

Railway Track Fault Detection System

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ABSTRACT: This paper proposes designing of railway crack detector (RCD) using IR sensors for the railway track geometry surveying system by detecting the cracks on the tracks. The most of the accidents are caused by the trains are due to the improper tracks and cracks in the tracks. The detection of cracks by the help of manual inspection will take more time and more human power. This project will introduce the Arduino technology with GSM. In this, two IR sensors are placed in front end of the inspection robot. When GPS gets the signal the robot gets activated and sends us a message that the device is ready. If there is a crack is found on the track, then the robot sends us the location where the crack has been detected. Then the followed cracks also detected by the same way. The proposed technique is better than the current detecting techniques. This system has the advantages includes low cost, less power consumption, less time and no human fatigue. This proposed system is for better security, gives accurate solution and provide effective testing infrastructure.

KEYWORDS: RCD, Arduino, GSM, GPS, IR Sensors

I. INTRODUCTION

Technology has touched everything in the world and using the technology we invented different types of products to reduce the human power. The advancement of technology may leads to the automation. In this proposal, we exhibit how the railway track faults are detected and how they can be resolved using this technology. The Indian railway network is the largest transportation network and it is the backbone of our country. The railway transportation is the cheapest and modest way to transport the goods. The most of the commercial transportation is made by the railway network, because it is the cheapest mode to transport the goods. Comparing to the other transportation networks, the railway transportation is the better secured and easy to transport the goods or people. The rapidly increasing of economy in India results in an exponentially increasing demand for the railway transportation in past years, and this has resulted to a huge rise of traffic in the Indian railway network. Transportation is the key of necessity of specialization that allows products and consumption of products in different locations. Now a days the transportation is very important for the goods as well as for the passengers due to the rapidly increasing of population. The caring taking for the goods and passengers, is also should be taken for the trains as well. Because a train accident may leads to the loss of economy and people. These accidents are caused by the improper tracks or cracks in the tracks. These problems can be avoided by this proposal.

II. WHAT EFFECTS DOES INFLUENCE THE RAILWAY CRACKS

There are two types of cracks in rail tracks i.e. Natural and Artificial. Natural causes are like weather, floods, cyclone, landslides etc. The other type is artificial like improper tracks, discontinuity, misalignment, absence of nuts & bolts etc. Detection and maintenance of rail defects are major issues for the rail community all around the world. The defects mainly include weld problems, internal defects worn out rails, head checks, squats, palling and shelling, corrugations and rolling contact fatigue (RCF) initiated problems such as surface cracks. These problems will cause a great damage in economy, goods and people will die due to these problems.

EXISTING SYSTEM : The current existing system used in railway networks to detect the cracks in the tracks are surveying manually. LED (Light Emitting Diode) and LDR (Light Dependent Resistor) sensors cannot use on the slab of the tracks. Images processing input images are noisy system, high cost, and it's not getting accurate output.

Automated Visual Inspection method is complex system because video colour analysis is used to identify the crack in rail track under the bad whether condition is not getting perfect output. The existing system is delay in passing the information. These are the time consuming methods and human power included.

III. BLOCK DIAGRAM

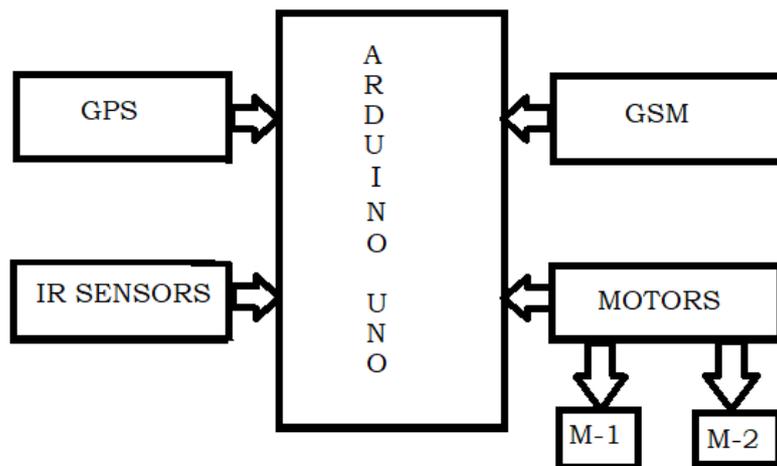


Fig : Block Diagram Of The System

COMPONENT FUNCTIONS:

GSM SIM 900A:

SIM900A Modem is built with Dual Band GSM/GPRS based SIM900A modem from SIMCOM. It works on frequencies 900/1800 MHz. SIM900A can search these two bands automatically. The frequency bands can also set by AT commands. The baud rate is configurable from 1200-115200 through T command. The GSM/GPRS modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. SIM900A is an ultra compact and reliable wireless module. This is a complete GSM/GPRS module in a SMT type and designed with a very powerful single-chip processor integrating AMR926EJ-S core allowing you to benefit from small dimensions and cost-effective solutions.



