

Crack and Object Detection of Railway Track with SMS based Real time Information System

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Abstract

In the current rail system, it is more necessary to have safety elements in order to avoid accidents. One of the important causes that can provoke serious accidents is the existence of obstacles on the tracks either fixed or mobile and the cracks that are In the current rail system, it is more necessary to have safety elements in order to avoid accidents. One of the important causes that can provoke serious accidents is the existence of obstacles on the tracks either fixed or mobile and the cracks that are happened to the track. This project deals with one of the efficient methods to avoid train collision and obstacles detection and crack detection. This project aims for the detection of cracks in railway tracks, distance between the tracks and the presence of humans on railway tracks. In the current rail system, it is more necessary to have safety elements in order to avoid accidents. One of the important causes that can provoke serious accidents is the existence of obstacles on the tracks either fixed or mobile and the cracks that are happened to the track. This project deals with one of the efficient methods to avoid train collision and obstacles detection and crack detection. This project aims for the detection of cracks in railway tracks, distance between the tracks and the presence of humans on railway tracks. The design of system consist a Global Position System (GPS) module, Global System for Mobile (GSM) modem, Infrared (IR) sensor. Now a days, the cracks in the railway track are measured by a high cost Linear Variable Differential Transformer (LVDT) with a less accuracy. In proposed system, the IR sensors are used for detect the crack in the rail track, ultrasound sensors measure the distance between the two trains on track. If any cracks or obstacles are detected on the railway tracks or if any change in the distance between the two tracks, the longitude and latitude of the track location is messaged to the nearest railway station using GPS and GSM modems. The proposed system is compared with the traditional measuring systems, where it stands as an efficient and cost effective system for railway applications.

INTRODUCTION

Transport is very important to carry the passengers and goods from one place to another. The better transport leads to more trade. Economic level is mainly depends on increasing the capacity and level of transport. This paper presents an implementation of an efficient and cost effective solution suitable for railway application. The project relates to the detection of cracks in the railway tracks using IR sensor. According to a possible embodiment, the railway carriage carrying the control equipments is provided with sensor orientated to detect the crack. This project pertains to a process for monitoring the condition

of rail on train tracks and more specifically has the object of the identification of defects detected by monitoring equipment on the tracks to be checked to allow maintenance crews to subsequently find these defects. Two IR sensors are fixed near the wheels of the train is used to find out the crack on the rail. Each sensor will produce the signal related position with the rail. If the track is said to be normal on its position when both the sensor gives the constant sensed output. If anyone misses their output condition to fail then there is defect on that side. It will inform this by giving alarm. Where sensors and alarm should connected to the microcontroller I/O lines and microcontroller is programmed to our needs.

The 60% of accidents in railways are due to track problems which lead to derailment. This project presents the system for automatic crack detection in railway tracks.

India has one of the world's largest railway networks, manual Inspection and detecting a crack on these railways tracks is very tedious process and consumes lot of time and human resource. The project aims in designing railway track crack detection autonomous vehicle using Microcontroller, IR obstacle Sensors assembly system, which detects the cracks along its path and send sends the alert information to both Station Manager of opposite side Railway Station.

What is EMBEDDED C?

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems

Why EMBEDDED C is important?

Embedded C is a programming language that is used in the development of Embedded Systems. Embedded Systems are specialized systems designed to perform very specific functions or tasks. Embedded System is the combination of hardware and software, and the software is generally known as firmware which is embedded into the system hardware. Embedded C is used to program a wide range of microcontrollers and microprocessors. Embedded C requires less number of resources to execute in comparison with high- level languages programming language.

