

## Railway Accident Avoidance System

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**Abstract:** Cloud computing and Internet of Things (IoT) are two different emerging technologies that become part of our life. Their adaptation and usages are expected to be more and more effective. Railways are providing Eco-Friendly transport system for the mankind. In this paper we proposed and implemented IoT based cloud computing model using RaspberryPi2.0, LM393 sensor signal conditioning units, Piezo electric buzzer components. Our working model was to integrate with cloud environment, python language and 'smartliving.io' IoT platform via internet using WIFI. In cloud we are providing data of the railway authorities. If any track was damaged in certain point our system detects and transfer that message to cloud, then the cloud automatically sent SMS for concern railway authorities' mobiles. The railway system use sensors to improve rail transport safety and integrate with local stations using wired network. In this scenario, we have two major problems in case of misshaping. First, the concerned railway local authorities doesnot have powers to take their own decisions they were intimate to higher authorities on the situation. It is a long time process to take the decision most of the time it will be late to receive the information. Second, in wired network it is a problem with climatic conditions and vulnerabilities, it has a limitation for integrating number of sensors to current system. This system was successful tested and results are evaluated. In system continuously monitor the status of track and updates it time to time cloud by IOT platform using Raspberry pi.

**Keywords:** IOT, Railway, Cloud computing, Raspberry-Pi, Wi-Fi.

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### I. Introduction

An IoT is the system for gadget, buildings, vehicles and different things installed with programming, hardware, network and sensor connectivity. It also empowers these items to exchange and gather information. The IoT also allows objects to get remotely controlled and detected things over existing network. It also makes an open doors for more simple and forward incorporation of the physical world into PC based frameworks, and bringing about exactness and economic advantage for enhanced system when IoT is expanded with actuators and sensors.

Due to increase in population, there is a rapid increase in rail traffic. Increase in Rail traffic results in many electromechanical devices. The generator delay will help protect both the generating set and the appliances; a delay circuit allows the generator to run to full load, before connecting the load to it. The power indicator on the other hand gives the operator both visual and audio indication, when the public power is restored thereby reducing cost of power as it is cheaper to run on public power supply. This paper combines twin functions of automatic changeover and sequential (gradual or step) loading to eliminate the need for manual changeover, protect the loads, extend the lifespan of the generator and improve reliability of power supply. The importance of automatic change over and step loader cannot be over emphasized especially in critical industries like banking, telecommunications, defence, and healthcare where continuous operation is critical and interruption of power supply has grievous consequences. A sequential loader is used to ensure power gets to every load step by step. This is to ensure that power supply to the load is not accompanied by overloading of the generator. This device is derailments/collision of trains. Many a time collisions happens due to a train on the same railway track or due to some technical problem. For this many system has been designed. But they are designed by considering the mistakes made by Loco pilot. But every time it's not because of LP's mistakes. Some accidents occur due to fractured tracks. We are proposing this system to avoid the collisions/derailments due to the crack or fractured in a railway tracks.

### II. Review Of Literature

Literature Review acts as the basis of research and study of the various concepts required for a particular domain. It describes the theories and other methodologies that can be adopted in order to implement modules of the proposed system.

**A. Zigbee based prototype design of Anti-Collision system for locomotives.**

Atul Sarojwal, PP Singh,AK Gupta [1] had proposed a Zigbee based prototype design of ACS. In the proposed method is divided into various modules i.e. Train Module, X-CTU software, Controlling Module, Actuating Module, Zigbee Module and Braking Module. It can safely be incorporated with Railways for Anti-Collision practice that is collision can be avoided. cost can be reduced up to considerable extent. To avoid collisions Zigbee module provides wireless technology. As it totally automatic system therefore it avoids dependency upon weather, human beings as well as satellite. It cannot avoid the derailment due to discontinuity of tracks.

