RAIL VULNERABILTY MONITORING SYSTEM

[1]Disha Shetty, [2]Meghana Prabhu, [3]N Shriraksha Acharya, [4]Parvathi Pai, [5]Ranjith Bhat.

[1,2,3,4]UG Students, [5]Assistant professor
Department of Electronics & Communication Engineering
Shri Madhwa Vadiraja Institute of Technology and Management, Bantakal, Udupi, Karnataka, India.

***Abstract*— To overcome the problem of derailment this project proposes an unmanned obstacle detection and faulty rail track detection. Unmanned obstacle detection is a IR sensors base system and IR sensors for crack detection is a dynamic approach which combines the use of GPS (global positioning system) tracking system and GSM (global system for mobile communication) modem to send geographical coordinate of location. . Thus the sensed fault and actual distance where the fault is being detected is being received at the control room making an alert signal ON, railway crack detection system prevents train derailment by detecting crack in railway track using this technology.**

***Index Terms*— GPS, GSM, IR Sensor, 16*2 LCD, Arduino UNO.**

I. INTRODUCTION

Railways are large infrastructure and are the prime mode of transportation in many countries. Even a small improvement in performace of railways has significant economic benefits to railway industry. Accidents happening due to track breaking have been a big problem for railways for life security and timely management of services. This breakage needs to be identified in real time before a train actually comes near to the broken track and get subjected to an accident. It is seen that 46.5% of the railway accidents is due the same reason. The manual inspection of rails practiced now is more prone to errors and is not an efficient method. The rail vulnerability system is used to overcome these shortcomings. This device automatically detects the crack which leads to derailment by using an IR sensor and also informs the monitoring station to take the appropriate action.

II. OBJECTIVE

- The proposed broken rail detection system automatically detects the faulty rail track without any human intervention.
- The exact location of the crack is sent to the concerned authority using the GPS and GSM module.

III. METHODOLOGY

BLOCK DIAGRAM

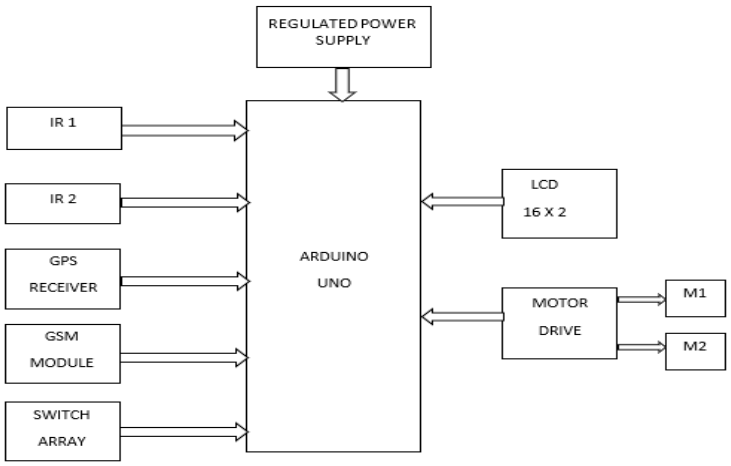

Fig.1. Block diagram of the System.

The block diagram of the proposed system is shown in the fig.1. The system incorporates the use of IR sensors for obstacle and crack detection. The bot is placed on the railway track as the initial step. The motor drivers drives the bot to move on the track at a particular pace. When there is a crack or an obstacle is detected the bot is programmed to stop its motion. Here the micro controller coordinates the consecutive steps. The geographical locations of the detected area are sent to the respective personnel at the maintenance and control room to take appropriate actions. Hence an unmanned obstacle and crack detection approach which combines the use of GPS (global positioning system) tracking system and GSM (global system for mobile communication) modem to send the coordinates is implemented to avoid train accidents due to derailment.

IV. COMPONENT DESCRIPTION

1. Microcontroller

The system consists of microcontroller ATMEGA328 which contains 32 pins (14 digital I/O pins).For this system it is required that GSM should work at 12V and 1A dc source. Hence, we an adapter is required to provide 12V, 1A dc for the GSM module. As soon as we connect this adapter to the GSM module, 12V supply flows in the circuit. We require a power supply, which converts 12V to 5V as our microcontroller works on 5V.

2. Power supply

This section needs two voltages viz., +12 V & +5 V, as working voltages. Hence specially designed power supply is constructed to get regulated power supplies.

