AUTOMATIC RAILWAY TRACK DETECTION SYSTEM

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Abstract

In India rail transport occupies a prominent position in providing the necessary transport infrastructure to sustain needs of a rapidly growing economy. Today, India possesses the fourth largest railway network in the world (2). However, in terms of the reliability and safety parameters, we have not yet reached truly global standards. 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 system proposes a cost effective solution to the problem of railway track crack detection utilizing IR (Slot sensor) assembly which tracks the exact location of faulty track which then mended immediately so that many lives will be saved.

Keywords: IR transmitter and receiver, Crack detection, GSM, ARM 7, Motor Drive and LCDs.

I.INTRODUCTION

The Indian railways are the largest railway passenger transport in today's world and it is the backbone of countries transport infrastructure. In India most of the commercial is being carried out by the railway network because it is being cheapest mode of transportation preferred over all other means of transportation. The rapidly developing economy of India has resulted in an exponentially increasing demand for transportation in recent years and this has resulted into an enormous rise in the volume of traffic in the Indian railway network. In railway bridges any time the bridge it's striking due to weather condition floods earthquake cyclone etc. Now days system have some limitations if the bridge or track damaged that information goes to railway authority people they notifies and informs to the corresponding trains it will takes more time informing those information .These problems with the rails generally go unobserved due to lack of proper maintenance and the currently irregular and manual track line monitoring that is being carried out in the current situation. Therefore more efforts are necessary for improving safety. Railway safety is the crucial aspect of rail operation the world over. So to avoid delays our proposed system will immediately notify and informs the current train comes on the track through wireless medium a vast majority of the work done in the field of crack detection uses the infrared sensing technique and It is a well understood technique so much so that it was initially thought to be the best solution to the problem of crack detection but later it was found to be prone to external disturbances and hence came to be considered inaccurate. Techniques that employ ultrasonic and tide over some of the problems mentioned earlier but they can only inspect the core of the track that is it cannot check for surface and near surface cracking where most faults are usually located.IR sensor Used for Crack Detection on

Railway Track. It is work in pairs of Transmitter and Receiver .Limit sensor which we used it measure Distance i.e. At what distance fault is present from starting Point to fault location .In it we used 2 pairs of Slot Sensor at Right and Left side i.e. IR Transmitter and IR Receiver ,This Sensor detect Obstacle present in tracks.

II.PROPOSED SYSTEM

Automation has touched every aspect of our daily life. More and more advancement is being introduced in every field to reduce human efforts and to save time. Thinking about the same we are trying to introduce automation in the field of railway track inspection. In our project fault detection on railway track is done by different sensor modules mounted on the moving robot. The different faults which our system would encounter are: -

1. Break in rails Track.
2. Obstacle on track.

And also limit switch used for measuring purpose, it measure distance from starting point to that point where any fault present. The different techniques used for the detection of same are Infra-red Sensor (IR), limit switch and ultra-sensor .Motor Driver IC L293D Is used for drive DC motor .In this, 2 motors operate at one time,12 V Motors are used .Its Load supports 5v to 24V.All these sensor are interfaced with controller. Controller ARM7 LPC2148 is used for interfacing all components, with supporting 2 UARTS Pin. When any of the faults is detected on track, output of the sensor is made high and given to the controller.LCD display is used to Display the all conditions that happen in railway tracks and also display distance. At With this the robot is made to stop then and there and the sensed fault is send to the control room or the railway station by the by GSM module mounted on the robot. Thus the sensed fault is detected and being received at the control room.
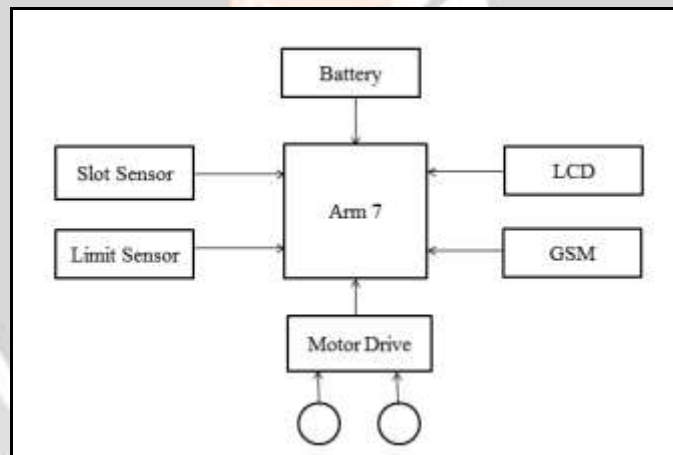