**B. Anti-Collision Device (ACD) Network (Raksha Kavach )**

Achint Agarwal, Aman Mishra and Amit Saxena [2] had implemented a technology ACD. Based on 'Radio communication', 'Microprocessors' and 'Global Positioning System (GPS)' technology, Konkan Railway team produced a working prototype in 90 days of Anti Collision Device (ACD), were mounted on trains approaching nearby, will allow them to assess each other's course accurately and initiate an automatically brakes, in case they are on 'collision risk' It includes Detection & Prevention of Head-on, Rear-end and Side Collisions, Detection & generation of Train Parting / Jumbling, 'Train Approach' and also warns to the road vehicle operators at Railway Crossings including unmanned as well as manned. The disadvantage of this project was that the system was unable to communicate.

**C. Implementation of Railway Track Crack Detection and Protection**

N.Karthick , R.Nagarajan , S.Suresh and R.Prabhu [3] done their work to detect the cracks in the railway tracks and avoid the accidents. They use ultrasonic metal detecting sensors and once crack is detected the train applies brake automatically to halt and even it disengages the panograph. Then alert to driver and automatic emergency brake control is applied. If this system is used in railways, the accidents could be controlled and the place of damage could be sent automatically to control room and since its completely automated system this can be used in village areas. Reduced the man power and time is saved. Detection range is very low.

**D. Automatic Accident Control System on Railway Tracks**

Ranu Dewangan, Pratibhadevi Umesh [4] proposed An Automatic Accident Control System on Railway Track has successfully been designed and developed. They used Zigbee sensor is interfaced with PLC Module. The PLC detects the function of the sensor and the resolution of system depends on the output of sensors, then it detects the priorities and provides output to the light present in train for ON or OFF the RED or GREEN light and on time is depend on the specific priorities .It will sense till long distance in track. Today it will very useful for railway board.

**III. Methodology**

The proposed system concentrates on detecting the crack or fractures in the track and avoid the derailment due to the fractures. The proposed system aims to detect the crack in the track and alert it to the loco pilot. This method of crack detection is carried out using voltage comparators. Voltage is passed through the tracks and the voltage is compared with the reference voltage. The system will use Raspberry Pi, LCD, led, buzzer, Telegram api for transmission of message. Using Raspberry Pi, the comparator output will be verified and accordingly the output will be printed. If the voltages are not equal the track status not ok will be shown and the led and buzzers will be on. If the voltages are equal i.e., input voltage equals reference voltage, then the track status ok will be shown.

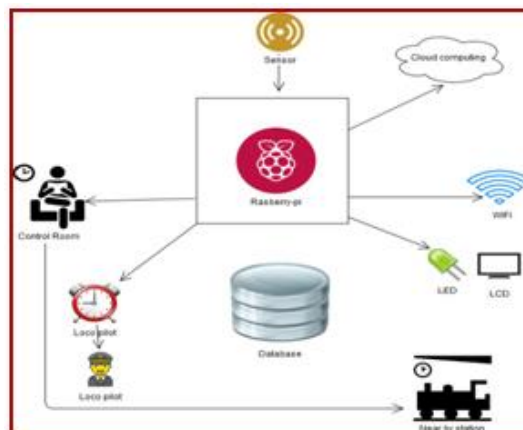


Fig I.A: Architecture Diagram

The architecture of the proposed system is as shown in Fig I.A]. The Raspberry Pi is the main processing unit of the system. It receives the output voltage of the comparators. It then checks the condition and accordingly prints the status of tracks on the lcd.



**Fig II.B]:** 16x2 LCD Display

16x2 LCD Display will show the track status to the loco pilot.



**Fig II.C]:** Raspberry Pi 3 B+

The Raspberry Pi 3 Model B+ is the latest product in the Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT. Raspberry Pi consists of ARM cortex-Quad core processor, 1GB RAM, 40 GPIO'S, Camera Serial Interface (CSI), Digital Serial Interface (DSI), 3.5Mh audio I/O 4USB ports, one 10/100 Ethernet, one HDMI, one micro SD card slot extendable up to 32GB. In this memory card Rasperry an OS is loaded and python code is dumped.Fig: II.C].

