



## Review on Crack Detection on Railways Track by using IR Sensors

Rahul Dekate<sup>1</sup>, Vaishnavi Sigjanjude<sup>2</sup>, Nayan Thawkar<sup>3</sup>, Snehal Choudhari<sup>4</sup>, Amit Asatkar<sup>5</sup>

<sup>1</sup>Asst. Prof., SCET, <sup>2,3,4,5</sup>Student, SCET

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### ABSTRACT

In a country like India, where most people depend on trains for their travels, if cracks in a railway can be detected early, it can lead to serious loss of life and property. This paper proposes a split detection system that detects cracks without human intervention and sends the error code to authorized personnel using GSM. Cracking detection in this way can be done during the day and night and the wrong location can be detected. In this paper, we have developed the use and integration of a combination of ultrasonic fracture method and a complete channel system for testing the geometry of a permanent train. The system contains a GSM module, an IR sensor, an electric sensor, an ultrasonic sensor that will deliver a split detection function, the purpose of communication and the identification of any creature crossing the railway line. The GSM module contributes to the identification and transmission of a geometry rail detection parameter at a nearby railway station. This paper also describes the summary of non-destructive experiments based on ultrasonic (NDT) and wireless nerve networks (WSNs) to maintain a continuous record of material without interruption of respect during running. The PIR sensor is used so that there is no direct monitoring and detection of live creatures in all tracks. This can work day and night. Your integration of both WSN and NDT technologies will create a variety of advanced and trendy applications to make wireless scanning less expensive in real time..

**Key words:** Crack detection, Railway, and IR sensors.

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### INTRODUCTION

Indian Railways contains the largest railway networks in the world, with problems falling more than 1, 15,000 km across India. However, in terms of the reliability, trustworthiness, and safety of Indian Railways passengers is not at the international level. Among other things, cracks are being developed on the railway line due to a lack of timely detection. [1] Communications), as well as the Arduino-based module its implementation is an effective way to detect cracks in the tracks and thus avoid damage to trains. [2] For this project, we use an ultrasonic sensor used to detect cracks in the rail and to inform authorities of SMS and location messages using GPS and GSM modules. Broken rails represent one of the leading causes of the collapse of the world's most expensive and dangerous trains. Considering corruption in general, in the US alone, on average, more than one major collapse occurred every three days, steadily within a decade. [3] Available statistics on the frequency of train crashes in other countries do not help to better understand the economic, social and environmental impacts. In the proposed system, the system is programmed to run back and forth on the track at intermittent intervals when the track is free. And if it detects any crack in the track it will send an error signal to the authorities using a wireless module. [4] Cracks are detected using IR sensors and an error signal is transmitted. Existing systems do not work well in monitoring surface area and near cracks precisely and are not suitable for tunnel. The delay in notifying train officials about the cracks is huge. It is expensive and not very accurate. [5]



**Fig. 1** Railway crack on track

### MAIN IDEA FOR PROBLEM SOLVING

Our paper discusses one of the cost and effective ways to avoid train accidents by developing solutions to the problem of train breakdown detection. This process is used outside the station to avoid the difficult situation for Indian railway networks to become too stationary; an automated system that is not dependent on manual labor is downloaded for illumination. It proposes a cost-effective solution to the problem of solid compression system detection system (RRCDS) [4] using AT mega microcontroller, IR sensor, buzzer, GPS, Bluetooth assembly to ensure durability, duplication and easy implementation, concept the main one has been kept very simple. An IR sensor is used to detect fractures. To find the location where cracks are found, a GPS service is used. Calculates latitude and longitude and converts them to analog signals. By using sing this wireless message to the appropriate authorities. Then an alarm goes off with the help of a buzzer indicating the discovery of a crack, thus tracking the exact location of the track damage quickly to save many lives.

### TYPES OF SENSOR

#### Ultrasonic Sensor

The ultrasonic sensor is an electronic device that detects a specific object's distance by generating ultrasound sound waves and transforms the sound transmitted into an electrical signal waves. Ultrasonic waves can travel quicker than electrical signal. Ultrasonic Sensor The ultrasonic sensor HC SR04 has a module of 4 pins whose pin names are Vcc, trigger, ground and echo.



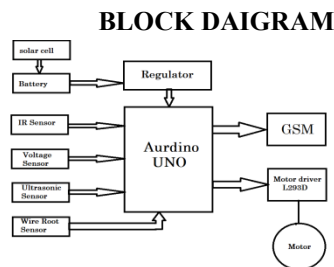
#### IR Sensor

IR sensor is used to detect the crack in railway track. Infrared (IR) transmitter is one type of LED which emits infrared rays generally called as IR Transmitter. The transmitted light rays are received by IR receiver on adjacent side. IR transmitter and receiver should be kept parallel and adjacent to each other so that transmitted light can fall on receiver straight. Then the LCD display is used to view the result.



