Train Track Fault Detection System

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Abstract

The Transportation of train always depends on railway tracks (rails) only. If there is a crack in these rails, it creates a major problem. Indian railway is the largest railway network in Asia and additionally world's second largest network operated underneath a single management. The railways became the prime suggests that of transportation because of their capability, speed and responsibleness. This is to avoid rail accidents by using latest communication technologies. In this project GSM communication protocols are used to convey the message of crack detection via SMS. The main aim of this paper is to develop an embedded system to identifying rail track fault sending message to near station using ZIGBEE TECHNOLOGY. This paper describes a system, basically an electronic system that can help us to detect the exact location of the crack which has been formed accidently or due to the terrorist activities. In India, Railway is the backbone of transport system. Rail accidents occur commonly due to derailments due to cracked tracks than collision or fire in trains. 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 deformations realizing in the course of accidental collisions/crashes.

Keywords: Track, Vehicle, Detection, Buzzer, Signal, Control, Network etc. Rail line, fault, crack detection, stress. Crack detection, Eddy current loss, Security system, GSM.

I. INTRODUCTION

In India most of the commercial transport is being carried out by the railway network and therefore as any problem occurred during transportation the
Major damage is getting occurred to the economy- non withstanding a social life. It is the fourth largest railway networking the world exceeded only by those of the United States, Russia and China. In most of the countries, rail transportation is the backbone of trade and economy. Railways give energy economical means to transport material over land. The railway tracks are an outsized part of the system give sleek and arduous surfaces on that the wheels of the train roll with a trifle friction. There is also a view that the current framework needs to be modernized and better aligned with safety legislation that applies to other modes of transport in India. In general rail transport in India growing at a rapid pace, the associated safety infrastructure facilities have not kept up with the aforementioned proliferation. Our facilities are poor when compared to the international standards and as a result, we have been having frequent derailments that have resulted in severe Loss of valuable human lives and also property. To demonstrate the gravity of the problem, 1 Statistics say that there have been 11 accidents in 2011 till the month of July alone, which leaves much to be desired regarding rail safety. India has fourth largest rail network in the world comprising 115,000 km of railway tracks. Approximately, 60 percent of rail accidents are due to derailments, of which, 90 percent are due to cracks problems. The principle point of the present exploration work is to outline and create a strong safety framework for train tracks that can avoid accidents and give data on mischance. These days' trains' accident cases are higher than any other Time, it has gotten to be fundamental to give train tracks superb safety system with fault detecting technique. The mix of those factors has place extended pressure on the present infrastructure, resulting in enlarged demand in examination and maintenance of rail assets. The expenditure for examination and maintenance has so adult steady over the previous couple of years while not but being followed by a major improvement of the industry's safety records. The fault detection and maintenance in Indian railway is being carried out manually now a days, which is a tedious task. The organization of paper is as follows: Section II discusses the statistics of rail accidents in India along with the recent methods used for crack detection in railway system. Section III gives details about the block diagram of this project and section IV discusses results. Section V concludes the project in brief.

II. Proposed System

This system involves the design of crack finding robot for finding cracks in railway tracks. This system

uses controller for interfacing the robotic vehicle e and crack detection sensor. The stress on the wheels and rails are the primary indicators. Strainguages are employed for measuring the above said factors. Knowing the dynamic parameters of the rail (Young's modulus E, Poisson's ratio ν) and its geometrical characteristics (web thickness t, geometrical moment of inertia I, first moment of space H) the theoretical value of the strain can be calculated for a particular stress. In the Current System the principle involved in crack detection is the concept of IR (infra-red sensor). In the proposed design, the IR transmitter will be attached to one side of the rails and IR receiver to the opposite side. During normal operation, when there are no cracks, the transmitter light does not fall on the receiver. This project uses regulated 3.3V Power supply the project is suitable for Indian scenario The system can be operated at tunnels also, without interruption. IR sensors are used for obstacles detection.

