Automatic Railway Track Crack Detection Embedded System

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ABSTRACT: In India, Rail Transport is most commonly used mode of long distance transportation.so,safety has been one of the biggest concerned in Indian railway system.The manual inspection of crack in the railway track is too long and time consuming, so to overcome we have introduced a project in which ultrasonic sensors are used for detecting the cracksin rails.we have interfaced the microcontroller(Atmega32)with GPS/GSM module so as to get quick notifications to control unit and suitable action can be taken on it. The main aim of our project to avoid accidents, to detect the cracks in railway tracks, as soon as the crack is detected the alert messages are send to nearest control unit.

KEYWORDS: Ultrasonic sensor, GPS/GSM module, Microcontroller (Atmega32), Control unit, DC motors.

I.INTRODUCTION

India has one of largest railways networks in the word.In our system the major parameters include the detection of crack from rails using the ultrasonic sensors, as the crack will be detected the location is sent to the nearest station using GPS/GPRS modem. The detection of critical surface crack in railhead is major challenge for railway industry. The main aim of this system is to find out crack in railways tracks .with the help of sensors and module we can use them to find cracks and send alert messages to their control units.

II.LITERATURE SURVEY

In [1] authors proposed is used solar railway track crack detection vehical by using LDR sensor.Avehical ,to which power supply is given by solar panel,is so designed to detect the crack or any deformities on railway track.In[2] proposed is used to extract the train course and railroad track space which is fixed in front of the train using dynamic programming. The algorithm extracts the left and right rails using dynamic programming simultaneously. Our method does not need any static calibration process. From this purpose, a camera system was installed in front of a locomotive. proposed a technique to detect a crack in a railway track by measuring distance from track to sensors by using ultrasonic sensors.In[3] proposed it was found that there was number of unwanted modes which can be easily excitable from the railhead surface. Signal processing techniques are focused on two aspect, one involving focusing of a phased array across the railhead, the second includes an increased probe length along the rail by a spatial averaging method. The latter was found to be highly effective and robust, rendering the phased array obsolete and thus reducing both system complexity and data acquisition time.

III.BOARD HARDWARE FEATURES

A) ATMEGA32 MICROCONTROLLER

A microcontroller is a device which is self-contained with memory, peripheral and processor. It is also known as embedded controlled because it can be used as an embedded system. This part of the project forms a main control unit of the whole project. Sobasically the micro controller which is used in this project is to control the device interfaced with the device, so this forms a heart of the project.

Figure.1 IC ATMEGA32

B) ULTRASONIC SENSOR

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: Using IO trigger for at least 10us high level signal. The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

[Test distance = (high level time × velocity of sound (340M/S) / 2.]

The ultrasonic sensor module can be used for measuring distance, object sensors, motion sensor's etc. This module can be used with microcontroller to integrate with motion circuit's.

Vcc Trig Echo GND

Figure 2. Ultrasonic sensor

C) PMDC Motor

PM-DC Series permanent magnet DC motors are designed for long motor life with permanently lubricated ball bearings and are TEFC (totally enclosed fan cooled)or TENV (totally enclosed non ventilated). The DC motor voltages available are 12, 24, 90 and 180 volt.

D) GSM

GSM stand for Global System for Mobile communication is a wireless service like General Packet Radio(GPRS).The main work of this GSM system in this project is to give message of location of crack (in railway track) to the control area.

E) GPS

GPS is also known as Global Positioning System is a network which is method or working exactly where something is. A GPS system can be placed in Vehicle, devices. It can either be fixed or portable unit. The main function of GPS system is to provide the exact location and information.
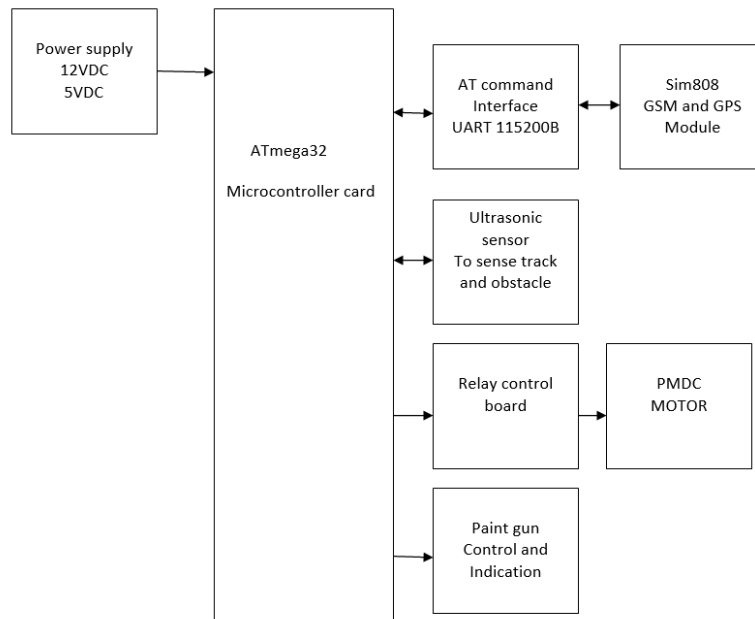
IV.BLOCK DIAGRAM

