Automatic Rail Track Inspection And Crack Detection Using Ultrasonic Sensor

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Abstract- *Faults of railway tracks have been causing immense accidents and loss of lives. Most of the accidents are caused due to cracks in the railway tracks, which cannot be easily identified by manual inspection. The main objective of this project is to inspect the railway track using sensors to detect damages in the railway tracks and to avoid derailing of trains and safeguard passengers. The sensors are mounted in the test trail run trolley to detect the crack in the track. On detection of crack, the trail run trolley stops and sends an alert message to the nearest railway control station and live relay can be viewed to take appropriate remedial measure without delay.*

Keywords- detect damage, avoid derailment, safeguard passengers

I. INTRODUCTION

These days the sabotaging of railway tracks has been causing immense accidents and loss of lives. The main idea is to develop an automotive sensing to detect any anomaly on the railway tracks. The solution should comprise of sensors which can keep tab on the railway tracks and the consolidated picture can be seen at a local and global surveillance shelter. It should be able to identify/track railway tracks health index and any deterioration must be accompanied by alerts messages. Sensors need to be installed on the test trail run trolley. Sensor integration can help address the issue in the railway track. This project is one of the efficient methods to avoid train accidents. The main objective of our project is to detect train derailment in curves and bends to avoid collision between trains and any cracks or faults to avoid accidents. We are using GSM communication to reduce the important factor such as wastage of time, cash, manpower and also the mistakes which made by the humans. To do this a large amount of data is captured by using the sensors and conveyed to the controller for the further processing. The captured data is then sent to the global and local surveillance shelter which is more convenient to rectify the track's damage.

II. EXISTING SYSTEM

The title of our base paper is Railway Track Fault Detection System by Using IR Sensors and Bluetooth Technology. The paper proposes designing of robust railway crack detection scheme (RRCDS) using IR sensor assembly for railway track geometry surveying system by detecting the cracks on railway tracks. Most of the accidents in the train are caused due to cracks in the railway tracks, which cannot be easily identified. The manual inspection of railway track took more time and human fatigue. The proposed system introduces Bluetooth based technology, to prevent the train accident. Two IR sensors are installed at front end of the inspection robot which monitors the track and gives the status to Arduino controller. If there is crack found it immediately sends the location of crack via Bluetooth to mobile phone. The proposed broken rail detection system automatically detects the faulty railway track without any human interference. The advantages include less cost, low power consumption, and less analysis time and also facilitate better safety standards for rail tracks and provide effective testing infrastructure. 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.

III. PROPOSED SYSTEM

Our project is to develop a hardware system with the help of IOT based method to detect any anomaly on the railway tracks. The main idea is to develop ultrasonic based sensing to detect any crack on railway tracks. It should be able to identify railway track's health index and any deterioration must be accompanied by alerts message. Track damage status is monitored by ultrasonic sensors. Wi-Fi enabled camera is interfaced with the device and live relay is recorded. When a crack is detected, sensor sends signal to controller to stop the device and a notification message is sent to the local surveillance using GSM. The image of the crack can be viewed with the help of Wi-Fi camera. GSM can be used to move the device further.

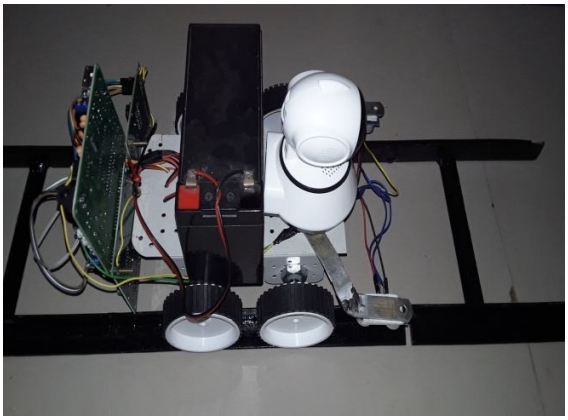

Figure 4.1 Experimental Design

IV. SYSTEM ARCHITECTURE

In this project we using Arduino controller in which all the other components are interfaced with. We are using four motors and two motor drivers to move the test run trolley in bidirectional. Front left and back left motors are controlled by one motor driver and front right and back right motors are controlled by another motor driver. Two ultrasonic sensors are mounted in front of the test run trolley that is connected to the arduino. It is used for inspecting the railway track whether crack is detected or not. Once the crack is detected, the sensor sends echo signal to the controller to stop the test run trolley. Thus the controller will stop the trolley. GSM is used to send a notification message to the nearest railway station control that crack is detected. Wi-Fi enabled camera is mounted in the trolley where live relay can be viewed to take respective remedial measures regarding the crack detected.

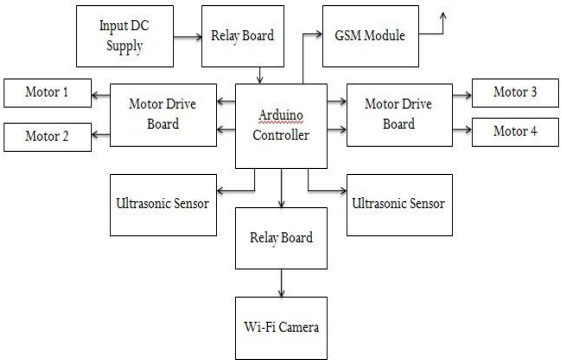

Figure 5.1 Architecture diagram

Track Detection Process Flow:

The process is initially started to move forward. It checks whether the crack is detected or not. Once the crack is detected, the trolley stops and send a notification message that crack is identified. The defect can be viewed by using the camera mounted in it. And then again the trolley must be initiated to move forward. This process continues until the crack is detected or end of the rail road.

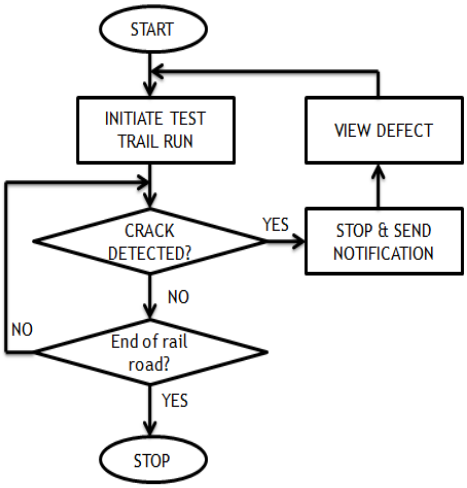

Figure 5.2 Track Detection Process Flow

V. REQUIREMENT SPECIFICATION

The hardware requirements we are using are Arduino board, Relay board, Ultrasonic Sensor, GSM Modem, Wi-Fi Camera, DC Gear motor 60 RPM, Motor driver board L293D, Robot chassis with wheel, Connecting wires and Power supply.The software Arduino IDE 1.8.5 is used for coding the Embedded C coding.

IV. CONCLUSION

In this paper, we have presented the ultrasonic sensor based crack detection of railway system GSM technology. The crack can be detected easily & it does not give the false output. GSM base crack detection system automatically detects the faulty rail track without any human interface. This method having many advantages on traditional detection techniques. The main advantages of this system like less cost, low power consumption, on time data operation and minimum analysis time.

VII. ACKNOWLEDGEMENT

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