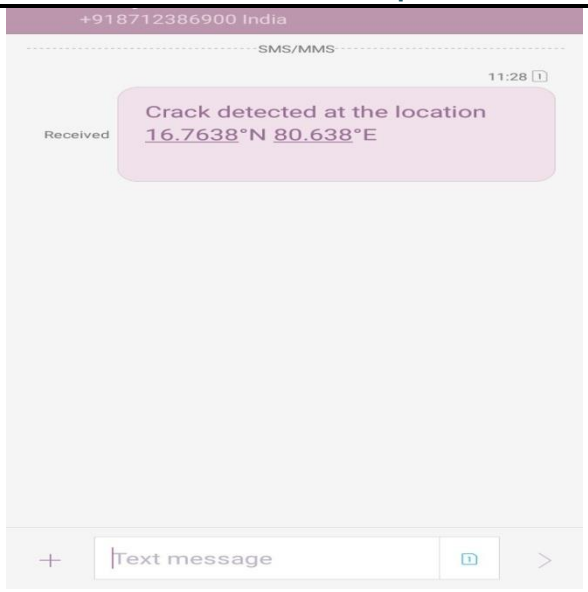
IV. RESULTS

Thus, the buzzer has made sound and immediate sms with exact location has been sent to the mobile unit.





V. CONCLUSION

Hence by eliminating the previous methodologies,disadvantages has been overcome in an efficient manner. In future scope we can use radars and implement a better networking system to avoid railway accidents.

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