

## Crack Detection System for Railway tracks

Patel Ranu<sup>1</sup>, Ghule Avinash<sup>2</sup>, Vikhe Nikhil<sup>3</sup>, S.B. Mandlik<sup>4</sup>

*Dept. of Electronics and telecommunications Engg.<sup>1,2,3,4</sup>, P.R.E.C Loni, Maharashtra, India*

*Email: - [ranupatel111@gmail.com](mailto:ranupatel111@gmail.com)<sup>1</sup>, [avinashgule183@gmail.com](mailto:avinashgule183@gmail.com)<sup>2</sup>, [vikhenikhil@gmail.com](mailto:vikhenikhil@gmail.com)<sup>3</sup>,  
[mandlik.sb@gmail.com](mailto:mandlik.sb@gmail.com)<sup>4</sup>*

**Abstract:-** Safety being prime importance in the field of transportation, it is essential to develop an effective and affordable system. Railway being one of the chief modes of the transportation for passengers and goods, it is essential that its safety remains well rounded and secure. One of the foremost reasons of railway accident being derailment results in huge loss of life and property. The paper have presented a system that can detect cracks present in the railway tracks which are the major causes of derailment. The system to be consist of ultrasonic and IR sensors for crack detection. This system consist of GPS and GSM for application of communication purpose. The GPS module and GSM modem help us to find and send railway geometric parameter of crack detection to nearest railway station authority. The project can be used during day and night.

**Keyword:-** IR sensors; Ultrasonic sensors; GPS; GSM; Railway cracks.

**Introduction:-** Indian railway is one of the largest railway system in the world. It ranks fourth behind only USA, Russia, China etc. So it becomes a tedious and complicated task to maintain the railway track. The Indian rail network covers distance of over 65000 miles. So for the smooth working of the railway it is necessary to keep maintenance up to date. Indian railway has suffered a lot due to accidents occurred all over the country. Train derailment is one of the major cause of large scale train accidents. This derailment are caused due to the cracks that occurs in the tracks. Indian Railway is one of the largest passenger transport in the world and it is the mainstay of the country's transport infrastructure. In India, most of the commercial transport is being carried out by the railway network because it being economical mode is preferred over all other means of transportation. The speedily emerging economy of India has resulted in an exponentially increasing demand for transportation in recent years, and this has resulted into an mammoth rise in the volume of traffic in the Indian Railway network. The railways go across the length and breadth of the country and carry over 30 million passengers and 3 million tons of cargo daily. In spite of, boasting of such commendable statistics, the Indian rail network is on the developed course attempting to fuel the economic needs of our Indian nation. However, in terms of dependability and protective factors, we have not yet reached truly worldwide

standards. The primary problem has been the lack of proper maintenance of rails which have resulted in the formation of flaws in the rail track and other similar problems caused by antisocial elements which threaten the security of operation of rail transport. The paper presents an application of an competent and cost effective solution. In this project we are going to use IR sensor to identify the cracks in rail road, when the crack is detected its latitude and longitude values are send as a message to nearby station by using GPS and GSM service. The main aim of this module is to apply it at every small and medium scale stations and covers thousands of miles of tracks that remains unchecked and unmonitored. Being an affordable and cost-effective techniques this system can be used by these stations.

**Proposed system:-**The paper presents a system for detecting the cracks in the rail tracks using IR sensors and ultrasonic sensors. The IR sensors are placed at the front of the module to carry out detection of the cracks on the tracks. The ultrasonic sensor is used to variation between the distance of two tracks. If any sort of crack is detected then system will trace the latitude and longitude of the place and will send the information to the nearby rail authority. If any variation is detected between the tracks by ultrasonic sensors then the information of the location will be given to the authority. This function of locating the latitude and longitude is done using the GPS and the message is sent using GSM.