**A. Software Unit:**

- i. Python IDLE  
The coding of the entire process is done in this software. It helps the Raspberry Pi to carry out the tasks as per the given instructions in the code.
- ii. Telegram api  
The telegram api is used to transfer the signal information to the officials.
- iii. Database  
Database is created to store all the details of the nearby surroundings of signals. It includes nearby station name, signal, track switch no,etc.

**B. Hardware Unit:**

- i. **16x2 LCD Display:**  
This is the display having 16 rows with two columns to print a text on it.It will be connected to the RaspberryPi to indicate the status of the track to allow the LP keep track of it.
- ii. **Raspberry Pi:**  
It will be connected to computer with a USB cable. Thus, the compared voltage will be transferred to the Raspberry Pi. It also interfaced with the 16x2 LCD Display and led, buzzer.
- iii. **Comparator:**  
The comparator used is the dual comparator. The comparator will have two inputs one will be the reference voltage and another will be the voltage coming through tracks. If the voltage equals reference voltage the comparator will give output as high else will provide low.

**IV. Working Of The System**

**a. Setting up the System**

Raspberry Pi is interfaced with 16x2 LCD along with the comparators. The code is uploaded into the Raspberry Pi starting the system. Text messages are transferred to the officials's smartphone using Telegram api. Tracks are placed and voltage is passed through it.

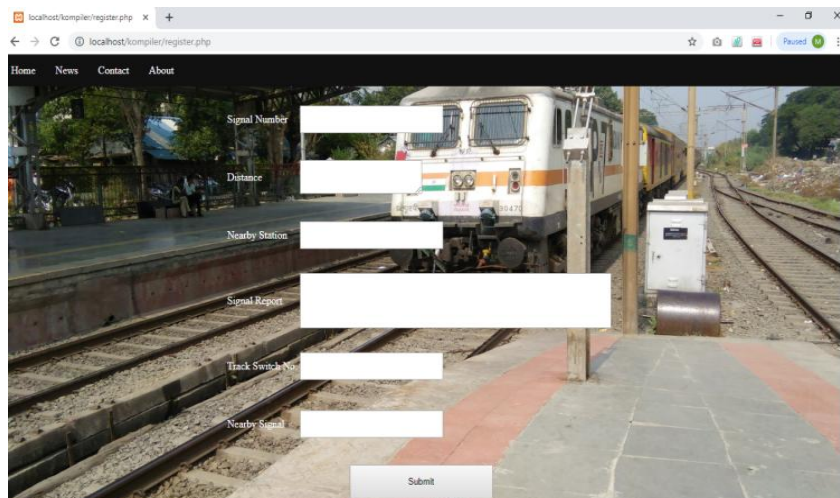
**b. Working of the system**

Pass the voltage through the tracks. Comparator is placed on the other end of the tracks. Reference voltage is provided to the comparator as the second input. If the tracks voltage is equal to the reference voltage then the Raspberry Pi will show the status as ok through the lcd. If the track voltage is less than the reference voltage that means the track is not ok .It will print the status as track is not ok on the lcd, the led will blink and the buzzer will start buzzing. If the status shows not ok then the Loco Pilot will be alerted and the train will be stopped. The LP will then extract the signal details by putting the signal no as input and all the data will be sent through as a message to the officials indicating the emergency to the officials. Accordingly the officials will take action.

