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RAILWAY TRACK CRACK DETECTION SYSTEM USING GPS AND GSM

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ABSTRACT

Indian Railroad is one of the biggest railroad systems on earth. Despite the enormous development of the Indian Railroads, some accidents occur due to the cracks in the railway track. To overcome this major problem we have proposed a monitoring device that used to detect the crack in the track and to send SMS via GSM and GPS module with the help of Arduino UNO.

The main goal of our project is to ensure the safety of both people and the cargo. The device processes the data from different sensors set up on the railroad lines using Arduino microcontroller.

The sensors detects the cracks and and the microcontroller analyses the information gathered by the sensors. Then the device contacts the relevant authorities alerting them about the threat. The alert system uses the GPS and GSM module to send crack detection location through SMS format. The alert may appear as alarm or message on the screen.

The Railway Crack Detection system that uses Arduino is cost effective and straightforward to implement making it viable solution for railways worldwide.

INTRODUCTION

In today's world, transport, being one of the biggest drainers of energy, its sustainability and safety are issues of importance. This is the fourth largest railway network in the world. The Rail transport is growing at a rapid pace in India. It is one of the major modes of transport but still our facilities are not that accurate, safer as compared to international standards. A survey on the internet states that about 60% of all the rail accidents is due to derailments, recent measurements shows that about 90% are due to cracks on the rails. Hence, it is not safer for Human Life. This needs to be at the utmost attention. This is need to be at the utmost

attention. These goes unnoticed and the properly maintenance of tracks is not done. This model says about a proposed proto type of testing train for detecting obstacles and crack.. To overcome this disadvantage, here proximity sensor is used, which will detect the crack accurately. This project discusses a Railway track crack detection using sensors and is a dynamic approach which combines the use of GPS tracking system to send alert messages and the geographical coordinate of location. Arduino Microcontrollers used to control and coordinate the activities of this device. The existing system is slow, tedious and time consuming. This system has GSM and GPS module which will give the real time location or coordinates in the form of Short Message Service(SMS) to the nearest railway station .To identify defects or symptoms of digital images of track elements the Railway service presently uses machine vision technology and for analysis of images uses custom algorithms.
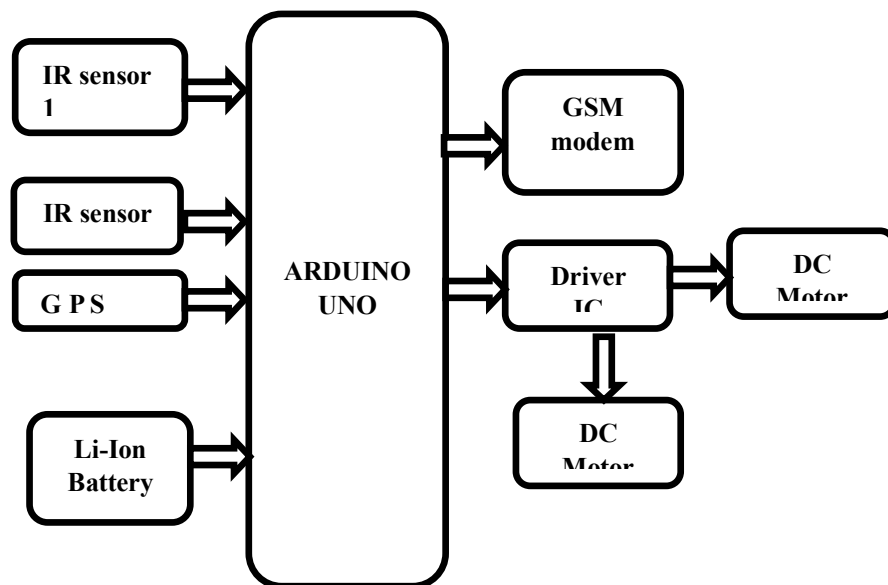

Figure.1 Block Diagram

OBJECTIVE OF THE PROJECT

The main objective of the proposed system is to detect the tracks and avoid much accidents. The defect in crack can be found out easily and the preventive measures will be taken immediately. The proposed system not only replace the human inspection but also is beneficial in terms of time and money and makes the inspection very much easier and accurate. Basically, the system operations start with initiating the motor. Initially, the motor starts, which in turn actuates the IR sensor. IR sensor is used to detect the cracks in the track. So, the motor operation is to drive the vehicle forward. IR sensor performs its operation scanning and detecting the

cracks on the track, when the crack is detected, it will stop the vehicle. Now, GPS will operate getting the coordinates of the location. So, now GSM Module comes into picture which operation is to transmit message to the control room of railway. So, GSM will send a message as "Obstacle Present" as to the predetermined location. When both the messages are sent and the program will go again on the initial stage and the motor will start again, and it will scan the track.