LITERATURE SURVEY

1. In 2017, Ishan Jain, Shubham Malik and Soumya Agrawa from India with the title “Automatic Railway Barrier System, Railway Tracking and Collision Avoidance, International Journal of Computer Applications” proposed a system helps to detect track, and to find the train collision. Also the system warns the train driver through SMS if the collision is about to occur.
2. In 2014, Prof Navaraj from India with the title “Crack Detection System for Railway Track using Ultrasonic Sensor” This proposed system aims for the detection of cracks in Railway tracks, distance.
3. In 2016, Naresh PS and Bharatha from with the title “Identification of type and degree of railway ballast fouling using ground coupled GPR antennas”. GPR studies were carried out on model and actual railway tracks using three ground coupled antennas and considering three fouling materials.
4. In 2016, Ramesh S from India with the title “Detection of Cracks and Railway Collision Avoidance System” This proposed system has the ability to avoid the Railway collision.
5. In 2017, Er.Kunduru Umamaheswari, Er. Polepogu Rajesh With the title “An Arduino Based

Method For Detecting Cracks and Obstacles in Railway Tracks”. This proposed system has the ability to detect the cracks and obstacles if any on the track.

EXISTING SYSTEM

A broken train speaks about one of the world's major causes of more expensive and dangerous rail accidents. Taking into account incidents in general, all considered in us alone, for every three days there is more than one major demolition, consistently over 10 years. Accessible interventions when the broken track clashes in different countries are disrupted do not sufficiently help to understand the political, social and ecological effects. In the current framework, when the track is open, the framework is forced to hurry up and out along the track at irregular intervals. Often, it will send an exception flag to the technician using a remote module just in case something stands out divided on the line. Divisions are detected by IR sensors and the error flag (SMS of GPS Location) is conveyed.

PROPOSED SYSTEM

In this proposed system, we have designed a innovative solutions to check the track status, if there is Crack using Surveillance Vehicle. Ultrasonic sensor is used to find and any obstacle and Generates buzzer alert and stop vehicle. IR sensor is used to detect any Railway Track Crack and send Location SMS to the Station master. 12V Transformer based power supply is used to supply voltage to the system.

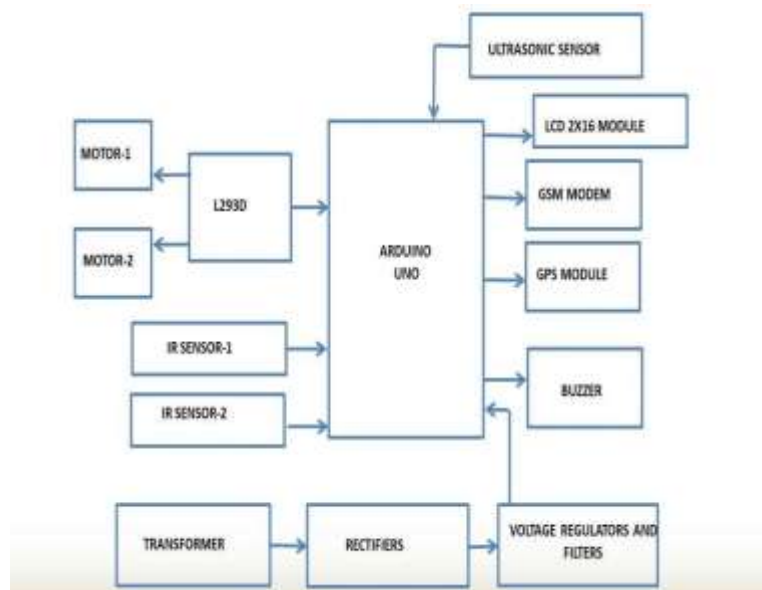


Fig1. Block diagram

SOFTWARE

AVR studio is an Integrated Development Environment (IDE) developed by ATMEL for developing different embedded applications based on 8-bit AVR microcontroller. Before the installation of AVR Studio you have to install the compiler WinAVR. By installing WinAVR allow AVR Studio to detect the compiler.

METHODOLOGY

This innovative system is designed using the central component of Arduino Development Board. The

vehicle is powered using 12V Transformer Power supply along with Voltage Regulators and Filters Capacitors. Start Button is pressed to Start Vehicle and Mosfet / Relay based Motor Drivers is used drive two Motors. The vehicle moves along the path of railway track and IR sensors mounted on the vehicle front end will inspect the track along the path. When any crack or deformation is detected on the track the vehicle stops, Retrieves GPS Location and Send Alert SMS to Predefined Numbers and High Frequency Alert Sound is also produced. After few seconds again Vehicle starts and search for another Crack. LCD 2x16 is used to display the Alert information to the Train Driver. Embedded C Programming Language is used to program this controller and update using onboard usb programmer. This System is also equipped with Ultrasonic Sensor to sense if there is any Other Train / Obstacle coming from opposite direction on same track. If any Train is detected, then Vehicle Stop, generates buzzer alerts and Starts again, if Obstacle removed.