III. Future Scope

By using various sensor networks techniques we also develop more and more reliable security systems applications, in which continuously monitors the railway track through the sensors and detect any abnormality in the track. By using GPS in this system we can monitor position of railway and display on digital map. Enhance features of GPS includes video feature, trace mode, history track. By using Wireless sensor networks techniques we also develop more and more reliable security systems applications, in which continuously monitors the railway track through the sensors and detect any abnormality in the track. The sensor nodes are equipped with sensors that can sense the vibration in the railway track due a coming train. The geographical positioning sensors are placed on the trains. Future work will aim to implement this method in all places where the track runs. But for this, range and Wi-Fi connections must be set up even in the remote places. Or else, newer methods can be developed which will ensure that this system of rail crack detection can be used even in the remote places. Also, if range of IR sensors can be improved, then the device can reach longer distances in shorter time. Nowadays in the current railway systems, it is becoming necessary to have safety elements in order to avoid accidents. the causes that can provoke serious accidents is the existence of obstacles on the tracks, either fixed or mobile. In this project circuits, sensors & motor are used which require +12V & +5V (DC) supply, to fulfill this requirement we have used following circuit of power supply which provides regulated +12V & +5V (DC).As shown above Transformer (15V/1A) is used to down convert the AC up to 15V . 4 diodes (IN4007) are connected to secondary of transformer in bridge for rectifying AC into DC. Capacitor 1000 µf & 1µf are used as a filter red led shows that rectification and filtering is ok.7812 IC is used as a 12V regulator it converts 15V into regulated +12V DC, yellow led shows that output of 7812 is ok.7805 IC is used as a 5V regulator it converts 12V into regulated+5V DC, green led shows that output of 7805 is ok. Instead of using manual method of crack detection, the use of this method helps inefficient and fast management of crack detection in track. Also the respective monitoring office will gets instant information about crack detection which will also reduce unwanted workload on them. And then key aspect to keep our city secured from the accidents caused by improper and unmaintained track.