LITERATURE SURVEY

1.**Review of Existing Systems**: Explore previous studies and projects that have implemented crack detection systems for railway tracks. Look for systems that utilize various technologies such as sensors, imaging techniques, or remote monitoring.

GPS and GSM Integration: Identify studies or projects that have integrated GPS and GSM technologies into infrastructure monitoring systems. This could include applications in transportation, structural health monitoring, or asset tracking.

Crack Detection Techniques: Investigate different techniques for detecting cracks in railway tracks, including visual inspection, acoustic monitoring, vibration analysis, and electromagnetic testing. Evaluate the effectiveness, accuracy, and limitations of each technique.

GPS-based Positioning Systems: Examine research on GPS-based positioning systems for railway applications, including train tracking, asset management, and safety monitoring. Look for studies that address challenges such as signal accuracy, reliability, and real-time data processing.

GSM-based Communication Systems: Review literature on GSM-based communication systems for remote monitoring and control of infrastructure assets. Explore studies on data transmission protocols, network coverage, power consumption, and security considerations.

PROPOSED SYSTEM

In proposed system crack in the tracks is detected by means of sensor and Arduino microcontroller, measuring distance for two railroad. In this project we use ultrasonic sensor to detect the crack. It uses to measure the distance between the two tracks. If any crack are occurred in the track means longitude and latitude coordinates of the place are to be sent to the

nearest station or control room and IR sensor measured the distance between the two track if there is any small variance found the message which contains coordinates of that particular place will be sent to the nearest station or control room with the help of GPS and GSM module. This project is to be made in order to change the system of crack detection in railways which can be resulted out as not only costeffective but also with good accuracy and time saving facility

a) Initially the tracks are being continuously monitored with the help of sensor, which is used to detect the crack in the tracks.

b) This monitoring is done with the help of IR sensor in order to sense the minor changes also which can be quite difficult with other sensors.

c) Whenever the crack gets detected with the help of IR sensor it passes the alert of crack found to the Arduino microcontroller.
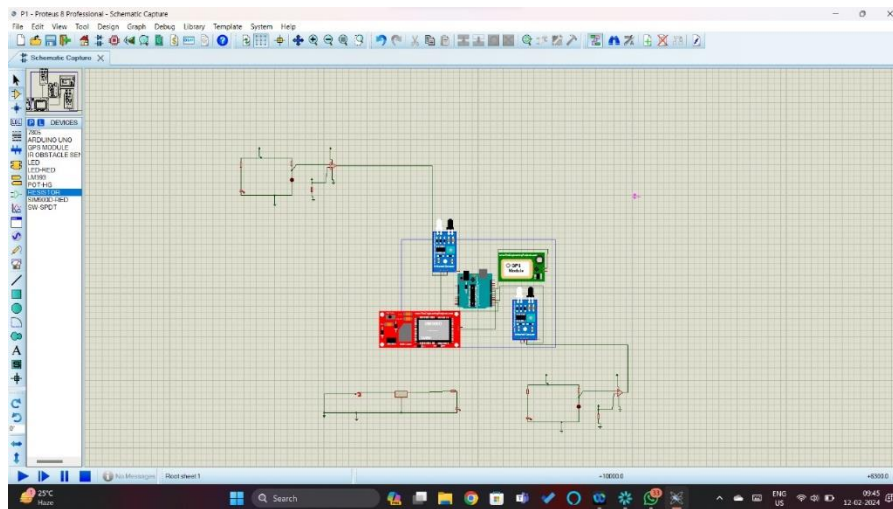

