"MULTI-SENSORS: CRACK DETECTION ON RAILWAYS TRACK"

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Abstract

In India the train service is the cheapest and easiest way to transport passengers as well as long distance and urban traffic. The main cause of cracks and other rail problems is often overlooked due to improper maintenance and unusual track line monitoring that accidents on railway tracks vary according to the current situation. Crossing a railway track and cracks not exposed on railway tracks. Therefore, there is a need for new technologies that will be robust, efficient and stable in both the detection of cracks in the railway line and in the acquisition of objects. Today the system has some limitations, if the bridge or track is damaged, that information goes to the people in the train station, informing and informing the corresponding trains will take more time to disseminate that information. In order to save a person's ability to get a quick response to crack cracks we use a system crash detection system usually ultrasonic or eddy based techniques with good accuracy. This project deals with detection of train track cracks using sensors and is a flexible approach that combines the use of GPS with a GSM tracking system to send warning messages and integrate location. Adriano mini controls are used to control and coordinate the functions of this device.

Keywords: GSM Module; Arduino Microcontroller; IR sensor; voltage sensor; ultrasonic sensor; Railway Track

Introduction

In India, railway transportation service is the cheap and the majority convenient mode of passenger transport and also for long-distance and suburban traffic. The main cause of the accidents happened in railways are railway track crossing and unrevealed crack in railway tracks. Therefore, there is a need to have new technology which will be robust, efficient, and stable for both crack detection in railway track as well as to object detection. This project discusses a Railway track crack detection using sensors and is a dynamic approach that combines the use of a GPS tracking system to send alert messages and the geographical coordinate of location.

Methodology

By using this Autonomous vehicle for purpose of railway track inspection and crack detection, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle. By using this vehicle for the purpose of Railway track inspection and crack detection and automated SMS will be sent to pre- defined phone number whenever the vehicle sensors detect any crack or deformation. This will help in maintenance and monitoring the condition of railway tracks without any errors and thereby maintaining the tracks in good condition, preventing train accidents to very large extent Railway track crack detection autonomous vehicle is designed in such a way that it detects the cracks or deformities on the track which when rectified in time will reduce train accidents. By using this Autonomous vehicle for purpose of railway track inspection and crack detection, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle. By using this vehicle for the purpose of Railway track inspection and crack detection and automated SMS will be sent to pre-defined phone number whenever the vehicle sensors detect any crack or deformation. This will help in maintenance and monitoring the condition of railway tracks without any errors and thereby maintaining the tracks in good condition, preventing train accidents to very large extent Railway track crack detection autonomous vehicle is designed in such a way that it detects the cracks or deformities on the track which when rectified in time will reduce train accidents. By using this Autonomous vehicle for purpose of railway track inspection and crack detection, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily done using this vehicle. By using this vehicle for the purpose of Railway track inspection and crack detection and automated SMS will be sent to pre- defined phone number whenever the vehicle

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Research Work

Prototype model

Fig 4 Prototype model 1

3.3 COMPONENTS:

COMPONENTS	SPECIFICATIONS
Arduino UNO	32 pins, Operating voltage: 6-20 volts
GSM Module	SIM900ADual-band , operating voltage: 3.4V - 4.5V
Ultrasonic sensor	HC-SR04, Operating voltage: DC 5V
IR sensor	Operating voltage: 5V DC, I/O Pins: 3.3V &5V
Relay module	Operating voltage: 5 V DC
Dry cell battery	12V Dry cell battery
DC geared motor	Operating voltage: 12V DC
Regulator IC	Output voltage of 5 to 24V, Output current up to 1.5A
Micro limit switch	Operating current: 5A, Operating speed: 1 to 500mm/s