WORKING:

When power supply is given to the vehicle from power supply, it starts moving forward along the model track. Here Ultra Sonic sensor stat monitoring the cracks in the model track.

1) When crack is detected by the Ultra sonic sensor the vehicle stops there, and GPS receiver send the position of latitude and longitude co-ordinate of the vehicle from satellite.

2) This latitude and longitude co-ordinate position of vehicle received by the GPS is converted into a message, done by the Atmega32 microcontroller.

3) Now GSM Module sent this message to the predefined number with the help of Sims card inserted into the module.

BLOCK DIAGRAM:

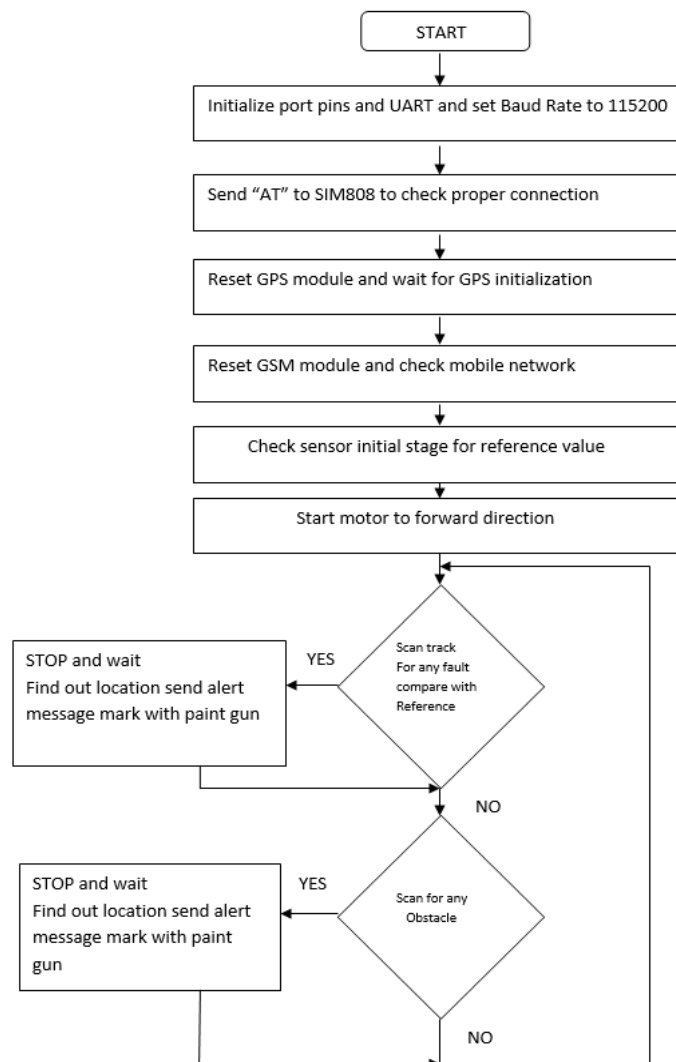**Figure.3. Block Diagram**

FLOWCHART

Figure.4.Flow Chart

Fig.5:Model

V.CONCLUSION

In this paper,we have represented a Ultrasonic Railway track crack detection system by using ultrasonic sensor.Asystem,to which power supply is given by system,is so designed to detect crack and sending sms and location to nearest control station.This can be implement to large scale which will reduce the Man labor as well as the maintenance cost.

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