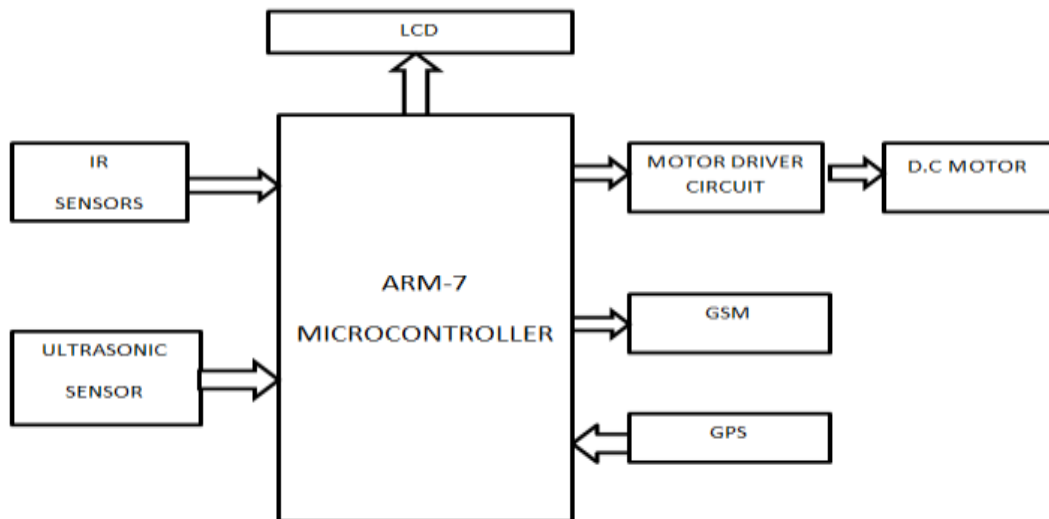


Fig. 1:- Block Diagram

**Working of the system:-** The key apparatuses of the system are IR sensors, Ultrasonic sensors, GPS and GSM. The IR sensors are used to detect the cracks. The IR sensors has a transmitter and receiver. The transmitter emits infrared beam and the receiver receives the infrared beams. To detect the crack on the track , transmitter and receiver must be kept in a straight line at the opposite ends of each other. The system will keep on monitoring the track if there is a crack on the track the receiver will receive the beam, then the crack will be detected. The ultrasonic detector will be placed at the either side of the module. The transmitter will ultrasonic beam at the track. The beam will rebound back and it will be received by the receiver of sensor. The microcontroller will calculate the distance, if the distance will remain constant then there is no fault. If there is any variation in the distance between the track then it will locate the location. The latitude and longitude of the cracks or the fault will be located using the GPS. This information will be sent to the rail authority using GSM to their mobile phone via text message.