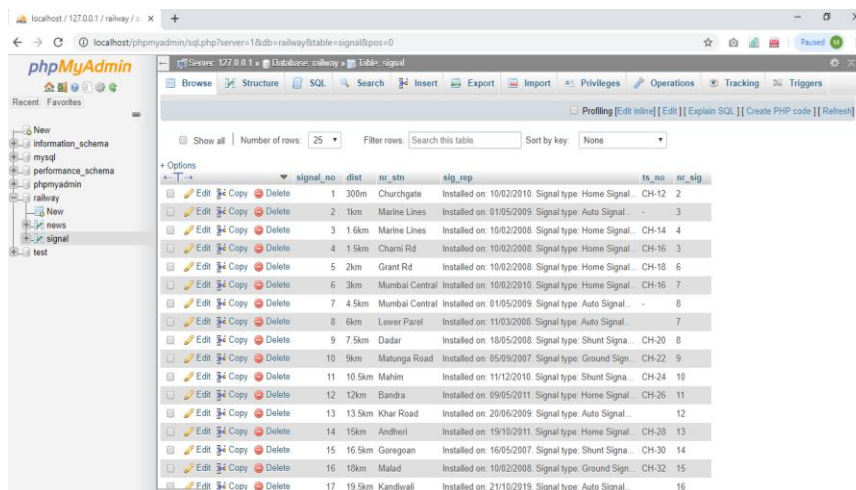
**V. Conclusion**

This system design and develop IOT based Railway Accident Avoidance System using Cloud Computing Technology & Raspberry-pi. system avoid the derailments by tracking the crack in tracks and informing it to the LP's and the Officials. system continuously monitor the status of track & update it time to time into cloud by IOT platform using Raspberry-pi. Raspberry-pi is the main processor of system.In this proposed system used LED, LCD and WIFI module. First the crack is detected through sensor and status display on LCD. if crack between track then glow LED and by WIFI module the message is send to control room using cloud computing and all the information are store in database. This system avoid train accidence due crack between the track and saving human life.

**VI. Output**



**Fig. 1:** Entering Signal data by railway officials.



**Fig. 2:** Database.

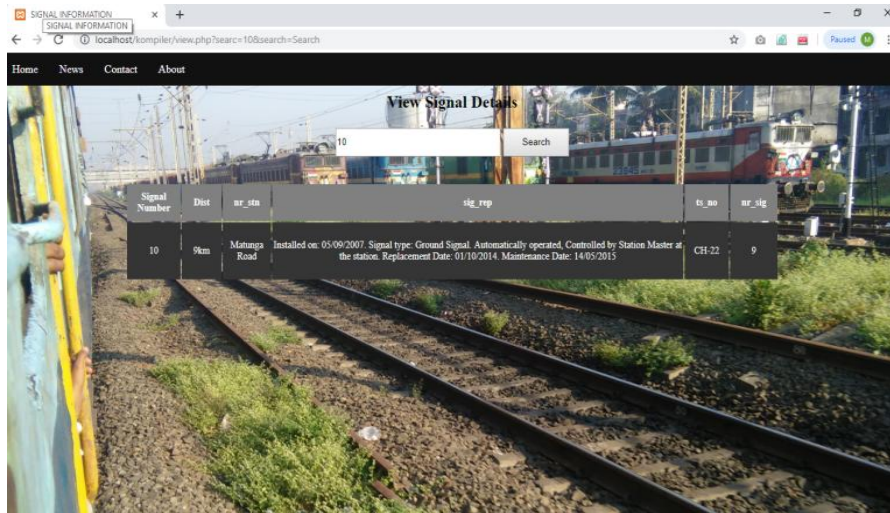


Fig. 3: Extracting data from database on a website.