Embedded C Programming language and Arduino IDE Compiler is used to write logic of the project. Onboard usb programmer is used to upload the code. Lcd Module is interfaced to Digital Pins 2,3,4,5,6,7. Ultrasonic sensor are connected to A4, A5 and Motors are connected to A0-A3 pins.

This system thus can be used in many domestic applications and in industrial setups. The power supply setup of the system contains a step down transformer of 230/12V, used to step down the voltage to 12VAC. To convert it to DC, a bridge rectifier is used. Capacitive filter is used which makes use of 7805 voltage regulator to regulate it to +5V that will be needed for microcontroller and other components operation, in order to remove ripple.

ADVANTEGES

- Real-time notification to the Authorities using SMS
- Approximate Geo – Location using GPS Module
- IR Sensor based Tracking System
- Anti Collision technique help to avoid accident if train comes in opposite direction

APPLICATIONS

- Railway Track Crack Detection
- Bus and Truck for Anti collision Techniques
- Shunting Trains in Industries
- Toy Trains in Parks

EXPERIMENTAL RESULTS RESULT

The project “railway track cracking detecting robot “was designed such that to

design locating system without using GPS communication module. Project presents an automotive location position very soon after the detection of the crack in the railway track and also in the times of obstacle detection. The system permits localization of the detection using base station network through GSM modem tower signals and transmitting the position to the microcontroller the controller takes the responsibility to transmit the location using the GSM_SMS services.

