**Abstract**— In this paper we discuss on design and implementation of a Railway track security system (RTSS). The proposed system can be used for failure identification in track. In this paper, the proposed broken ravldetection system automatically detects the faulty rail track without any human intervention.

The main goal of this project is to develop a raspberry pi to detect faulty railway track and send message to nearest station using internet of thing (IOT). This project is designed for railway track crack detection using raspberry pi 3, infrared sensor (IR) and ultrasonic sensor (US) are frequently used for crack detection along its path.

**Keywords**— IOT, Raspberry pi 3, Python, IR sensor, US sensor, Web page, DC Motor (Engine), GPS Module, Buzzer.

**I. Introduction**

The Indian Railways today has 113,617 kilo meters (70,598 mi) of total track over a route of 63,974 kilo meters (39,752 mi) and 7,083 stations. It has the world's fourth largest railway network after those of the United States, Russia and China. The railways traverse the length and breadth of the country and carry over 30 million passengers and 2.8 million tons of freight daily. It is the world's second largest commercial or utility employer, with more than 1.36 million employees.

Accidents of trains are not uncommon in the India. Unfortunately when these accidents are takes place, people are frequently seriously injured or even killed. Train of Accidents are involved oftentimes the result of mechanical failures and human error, and frequently it’s a combination of both. The general purpose of the project is to identify any railway track crack or distortion on the railway track using this apparatus, which can be applied in live by Railway authorities. The project setup would form the inspection and care of railway tracks softly and help them to monitor effectively by replacing the human investigation which is presently followed. The design of the vehicle and software related to it are very simple and can be easily adopted by the present system.

**II. Literature Survey**

The Indian Railways today has 113,617 kilo meters (70,598 mi) of total track over a route of 63,974 kilo meters (39,752 mi) and 7,083 stations. It has the world's fourth largest railway network in India. Approximately, 60% of rail mishaps occur due to derailments. Each time there will be a prepare mishap, those issues from claiming security for the Indian track is talked about for few days. Mostly the accidents occur due to human failure. Below figure 1 shows the percentage of accidents between 2009 to 2014. In fig 1 collision, derailments, level crossing, misc acc boxer, these are the type of accidents with percentage. The fig 2 shows Cause of accidents in between 2009 to 2014 with details. There have been various causes for train accidents ranging from Human Failure to Equipment Failure. In the 6-year period between 2009-10 and 2014-15, human failure has caused more than 86% of the total accidents. Out of this, 41% accidents were caused due to the failure of railway staff and the rest due to the failure of others. Equipment failure caused only 2.2% of the accidents[3].

![Number of accidents by type in Indian Railways (2009-10 to 2014-15)](image)

Fig.1. Percentage of accidents (2009-10 to 2013-14) [3]
III. Proposed System

In this paper we are proposed IoT based railway track security system with Raspberry Pi. In this system our project are detect the faulty railway track crack and also measure the distance of two railway track. When Infrared (IR) sensor are used for find the crack in the railway track and Ultrasonic sensor measure the distance between the two track. If any kind of crack are occurred in the railway track means longitude and latitude of this location are send to the nearest station and ultrasonic sensor are measured to the distance between the two track if any small variance means they detect and message to the nearest station using GPS and IOT modem. If any one pursuing on the track means they stop the surveying work after crossing rail road they are detect the track.

If there is a crack in the railway track, it creates a major problem. Most of the accidents in the train are caused due to cracks in the railway tracks, which cannot be easily identified. Also it takes more time to rectify this problem. In order to avoid this problem, we are using the crack detector robot, which detects the crack in the rails and gives an alarm. A robot is an apparently human automation, intelligent and obedient but impersonal machine. It is relatively, that robots have started to employ a degree of Artificial Intelligence (AI) in their work and many robots required human operators, or precise guidance throughout their missions. Slowly, robots are becoming more and more autonomous.