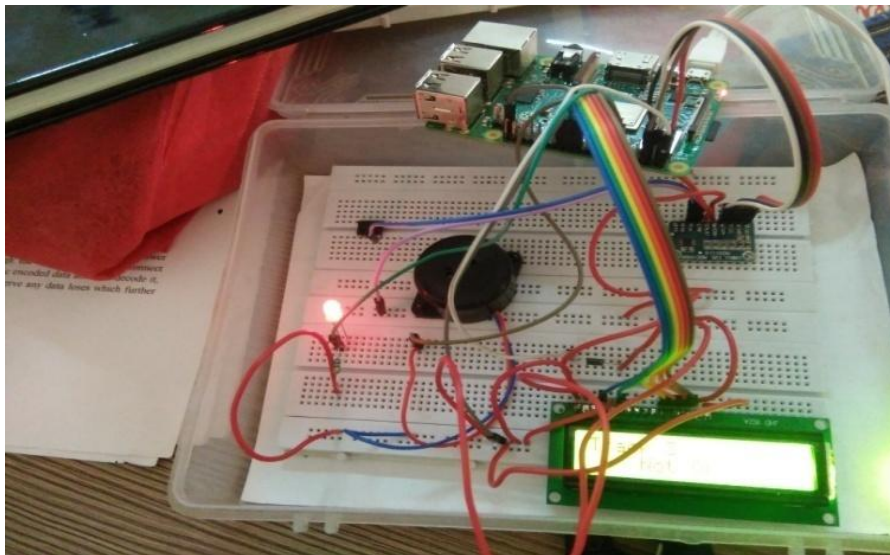


Fig. 4: If status Not OK.

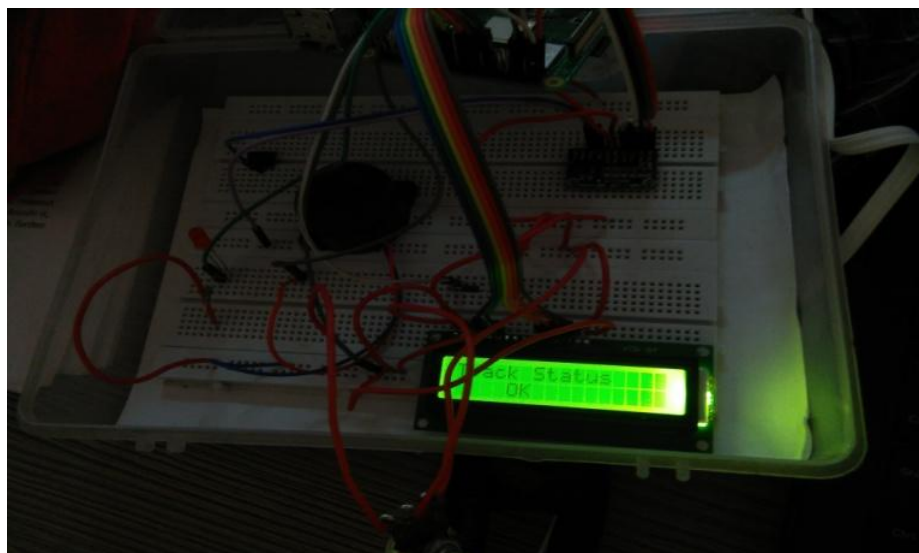
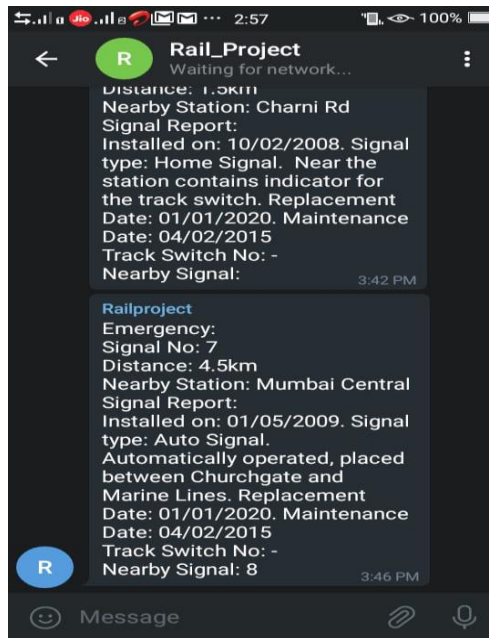


Fig. 5: If status OK.



**Fig. 6:** Message alert through Telegram.

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