POROJECT MODEL

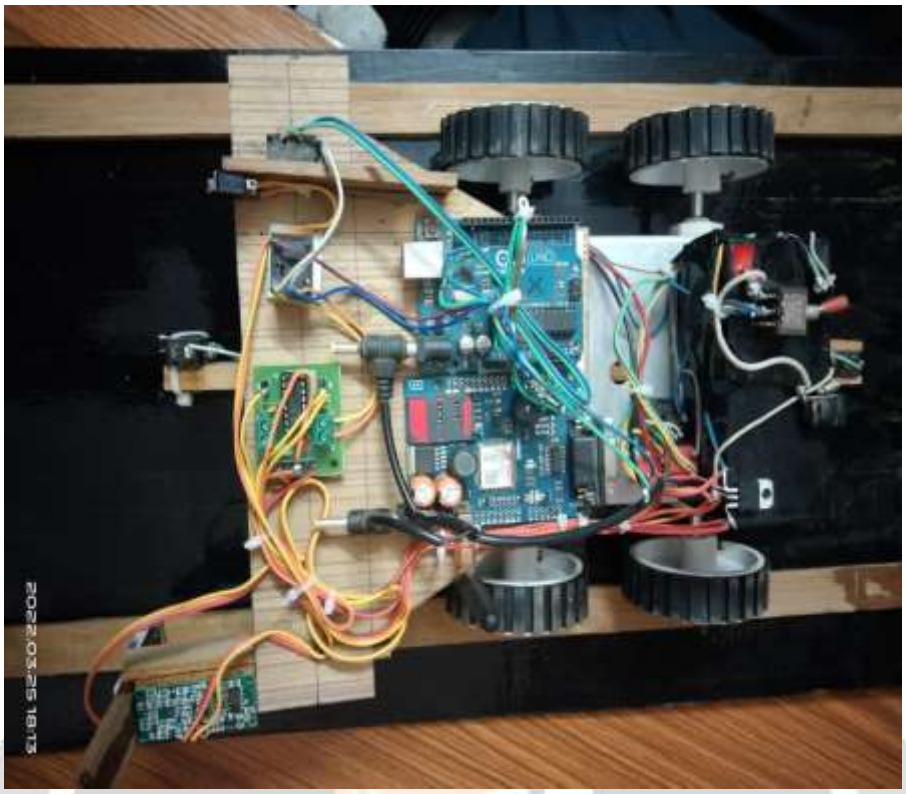

Fig 4 Prototype model 2

Main component specifications in the connection Arduino UNO Microcontroller the Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analogy inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

4.2 specifications

Arduino board Specifications Microcontroller:
ATmega328 Operating Voltage: 5V
Input Voltage (recommended): 5V
Digital I/O Pins 14: PWM O/P
Analog Input Pins: 6 DC
Current per I/O Pin: 40 mA
DC Current for 3.3V Pin: 50 Ma

4.3 DESCRIPTION

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. Byre cording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object The Ultrasonic sensor module is a convenient way for measuring distances from objects. This module has a lot of applications such as parking sensors, obstacle and terrain monitoring systems, industrial distance measurements, etc. It has a stable performance and high accuracy ranging from 2cm to 450cm with a resolution of 0.3 cm. The module sends an ultrasonic signal, eight pulses of 40kHz square wave from the transmitter; the echo is then picked up by the receiver and outputs a waveform with a time period proportional to the distance. The connected microcontroller accepts the signal and performs necessary processing. The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar. It's ideal for any robotics projects you have which require you to avoid objects, by detecting how close they are you can steer away from them. The HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object, and consists of two

ultrasonic transmitters (basically speakers), a receiver, and a control circuit. The transmitters emit a high frequency ultrasonic sound, which bounce off any nearby solid objects, and the receiver listens for any return echo. That echo is then processed by the control circuit to calculate the time difference between the signal being transmitted and received. This time can subsequently be used, along with some clever math, to calculate the distance between the sensor and the reflecting object. The HC-SR04 Ultrasonic Sensor specification In our project, there are two set of ultraviolet sensors units fitted to the front side of the vehicle. This unit is used to activate/deactivate GSM transmitter unit when it encounters any cracks in the track. The sensors in the circuit are used to sense the cracks which occur when the programmed value changes. When the vehicle is Powered On, it moves along the model track. The sensors continuously monitor the Condition of the tracks. In normal condition the motor, transmission is in initial stage. When the battery power supplies the microcontroller then it starts the motor in forward direction and serial transmission is used to send the messages to the microcontroller. When the crack is detected by the UV sensors the vehicle stops at once and the GSM module sends the text message to the predefined number with the help of SIM card that is inserted into the module and the position of the crack is sent along with the message comprising the GPS module hence this enables the operator locate the position of crack easily at the time of maintenance

a. At Normal Condition: At normal condition the vehicle is continuously sensing the defined track and the vehicle is running continuously with the fine message on the LCD display

b. At Crack Condition: As soon as the crack is detected by the system the UV sensor reflects the value equal to zero and the vehicle stops at once, The GSM module sends the text message to the predefined number with the help of SIM card that is inserted into the module to send the SMS and the GPS receiver triangulates the position of the vehicle to receive the Latitude and Longitude coordinates of the vehicle position, from satellites. The Latitude and Longitude coordinates received by GSM are converted into a text message which is done by microcontroller.

- Input Voltage: 5V
- Current Draw: 20mA (Max)
- Digital Output: 5V
- Digital Output: 0V (Low)
- Working Temperature: -15°C to 70°C
- Sensing Angle: 30° Cone
- Angle of Effect: 15° Cone
- Ultrasonic Frequency: 40kHz
- Range: 2cm - 400cm
- Dimensions
- Length: 43mm
- Width: 20mm
- Height (with transmitters): 15mm
- Centre screw hole distance: 40mm x 15mm
- Screw hole diameter: 1mm (M1)
- Transmitter diameter: 8mm

*D. Advantages***:**

1. Using this technique it provides accurate result compared to conventional manual method.
2. The system will be fully automatic
3. Save man power

E. Application:

1. It is applicable for identify the crack or gap on plane surface of wireless application. Wireless application protocol (WAP) is the communications protocol that is used for wireless data access through the most mobile wireless network.
2. The higher turbidity and imbalanced of pH in water supply used for drinking, agriculture and industry use is a serious issue

I. CONCLUSION

vehicle is designed in such a way that it detects the cracks or deformities on the track which when rectified in time will reduce train accidents.By using this Autonomous vehicle for purpose of railway track inspection and crack

detection, it will have a great impact in the maintenance of the tracks which will help in preventing train accidents to a very large extent. The regions where manual inspection is not possible, like in deep coal mines, mountain regions and dense thick forest regions can be easily
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