

RAILWAY TRACK SECURITY SYSTEM USING RASPBERRY PI

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Abstract: Railway service is the fastest system of transport networks in India. Rail accidents occurs more due to derailments than collision or fire in trains. The rail accidents are increasing day by day and this is because of improper maintenance of rail roads which leads to crack in railway tracks hence the proper maintenance should be provided and cracks should be detected to avoid such bad situations. Many techniques were used to solve this problem but there occurs less in transmission speed and accuracy. To overcome the problem this project is introduced to detect the cracks in rail roads using Raspberry pi and IR sensor. The IR sensor helps to detect the cracks. The communication is done through GSM technique. After detecting the crack the message is send to nearest station with location of crack. Thus the system is simple in operation and advantageous over both day and night crack detection.

Index Terms - raspberry pi,GPS Module,IR Sensor.

I. INTRODUCTION

In all transport systems, particularly in the case of railways, safety and reliability are highly considered. In recent years, with the development of high speed railway, speed and capability of the trains constantly improved and traffic density gets more and more serious. As a result the requirements to the reliability and high speed train operations enhances increasingly. However, safety of high speed railway extremely relies on its surrounding environment. The number of collisions connected railway accidents shows world-wide an increasing tendency year by year. The ever increasing operation velocities cause an increasing degree of the grave consequences both in loss of human life and severe damage to the train and other railway equipment. In the technical literature very few number of publications can be found that are dealing with investigations into the train collision processes to predict the level of forces and deformation realizing in the course of collisions/crashes. In the existing method the crack detection is achieved by using the concept of eddy current losses implemented in terms of Darlington pair circuit which is connected to microcontrollers with the sensors interfaced to identify the crack in the railway track. The solution is the comprehensive GPS/GSM based train tracking system. The inbuilt GPS module identifies the train location and transfers the information to the central system via GSM.

II. SYSTEM OVERVIEW

In the proposed methodology, the crack detection in the track is continuously monitored with the help of interfacing the sensors with raspberry pi. The data's are fed to the raspberry pi which acts as a central processing unit, where the detected crack is monitored using monitoring device. This system allows to find the faults in the track thereby alerting the nearby stations.

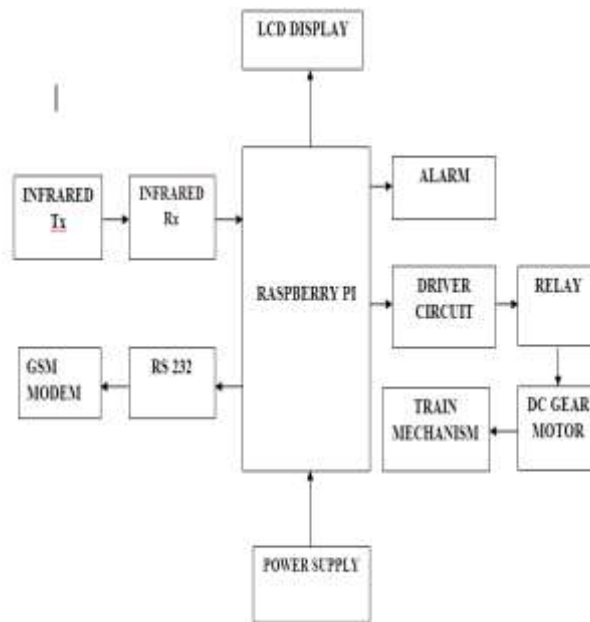


Fig1. Block Diagram

2.1 Raspberry Pi:

Raspberry pi is used to interface the computer and the sensors and it is used to monitor and detect the crack in the railway track. Raspberry pi is used because of its cost affordable solution in energy and economical solution to the more expensive alternatives. There are 2 modes in raspberry pi pins i.e Broadcast mode and Board mode. This project uses Broadcast mode.

Table 2.1: Pin Configuration

REQUIREMENTS	PIN NUMBER	GPIO
Power supply	1	-
Ground	2	-
LCD	3-Data 5-clock	GPIO 2 GPIO 3
Relay	32	GPIO 12
IR Sensor	40	GPIO 21
Alarm	35	GPIO 19

2.2 IR Sensor:

The 40th pin in the raspberry pi is GPIO 21 and it is connected to transmitter and receiver of IR sensor. IR Sensor is used for transmitting and receiving signal from the track. The transmitter transmits the signal through the track, if the crack is present in the track the signal gets cut down and gets back to the receiver. Here 16x2 LCD has 32 characters in total, 16 in 1st line and another 16 in 2nd line. LCD is connected to 5th pin of raspberry pi which is GPIO3 to display characters on it by writing a program in PYTHON to send the appropriate commands to the LCD through GPIO and display the needed characters on its screen.

2.3 Dc Gear Motor:

To move the train, the 9v supply is given to the DC gear motor. The relay is connected to the DC motor. When the crack is detected in the track the relay turns on and the DC motor stops working and the movement of the train was stopped.

2.4 GPS:

GPS is used to track the location, it is connected to the raspberry pi. When sensor senses the crack, GPS tracks the location and it send the message to the nearby station through way2 sms.

2.5 Web Camera:

webcam is a video camera that feeds or streams its image in real time, it is connected to the raspberry pi. When the image is captured and it send on to other networks via systems such as the internet, and emailed as an attachment.

III.RESULT ANALYSIS:

The experimental setup consist of raspberry pi B3 module, IR sensor, transmitter and receiver. The information is detected by IR sensor and sent it to raspberry pi and the alarm is activated. Then the GPS detects the location and share the message through way2 sms.

Trial 1:

At the first time ,the train set to run but due to the same size of joint and crack the sensor was unable to find a crack between joint and crack.

Trial 2:

By correcting the trail 1 problem by adjusting the size of the crack by expanding ,the train was allowed to run for second time. Due to the poor connection of GPS, it can't send location to the nearby station.

Trial 3:

By correcting the trail 2 problem by correcting the GPS program and all the damages are replaced, then the train is allowed to run.

IV. CONCLUSION:

This project discusses the critical safety techniques for high-speed train operation environment based on the train control. In order to ensure safe operation of trains, the proposed system uses a wireless network access framework according to the monitoring network of surrounding environment and the deployment of transition network to avoid crack detection in trains. System has ability to pin point the location and other attributes of an operational train in an economical accurate manner. The goal of this work is to design and implement a cost effective and intelligent full-fledged and wireless based Train Anti Collision and detection system to avoid accident.

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