**Flowchart:-**

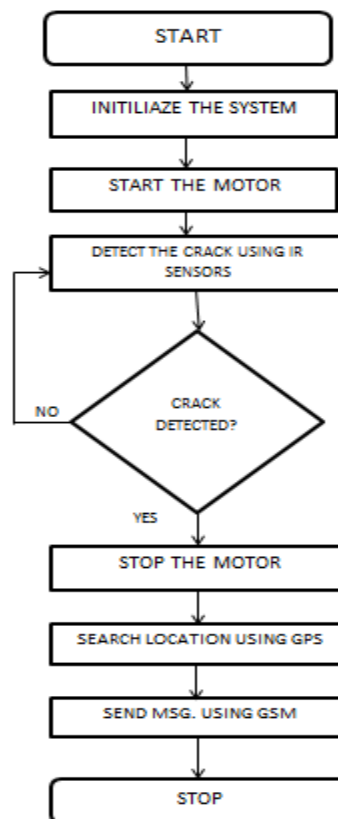


Fig.2:- For IR sensors

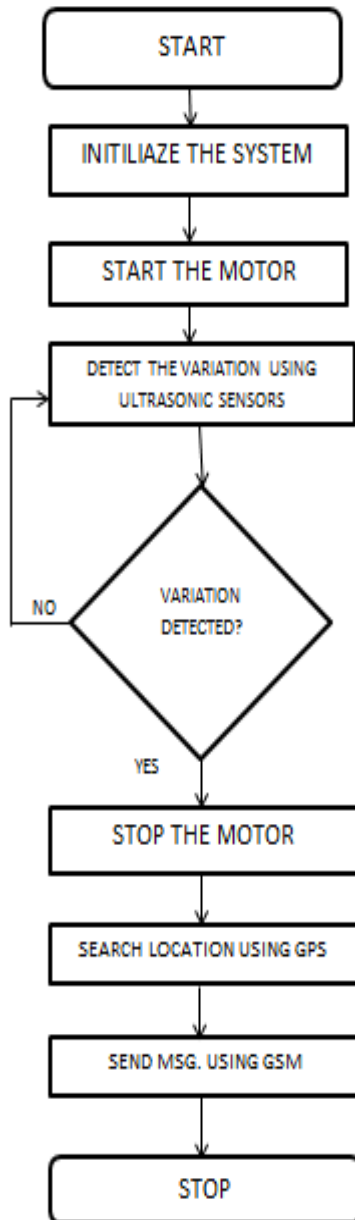


Fig.3:-For ultrasonic sensor

**Results:-** When the receiver of the IR sensor receives the infrared beam from the transmitter, the microcontroller detects that crack is present, it displays the results on the LCD and location is identified by GPS tracker. With the help of GSM the latitude and longitude of the crack location is sent to the authorities. The latitude and longitude is send on the mobile phone via text message. The ultrasonic sensor monitors the distance between the tracks. If there are any variations in between the tracks then the ultrasonic detects it and the microcontroller displays

the result to the LCD and the location is located using the GPS and with help of the GSM this information is sent to the via authorities via text message.

**Conclusion:-** In this paper we have presented a crack detection for railway tracks using IR sensors and ultrasonic sensors. Also the location of the crack or fracture using GPS. The latitude and longitude of the location is sent by GSM to the rail authority. This way the authorities can be able to solve the issue hands on. This improves the efficiency of railway track maintenance. Another advantage is that it can be applicable during day as well as night. It will increase the area covered for rail maintenance in one day by using it during day and night. The idea can be implemented in large scale application with better management of the resources available by the railway maintenance department, so that rail transport can become much safer and smoother mode.

**Future scope:-**In future work some more sensors can be adopted to fasten the detection, we may also use the CCTV systems with IP based camera for observing the visuals captured of the track. The introduced surveying system in this project is operational on both ballast and slab tracks. The system can be operated in tunnels without disruption. Here DC supply is given to the system from AC supply through adaptors. A rechargeable battery can replace the adaptors and making the system much more user friendly. The following tech. can be used for crash prevention purpose also.

**Reference:-**

[1] Xavier Gibert, Member, IEEE, Vishal M. Patel, Senior Member, IEEE, and Rama Chellappa, Fellow, IEEE, Deep Multitask Learning for Railway Track Inspection 1524-9050 © 2016 IEEE.

[2] Ravi Shankar Shekhar, Purushottam Shekhar, Ganesan P., IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems ICIECS'15, Automatic Detection of Squats in Railway Track

[3] Prof. P.Navaraja, Crack Detection System For Railway Track By Using Ultrasonic And PIR Sensor. ISSN 2348 – 9928 IJAICT Volume -1, Issue-1, May 2014 Doi:01.0401/ijaict.2014.01.24 Published Online 05 (05) 2014.

[4] Rajesh L V, Manjunath G Asuti, Mukunda Swamy, Crack Detection And Collision Avoidance In Railway Using Arm Cortex M S , Proceedings of 26th

IRF International Conference, 12th June, 2016, Bengaluru, India, ISBN: 978-93-86083-38-8

[5] L. Ramachandhran , S. Bobby , R. Deebiga , R. Divya , K.S.Kalaimahal Robust Railway Crack Detection Using IR LED-Photodiode Assembly, ISSN 2320-6802 ICIRET-2014, International journal for advance research in engineering and technology , EGS Pillay Engineering College Nagapattinam .

[6] Chanchal Kumar Vishwakarma<sup>1</sup>, Dr. S. Chatterji<sup>2</sup>, Dr. (Mrs.) Lini Mathew, An Intelligent Design to Detect Broken Track for Indian Railway, International Journal of Advanced Engineering Research and Technology (IJAERT), ISSN: 2348–8190 ICRTIET-2014 Conference Proceeding, 30th - 31st August 2014

[7] AKHIL N, DINU MOHAN , FAYIS P, SIJA GOPINATH, Railway Crack Detection System , International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 05 | May-2016 [www.irjet.net](http://www.irjet.net) p-ISSN: 2395-0072,

[8] Velmurugan K, Rajesh T ,Advanced Railway Safety Monitoring system Monitoring system based on wireless sensor network,, IJCSET, Feb-2016, Vol 6 , Issue2, 89-94, ISSN:2231-0711

[9] Miss. Renke Pradnya S, Miss. Mandve Punam D, Miss. Bandal Jyoti S, Miss Shinde Snehal K, Crack

Detecting Robot for Railway Tracks ,IJSRD - International Journal for Scientific Research & Development| Vol. 3, Issue 02, 2015 | ISSN (online): 2321-0613