IV. Hardware Description

A. Raspberry Pi 3

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs. The main features of Raspberry Pi 3 are[4]

- Processor: Broadcom BCM2387 chipset. 1.2GHz Quad-Core ARM Cortex-A53 802.11 b/g/n Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE)
- GPU: Dual Core VideoCore IV® Multimedia Co-Processor. Provides Open GL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode.
- Operating System: Boots from Micro SD card, running a version of the Linux operating system or Windows 10 IoT.
- GPIO Connector: 40-pin 2.54 mm (100 mil) expansion header: 2x20 strip Providing 27 GPIO pins as well as +3.3 V, +5 V and GND supply lines

Application:
- Low cost PC/tablet/laptop
- IoT applications
- Robotics
- Industrial/Home automation
- Server/cloud server
- Security monitoring
- Web camera
- Wireless access point
- Environmental sensing/monitoring (e.g. weather station)

B. GPS Module

LS20030–3 series products are complete GPS smart antenna receivers, including an embedded antenna and GPS receiver circuits, designed for a broad spectrum of OEM system applications. The product is based on the proven technology found in LOCOSYS 66 channel GPS SMD type receivers MC-1513 that use MediaTek chip solution. The GPS smart antenna will acquire up to 66 satellites at a time while providing fast time-to-first-fix, one-second navigation update and low power consumption. It can provide you with superior sensitivity and performance even in urban canyon and dense
foliage environment. Its far-reaching capability meets the sensitivity requirements of car navigation as well as other location-based applications.[1]

Features:
- Ultra High Sensitivity and Low Power GPS Receiver Module
- MediaTek high sensitivity solution
- Support 66-channel GPS
- Fast TTFF at low signal level
- Support AGPS

![Fig.4.GPS Modules](image)

C. **Infrared sensor**

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an objects as well as detects the motion. These types of sensor measures only infrared radiation rather than emitting it that is called as passive IR sensor. The IR Sensor-Single is a general purpose proximity sensor. Here we use it for collision detection. The module consist of a IR emitter and IR receiver pair. The high precision IR receiver always detects a IR signal.[5]

![Fig.5.IR Sensor](image)

D. **Ultrasonic sensor**

Ultrasonic sensor transmit an ultrasonic wave package and receive the reflected signal. The time taken for a signal to travel & return gives an indication of the distance ultrasound a frequency range is between 40 & 180KHz. Ultrasonic ranging module HC-SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:
- Using IO trigger for at least 10us high level signal,
- The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- IF the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.
- Test distance = (high level time×velocity of sound (340M/S) / 2.

![Fig.6.Ultrasonic Sensor](image)

E. **Wifi Module**

In this module we used python language (coding) for Connecting to the Account of Internet of thing (IOT) and this process is done by WIFI(Internet).[1]

F. **DC Motor**

The L293 and L293D are quadruple high-current half-H drivers. These devices are designed to drive a wide array of inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high-current and high-voltage loads. All inputs are TTL compatible and tolerant up to 7 V. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance
V. Working

i. When the vehicle is start, it moves along its path. The Infrared Obstacle sensors sense the circumstance of the tracks.[1]

ii. When a determination of crack is detected by the Infrared sensor the vehicle stops at once, and the get the coordinates of vehicle location through the Global Positioning System(GPS), the current position of the vehicle is received and the Latitude and Longitude coordinates of the vehicle position from satellites.[1]

iii. The Latitude and Longitude coordinates of vehicle is received by Global Positioning System(GPS) and are converted into a message which is done by Raspberry pi.

iv. The Internet of thing(IOT) module sends the message to controller and controller display the message on webpage.

v. Once the message has been successfully sent to the controller, the vehicle restarts its movement forward depending on the type of crack.[1]
vi. Result and Discussion

In the addressing experimental setup system is used to find the crack in the railway track and send real time position and orientation of GPS location to the control room administrator. So they will take sudden action against it.

Fig.10. Photograph of Implemented model

VII. CONCLUSION

In this paper we have come with an idea to overcome the drawbacks of railway accident due to crack in railway road. The system has IR and ultrasonic sensor to find the cracks. Data coming from sensor will process using Raspberry Pi and send data to control room using IOT. The combination of Raspberry Pi and IOT will become a novel idea in the railway track defect detection system. So the propose system will help to solve the problem of railway accident.

REFERENCE