IV. Methodology

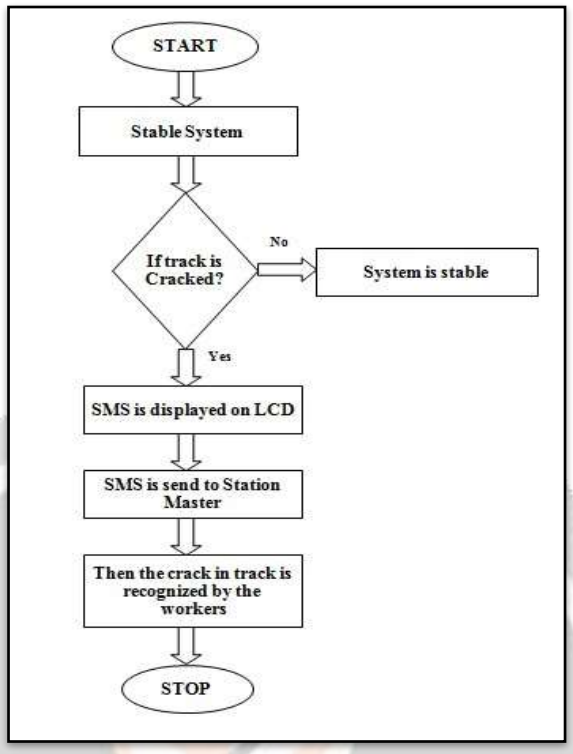


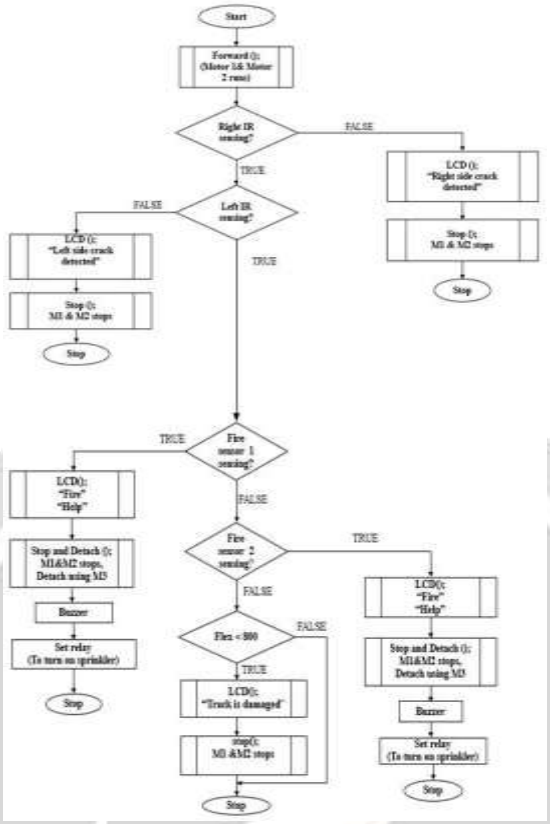
Fig.3. Flow Chart

1. The system can be operated at tunnels also, without interrupts.
2. Ultrasonic sensors are used for monitoring the deviation in tracks.
3. IR sensor is used to detect the cracks and breakage of tracks.
4. Transmitting the information to the current train which comes on the track.
5. Detection & Prevention of Fire Hazards in train.
6. IR sensor is used to detect the crack on the railway track by not receiving the echo from the track if the echo sound is received then no crack is detected in the track.
7. The output of the IR sensor is given to the microcontroller, which is connected to the GSM and motor driver with DC motor that acts as sensor that detects the train and gate is closed until the train completely moves away from barrier.
8. Hence, automatic of the gate operations at the train barrier is achieved using IR sensor.
9. Once the fire sensor that is connected to the controller attached in the compartments of the train senses the fire it sends the alert message
10. They include the infrared LED and LDR that depends on the light, when light reflects on the LDR then the resistance decreases and increases in the dark.
11. Regulated power supply is reduced that separates the coaches that are connected after the fire detection.
12. The train starts moving forward when the motor's input (namely Motor 1 and motor 2) are set high. There are 2 IR sensors placed in front of the train on both the sides (Left and Right).
13. In gate controlling unit, we use two IR sensors (to detect arrive and departure of train), Red and green LED (to indicate the traffic flow) and a motor (to open and close the gate).
14. The first IR sensor will detect the arrival of the train. As soon as it senses the gate will close with help of motor.
15. The red LED glows indicating the vehicles on the road to stop. The second IR sensor will constantly be sensing movement of the train.
16. . Once the last compartment of the train leaves the gate crossing there will be no movement for sensing.

V. Hardware And Software

i. Hardware

- ARM LPC2148.
- Regulated Power Supply.



- IR Sensor.
- Motor Driver.
- DC Motor.
- Liquid Crystal Display.
- Microcontroller (8051).
- Relay.
- Wi-Fi [ESP8266].
- Sprinkler.
- Fire Sensor.
- Flex Sensor.
- Buzzer.

ii. Software

- KEIL µ VISION.
- Embedded C.
- Flash Magic.

VI. CONCLUSION

Cracks in rails have been identified to be the main cause of accident in the past. Hence, solution of this

problem, using robot to detect the cracks in railway track and when robot detect the fault it sends the message to base station. The idea can be enforced in large scale to facilitate higher safety standards for railway tracks in future. The proposed system can have an excellent impact on the security and maintenance of tracks. Accidents occurring in railway transportation systems cost a large number of lives. Many people die and several others get physical and mentally injured. Accidents are the major causes for traumatic injuries. Cracks in rails have been identified to be the main cause of derailments in the past. Hence, owing to the crucial solution of this problem, we have worked on implementing an efficient and cost effective solution suitable for this application. The working model for efficient and cost effective crack detection on the rail tracks has been developed successfully.

VII. REFERENCE

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