Fig : GSM SIM900A

IR SENSORS:

Infrared waves are not visible to the human eye. In the electromagnetic spectrum, infrared radiation can be found between the visible and microwave regions. The infrared waves typically have wavelengths between 0.75 and 1000µm.

The infrared spectrum can be split into near IR, mid IR and far IR. The wavelength region from 0.75 to 3 μ m is known as the near infrared region. The region between 3 and 6 μ m is known as the mid-infrared region, and infrared radiation which has a wavelength greater higher than 6 μ m is known as far infrared.



Fig : IR Sensor

GPS MODULE:

GPS is a satellite navigation system used to determine the ground position of an object. Today GPS receivers are included in many commercial products. The GPS system includes 24 satellites deployed in space about 12,000 miles above the earth surface. A GPS receiver combines the broadcasts from multiple satellites to calculate its exact position using a process called triangulation. In order to GPS works correctly, it must first establish a connection to the required number of satellites. This process can take few seconds to a few minutes, depending on the strength of the receiver.



Fig : GPS module (rs232)

5.4 ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328. It has a 14 digital INPUT/OUTPUT pins, 6 analog pins, a 16MHz crystal oscillator and USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller, simply connect it to a computer with a USB cable or power it with a AC to DC adapter or battery to get started.



Fig : Arduino Uno(ATmega328p)

DEFAULTS IN TRACKS:

MISALIGNMENT: The misalignment of tracks will cause the damage to the train and change of root of the train while going. Generally the cause of misalignment is, the minimum gap of tracks shouldn't be maintain properly by the instructors. When the weather changes the tracks will be expanded and decreased slowly. Due to the occurrence of the both actions, the gap is maintained between the tracks. The improper gap between the tracks will cause the misalignment of tracks.



Fig: Misalignment of Tracks

ABSENCE OF NUTS & BOLTS:

The tracks are jointed by the nuts and bolts. This joint must be stronger to travel the train smoothly and gently. If there is an absence of nuts & bolts, the tracks will be in improper state and leads to the train accidents caused by this problem. The role of nuts and bolts in the railway tracks is very important. The nuts and bolts are must be tightened together that the tracks cannot be misaligned. These nuts and bolts should bare huge amount of pressure. These will play the main role for the proper tracks.



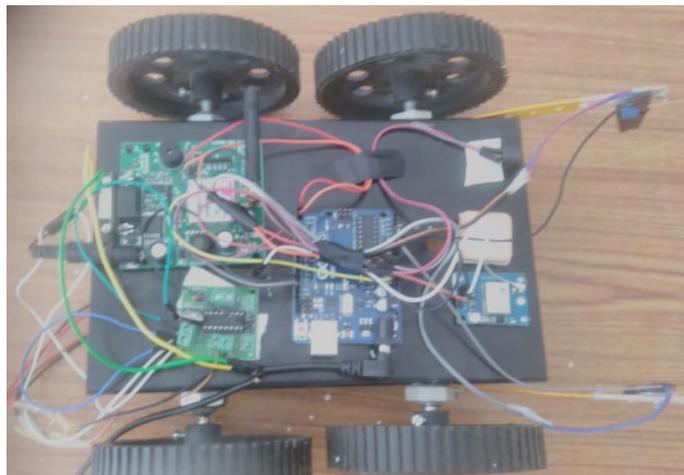
Fig: Tracks Connected By Nuts & Bolts

IV. PROPOSED SYSTEM

The proposed system will automatically detects the cracks without any man power. In the proposed system we used IR sensors to detect the cracks in the tracks. We used the micro controller (ATmega328) to control the robot. The GSM module will help to send the message signals. The IR sensors can detect the crack as well as the figure of the crack. The motor driver will drive the system. When the robot is getting started, it will send a message to our mobile or our computer. While the robot is moving on the track, when the crack is detected it will stop and send us a message that a crack has been detected. The crack location will be detected by using the GPS signal that we used in the system. The location will be sent by the GPS module by using the latitude and longitude values. The normal gap of the tracks is already fed to the system. The difference between the gap will be identified by the system. The detection is based on the speed of the system. If the speed is high, the detection of the crack will be less accurate otherwise the detection of the crack is more accurate.

V. RESULT

To avoid the train accidents and railway network damages while the time of transportation, the proposed system is more useful to reduce the above problems.



VI. CONCLUSION

In India the accidents caused by trains is huge rather than the any other transportation network. The railway transportation network is the backbone of our country's infrastructure. In this railway network the maintenance and detection of cracks are very important. The main of the project is to avoid the train accidents caused by the defaults in the tracks. To avoid those problems we come up with the new idea of Railway Track Fault Detection System. Using the old techniques can consume more time and more power. The automation technology we used in the proposed system will identify the cracks accurately and gives the crack location also. By solving these problems we can ensure the safe and secure railway transportation.

VII. FUTURE SCOPE

In future, the great damages occurred to the trains caused by the cracks in the tracks are reduced and being solved by this proposed system. By using this proposed system the cracks can be identified by the robot and proper action can be taken by the technicians.

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