



# **A Novel Approach Railway Track Error Detection Robot Using GPS Technology**

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**ABSTRACT:** The Indian railways are the largest rail passenger transport in today's world and it is the back bone of the country transport infrastructure. Almost nearly 24 million passengers use the railway system on a daily basis. Railway authorities had made an analysis of the recent accidents and customer complaints to provide a safe and secured system which can be widely used throughout the railway connecting system. India possesses fourth largest network in the world exceeded only by those of the United States, Russia and China. One of the most widely used and comfortable modes of transportation system is train, but occasionally, accidents are occur due to collision as well as other reason. It is very difficult to stop such collisions because of speed of moving trains, which is needs a lead distance to stop. Collisions are happened due to human errors and/or faulty equipments. The main problem about a railway analysis is detection of cracks in the structure. If these deficiencies are not controlled at early stages they might lead to a number of derailments resulting in a heavy loss of life and property. This project proposes a cost effective solution to the problem of railway track crack detection utilizing Zigbee control assembly which tracks the exact location of track damage which then mended immediately so that many lives will be saved.

**KEYWORDS:** Global System for Mobile (GSM), Infrared (IR), Gear Motor,

## **I. INTRODUCTION**

In general rail transport in India growing at a rapid pace, the associated safety infrastructure facilities. Analysis of the factors that cause these rail accidents, recent statistics reveal that approximately 60% of all the rail accidents have derailments as their cause, of which about 90% is due to cracks on the rails either due to natural causes (like excessive expansion due to heat) or due to anti- social elements. These cracks and other problems with the rails generally go unnoticed due to improper maintenance and the currently irregular and manual track line monitoring that is being carried out in the current situation.

The principal problem has been the lack of cheap and efficient technology to detect problems in the rail tracks and of course, the lack of proper maintenance of rails which have resulted in the formation of cracks in the rails and other similar problems caused by anti-social elements. The sensor network is a wireless network formed by a group of sensors deployed in same region, which can be used to measure the air pressure, temperature, acceleration, etc. Sensors can transmit signals via radio signal. Since sensors are now small and cheap, they can be deployed on a large scale. It becomes more and more important for applications like security, traffic monitoring, agriculture, battlefield, etc. Most of those sensors are powered by batteries. This project proposes a cost effective solution to the problem of railway track crack detection utilizing Zigbee control assembly which tracks the exact location of track damage which then mended immediately so that many lives will be saved.

## **II. CURRENT INDIAN RAILWAYS SAFETY**

### **2.1. Present Perspective Indian**

Railways are the world's second-largest railway, with 6,853 stations, 63,028 kilometers of track, 37,840 passenger coaches and 222,147 freight cars. Annually it carries some 4.83 billion passengers and 492 million tons of freight cars.

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Of the 11 million passengers who climb aboard one of 8,520 trains each day, about 550,000 have reserved accommodations.

## 2.2. Train Collisions

Collisions are the most dreaded accidents. It is very difficult to stop such collisions because of speed of moving trains, which need a lead distance to stop. Collisions happen due to human errors and/or faulty equipment. Two types

1. Head-On
2. Rear-End-Collisions

A head-on collision is one where the front ends of two ships, trains, planes or vehicles hit each other, as opposed to aside-collision or rear-end collision.. With rail, a head-on collision often implies a collision on a single line railway.

## III.LITERATURE SURVEY

The finding of cracks in railways tracks takes time consumption due to manual checking. It reduces the accuracy too. This method of design is having limited intelligence and time consuming. A literature survey on the existing techniques for crack detection reveal a number of sophisticated and accurate crack detection technologies. First, in the Indian rails, typically there are small gaps in the rail tracks to provide for thermal expansion during the summer. This design is provided so as to ensure that the track does not twist or crack due to the heat. When the existing technique of crack detection was implemented, it was found that the system was giving false positive signals; that is, it was counting the thermal gaps as cracks. Another issue faced during practical implementation is the presence of railway bifurcations. If the mechanical design of the robot is unsuitable, then it will have a tendency to either get stuck in these bifurcations or in worst case even fall out of the tracks.

## IV. PROPOSED SYSTEM

The core of the proposed crack detection scheme consists of a IR sensors that functions as the rail crack detector. In the proposed design, the IR will be attached to both side of the robotic vehicle. it also provides actual distance position of the crack in the track.