Fig.2: Block Diagram

III.COMPONENTS DESCRIPTION

The main components of automatic railway track detection are:

- IR Sensors
- GSM Transmitter and Receiver unit
- DC Motor
- LCD
- Battery

3.1 IR Sensors
In our project IR Transmitter and Receiver circuit is used to sense railway track cracks and obstacles (2) .There are 2 pairs of sensors used. It is used for obstacle detection .It have one transmitter and one receiver when any obstacle is present in this 2,it cuts the rays present between transmitter and receiver and give control signal to GSM Transmitter unit.

Fig 3.1: IR limit sensor

3.2 GSM Transmitter Unit
The modem can be used to make circuit switched data calls (CSD), making the unit suitable for remote dial-up systems Where a fixed phone line is not available. The SMS functionality enables the sending and receipt of text messages. The unit connects directly to a PC or terminal device via the DB-9 RS232 Cable interface. The integral SIM card holder accepts standard SIM cards.

Fig 3.2: GSM Module

3.3. DC Motor Driver
The L293D is a motor driver IC designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. This device is designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors.

Fig 3.3: L293D Driver IC

3.4 LCD

LCD Display is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply .Used in project to display errors occurred in tracks via GSM system.

3.5 Power Supply

The purpose of a power supply is to take electrical energy in one form and convert it into another. There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices such as computers, fax machines and telecommunication equipment. A regulated power supply maintains a constant DC output voltage through feedback action.
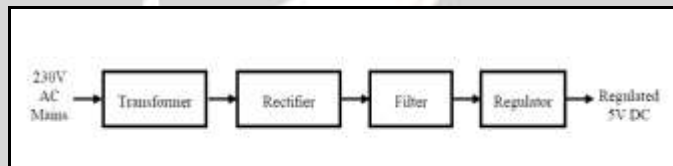

Fig.3.5: Block Diagram

IV.RESULT AND DISCUSSION

Robot continuously moves along the track to check whether any fault is present or not on the track as shown in figure 4.1.

Fig-4.1: Before detection of the crack.

When crack and any obstacle is detected, the robot will stop and the distance travelled by robot from a fixed point is displayed on LCD display as well as this distance is send to the control office through GSM modem(3).

Fig-4.2: After detection of the crack.

Fig.4.3: Message showing location of Fault

V. ADVANTAGES AND DISADVANTAGES

5.1 Advantages:

- Introduction of automation for Indian railway.
- The project saves human effort and time.
- Easy to use.
- It is cost effective.
- It will also increase the security for both rails and passenger.

5.2 Disadvantages:

- The signal transmission is below 50 feet.
- The vehicle operated in battery power, so rechargeable battery is used to drive the vehicle.

VI. APPLICATIONS

- At present the inspection is done manually, our project its application here. The inspection is done automatically with more accurately and saves time.
- Our robot can be used for path following also by changing the wheels and sensors.

VII. CONCLUSION

The Indian railways are the largest rail passenger transport in today's world and it is the backbone of the country transport infrastructure (3).This system makes an attempt in providing a visible solution in making the railway tracks crack free with GSM based railway detection scheme. The proposed broken rail detection system automatically detects the faulty rail track without any human intervention ,It means proposed system detects crack present in railway track as well as it also detect any obstacle i.e. living and non living thing. There are many advantages with the proposed system when compared with the traditional detection techniques. By this proposed system the exact location of the faulty rail track can easily be located and we will easily avoids the accidents occurs by the faulty track which will help us for saving many lives.

VIII. FUTURE SCOPE

• In future we can also use in the CCTV system with IP based camera for monitoring the visual videos captured from the track.

• In future a more advanced accelerometer sensor with more compatible technology can be used**.**

• In future we expand our project for a long distance.

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