3. GSM

GSM interfaced with microcontroller sends information in the form of SMS to the registered number. In our system, the transmitting pin of the RFID reader is connected to the receiving pin of the microcontroller and the transmitting pin of the microcontroller is connected to the receiving pin of the GSM module. It is used to send the information about the delivered ration.

4. LCD

LCD is an electronic visual display, which has light modulating properties of liquid crystal. We have made use of a 16x2 alphanumeric LCD for the display of information.

5. IR SENSOR

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

6. GPS

The Global Positioning System (GPS) is a network of about 30 satellites orbiting the Earth at an altitude of 20,000 km. ... Once it has information on how far away at least three satellites are, your GPS receiver can pinpoint your location using a process called trilateration.

V. FLOW CHART

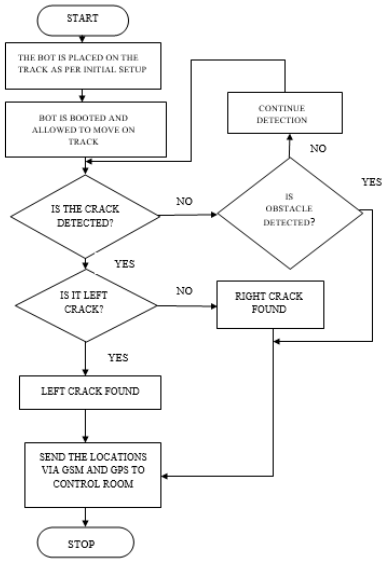

Fig.2. Flow chart of the system

As shown in the Fig.2 , The bot is initially placed on the rails. As soon as the system is powered the LCD, GSM, GPS is turned on. Once the start button on the switch array is pressed the bot begins to move on the track . the bot continuously detects for crack or obstacle. If the crack is detected, it will specify if it is left or right crack. If not it continues to move. Same with the obstacle detection process. After the detection the bot stops and the GPS tracks the exact location containing latitude and longitude coordinates to the control room via the GSM module.

IV RESULT

The rail vulnerability system is able to move on the rails and is able to immediately detect the crack on the rails if any, detects any obstacle which can disrupt the movement of the train. As shown in Fig 3 and 4 the message is displayed on LCD screen present on the bot whether the crack is present on the right rail or the left, also the object if any detected by the obstacle sensor will be displayed on the screen as in Fig 6.3. As shown in Fig 6.4 a message regarding confirmation about a message being sent to the monitoring

center is displayed on the LCD screen. Simultaneously the location co-ordinates that are the latitude and longitude are displayed and the message about the crack/object and its co-ordinates are sent to the monitoring station via the GSM module which is shown in Fig 6.5.

Fig.3. Indication of crack on the right rail.

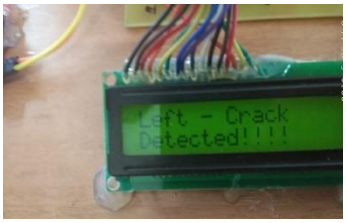

Fig.4. Indication of crack on the left rail.

Fig.5. Indication of detection of obstacle.

Fig.6. Indication of SMS Sent

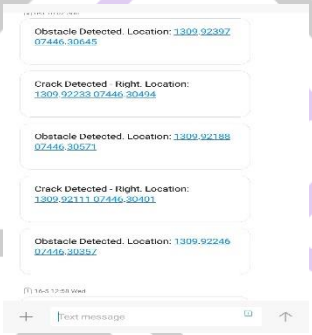

Fig.7. Message on the monitoring center screen.

IV. ADVANTAGES

- Highly Accurate And Reliable.
- Completely Automatic With Elimination Of Human Intervention.
- The Errors In The Human Inspection Of Rails Is Avoided.
- Reduction in rail accidents due to derailment.

V. CONCLUSION

With the increase in the loss of life and property due to train accidents (derailment), there is a need to find solution to avoid these cases. Manual detection of the track is in practice, which is highly unreliable. A highly reliable and automatic rail vulnerability system (bot) based on Arduino UNO is designed completely eliminating the human interference; it moves on the track and detects the crack or object which can have fatal results. The bot is able to detect either the left or right crack or the obstacle and send the coordinates of to the monitoring station via GSM there after the right action can be taken by the authority.

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[5] H Rowshandel*, G L Nicholson, C L Davis, C Roberts *School of Electronic, Electrical and Computer Engineering, University of Birmingham, UK, B15 2TT