Fig 1: Proposed embedded system Design

#### 4.1. Block Diagram

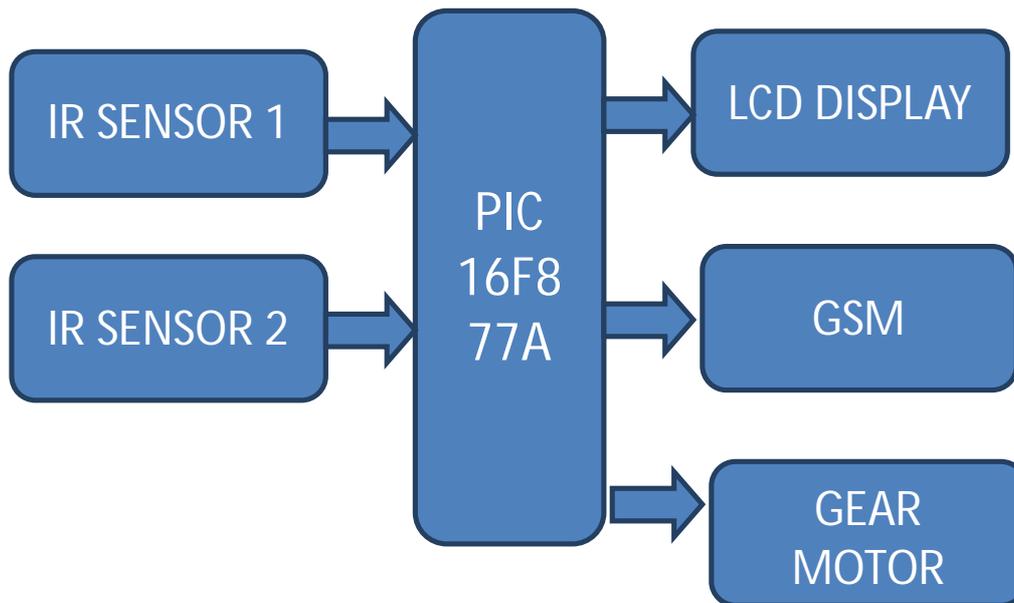


Fig 2: Block Diagram of Proposed Embedded Design System

#### 4.2. Microcontroller

Microcontroller is a standalone unit, which can perform functions on its own without any requirement for additional hardware like I/O ports and external memory. The heart of the microcontroller is the CPU core. In the past, this has traditionally been based on a 8-bit microprocessor unit. In the recent years, microcontrollers have been developed specifically designed CPU cores, for example the microchip PIC range of microcontrollers. The microcontroller that has been used for this project is from PIC series. PIC microcontroller is the first RISC based microcontroller fabricated in Complementary Metal Oxide (CMOS) that uses separate bus for instruction and data allowing simultaneous access of program and data memory. The main advantage of CMOS and RISC combination is low power consumption resulting in a very small chip size with a small pin count. The main advantage of CMOS is that it has unity to noise than other fabrication techniques. Technology that is used in PIC16F877 is flash technology, so that data is retained even when the power is switched off. Easy programming and erasing are features of PIC16F877.

#### 4.3. Global System for Mobile (GSM)

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.

While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

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Fig 3: Schematic View of GSM

## 4.4. IR Sensor

Infrared (IR) technology addresses a broad variety of sensing and remote control. An IR Emitter is a light emitting diode (LED). Different types of IR LEDs are specified based on their packaging and special features, such as output optical power, wavelength, and response time.

An IR Receivers are also called sensors since they detect the wavelength and spectral radiation of the light from the IR emitter. IR receivers are specified by optic features, packaging, special circuitry such as an ambient light filter, wide viewing angle, and more. Wireless applications, especially in the areas of sensing and remote control.

## 4.5. Robot platform-Gear Motor

A Gear motor is a brushless, synchronous electric motor that converts digital pulses into mechanical shaft rotation. Every rotation of the Gear motor is divided into a discrete number of steps, and the motor must receive a separate pulse for each step. The size of each step is same and the Gear motor can only take one step at a time. Since each pulse causes the motor to rotate a precise angle, typically  $1.8^\circ$ , the motor's position can be controlled without any feedback mechanism. The speed of rotation directly proportional to the frequency of the pulses.

## V.SIMULATION AND RESULTS

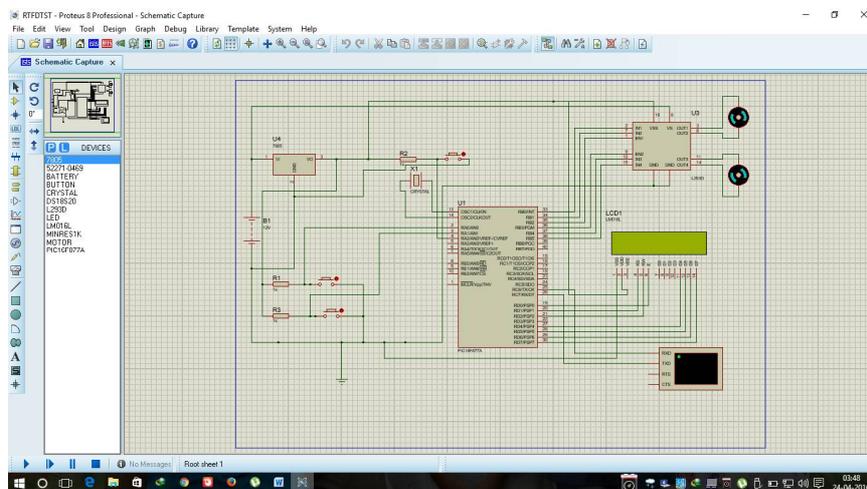


Fig 4: Simulation model



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## **VI.CONCLUSION**

In this project, track damage detection system for trains have been designed, simulated and tested. The simulation has been done using proteus and testing has been carried out using the developed prototype. It has been estimated that if the system is implemented in railways, trains accidently on the track fault detects automatically stops train and send the location of the track fault to control station to alert, train collision can be prevented and human life saved if this system is implemented.

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