**Voltage Sensor**

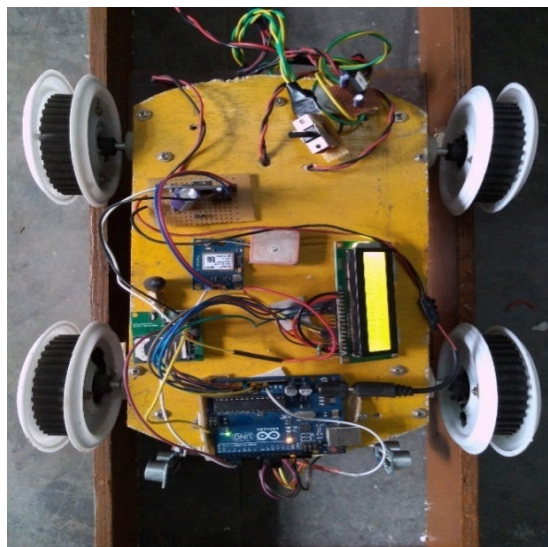
The microstructural changes induced in a thermal or stressed environment and cracked region of railway track often degradation of the mechanical properties of material. The Voltage Sensor (fluxgate sensor) can be used either to detect magnetic fields created by current passing through conductors or to detect localized magnetic fields non-destructive testing applications. The occurred discontinuity resulting from a crack also produces disturbance in the magnetic field in the material, and the magnitude of the disturbance is determined by the size and shape of the crack. The Voltage Sensor (fluxgate magnetic field sensor) with amorphous ferromagnetic core can be used to capture cracked regions in the railway track.



**Fig. 2** Crack Detection on the Railway track using Multi Sensor

As supply given to the Arduino Uno this will be activate and at the same time all sensor will be active. Initially the tracks are being continuously monitored with the help of sensor, which is used to detect the crack in the track. IR sensor detect the obstacle presents front of the vehicle. As any obstacle comes in front of vehicle IR sensor sense the Signals to the Arduino Uno and this will generate the output 0 and vehicle will be stop. Voltage sensor mainly works as magnetic signal sensing device. When any crack present on the track it will sense by the voltage sensor and give the signal to Arduino Uno and it will generate 0 output and then stop the vehicle. All sensors works same but in different manner. As any one output comes 0 from all four sensors vehicle will stop and give the message to the control room by using GSM module.

**PROTOTYPE MODEL**



**ADVANTAGES**

1. Using this technique it provides accurate result compared to conventional manual method.
2. The system will be fully automatic
3. Save man power

#### APPLICATION

1. It is applicable for identify the crack or gap on plane surface of wireless application. Wireless application protocol (WAP) is the communications protocol that is used for wireless data access through the most mobile wireless network.
2. The higher turbidity and imbalanced of pH in water supply used for drinking, agriculture and industry use is a serious issue

#### CONCLUSION

In this paper the system is presented to detect the cracks in the track effectively. We have implemented the IR sensor based railway crack detection system using Bluetooth technology and we also use IP based camera for monitoring the visual videos captured from the track. By this proposed model many lives can be saved by avoiding accidents. The idea can be implemented in large scale in the long run to facilitate better safety standards for rail tracks and provide effective testing infrastructure for achieving better results in the future.

#### REFERENCES

- [1]. S. Srivastava, R. Chaurasia, S. Abbas, P. Sharma and N. Singh, "Railway Track Crack Detection Vehicle", *International Advanced Research Journal in Science, Engineering and Technology*, vol. 4, no. 2, pp. 145-148, 2017.
- [2]. B. Siva Ram Krishna, D. Seshendia, G. Govinda Raja, T. Sudharshan and K. Srikanth, "Railway Track Fault DetectionSystem by Using IR Sensors and Bluetooth Technology", *Asian Journal of Applied Science and Technology (AJAST)*, vol. 1, no. 6, pp. 82-84, 2017.
- [3]. Ramavath Swetha, P.V. Prasad Reddy, "Railway Track Crack Detection Autonomous Vehicle" *ISSN*, vol. 4, Issue 3-2015.
- [4]. S. Sawadisavi, J. Edwards, E. Resendiz, J. Hart, C. Barkan, and N. Ahuja, "Development of a machine vision system for inspection of railroad track," in *Proc. Amer. Railway Eng.MaintenanceWay Assoc. Annu. Conf.*, 2009.
- [5]. P. Navaraj, "Crack Detection System for Railway Track by Using Ultrasonic and PIR Sensor", vol. 1, no. 1, pp. 126-130, 2014.