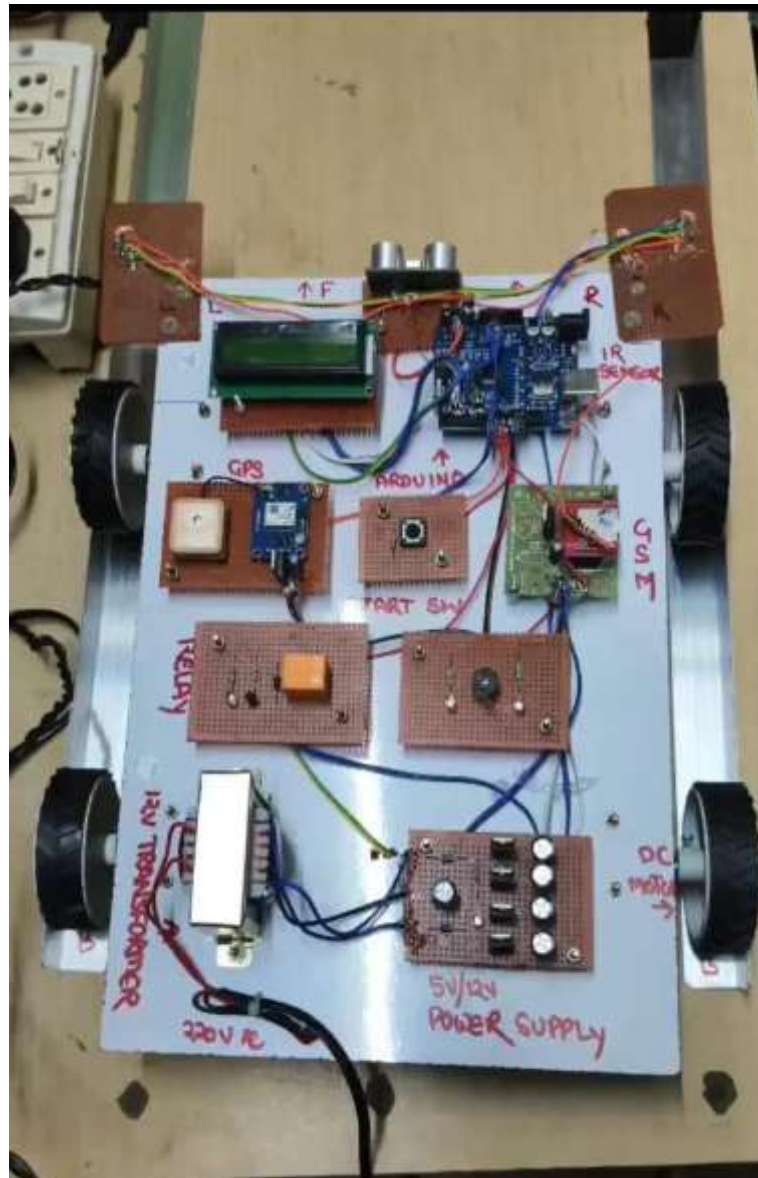


Fig2.1: before supply

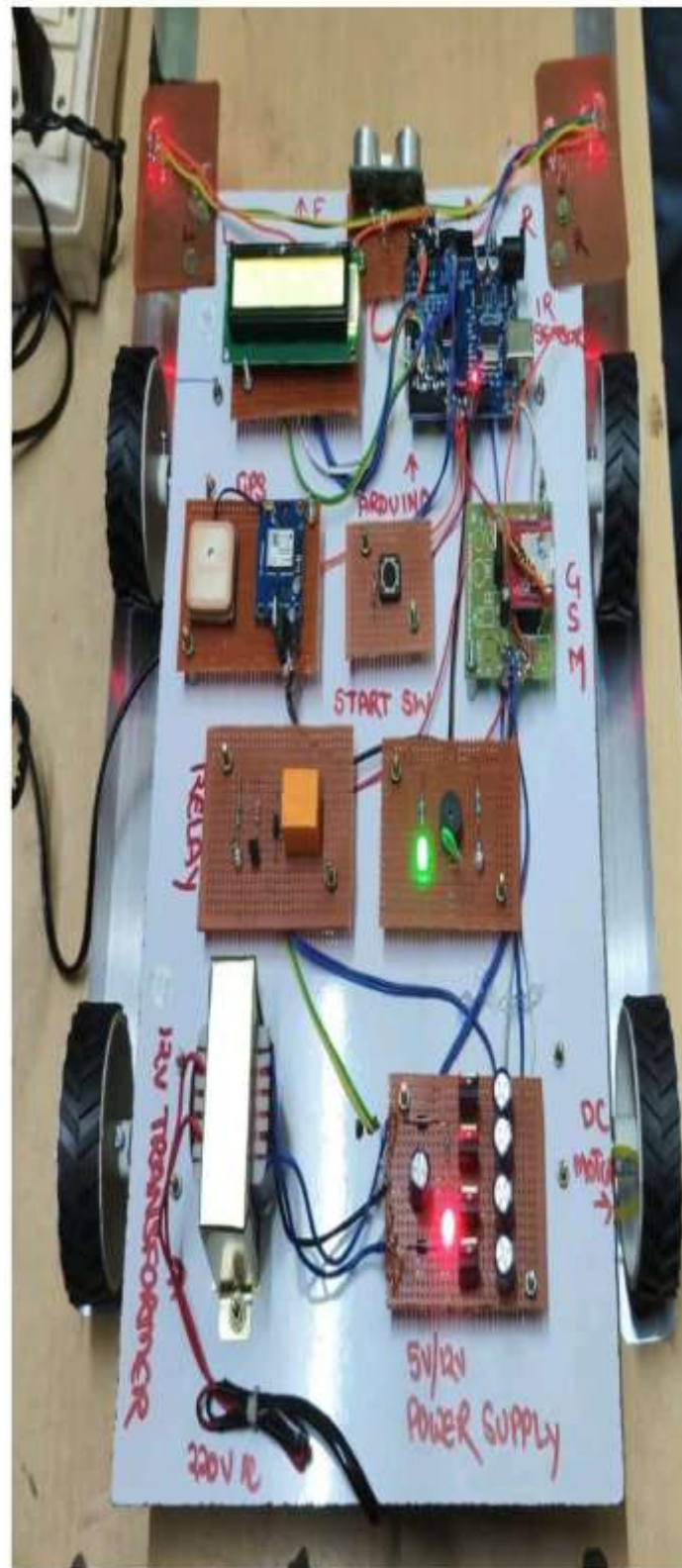


Fig2.2: aftersupply

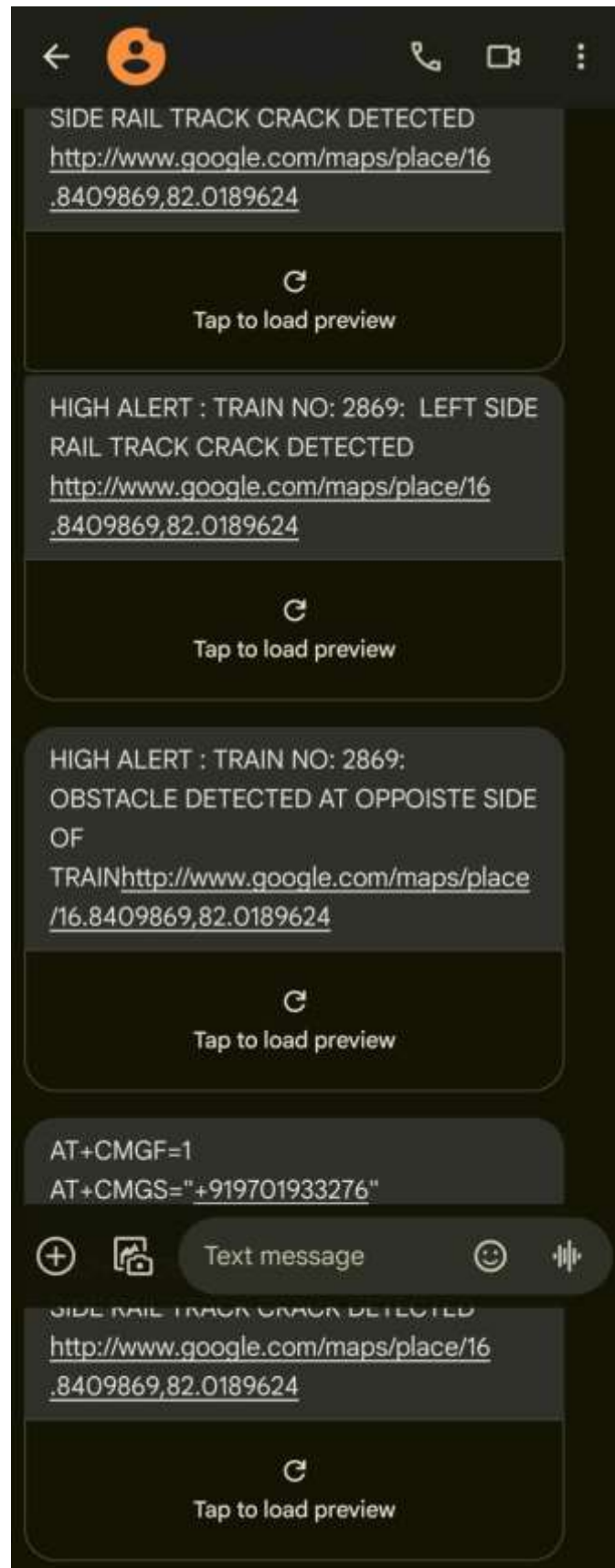


Fig2.3:Alertvia sms

CONCLUSION

As per the study the existing systems are time consuming as well as uneconomical. The proposed system is not only overcome these problems but also improve accuracy and crack detection in rails. It is the most economical solution provided in order to achieve good results of railways of our country in order to minimize the stats of accidents caused.

There by possible to save precious lives of passengers and loss of economy. It also saves the time and money for identification of crack. Anti-collision technique helps train to collide in head-on direction. This technique are also now applying in commercial 4 wheeler vehicles.

FUTURE SCOPE

Further this system can be Implemented in Trains with multiple sensors such as Temperature, Gas and other Sensor as a Safety features and Send alerts or SMS if any accident occurs.

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