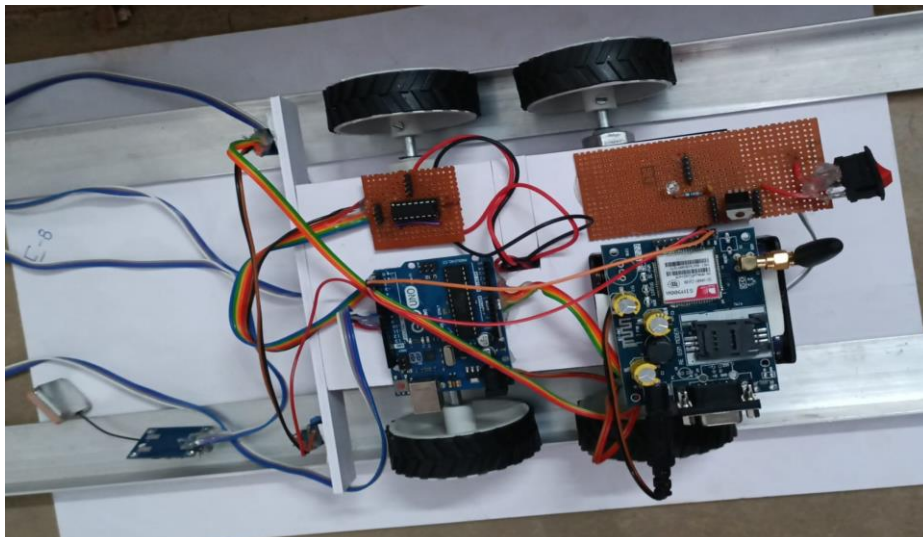Figure.2 Schematic Diagram

Figure.3 Project Setup
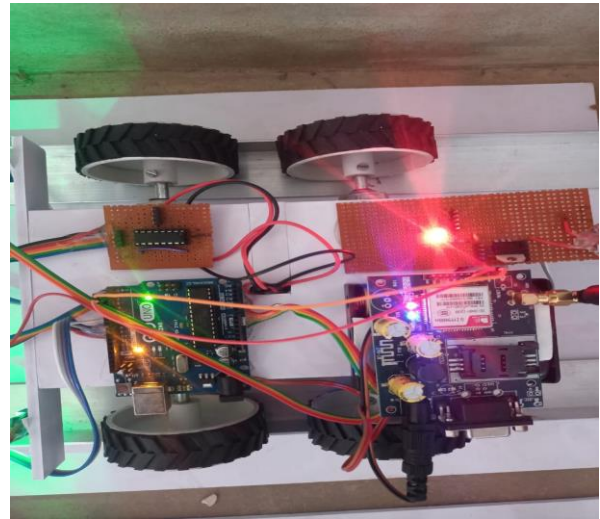
RESULTS

Figure.4 Front View of device

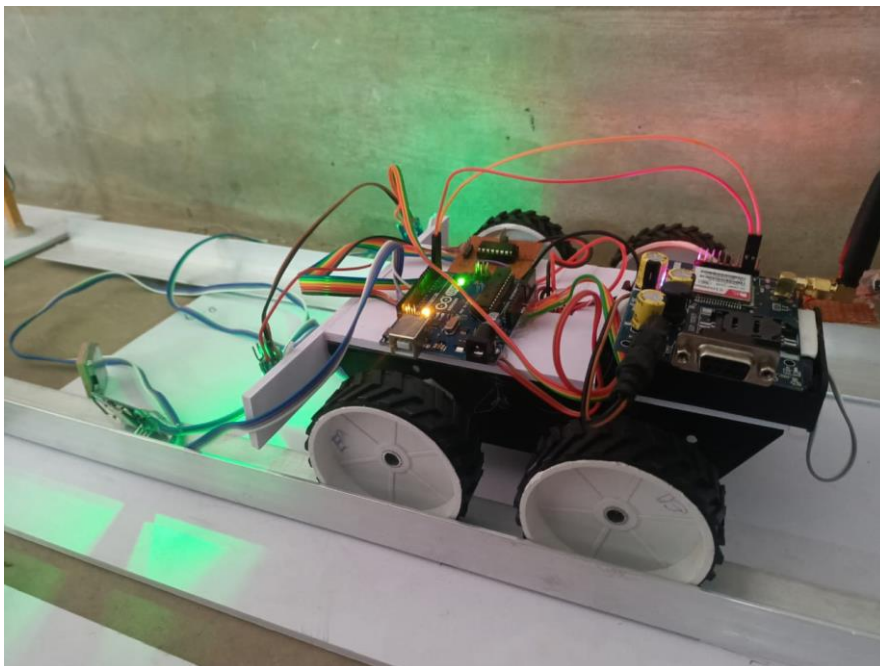Figure.5 Top view of device in ON state

Figure.6 Device in ON state

CONCLUSION

The maintenance of the tracks will be greatly impacted by the use of this automatic vehicle for railway track inspection and crack identification, which will greatly aid in the prevention of

train accidents. This vehicle can readily be used in areas where manual inspection is not feasible, such as deep coal mines, mountainous areas, and thick, dense forest regions. The automated SMS will be sent to a pre-defined phone number anytime the vehicle sensors detect any crack or deformation when this vehicle is used for railway track inspection and crack detection. This helps in maintaining and monitoring the condition of railway tracks without any errors, thereby maintaining the tracks in good condition and preventing train accidents to a very large extent. A railway track crack detection autonomous vehicle is designed in such a way that it detects the cracks or defects on the track, which, when rectified in time, will reduce train accidents. People in remote areas can use it as a means of transportation. 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. Thereby possible to save precious lives of passengers and loss of economy. It also saves the time and money for identification of crack

FUTURE SCOPE

The automated vehicle robot can be given a faster speed, but more work needs to be done in this area. In addition, improvements can be made to provide a more precise location for the fault's origin. To increase the effectiveness of this system, the robot can also be made large enough that, using its weight, the track's stress and strain parameters can be evaluated. If you want to offer robust connectivity at a low input cost, you can also add a Zigbee module for a quick, short-distance inspection mechanism. A solar supply could be used to power it. Being environmentally friendly and generally accessible, solar energy.

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