

# **VISUAL DEFECT DETECTION IN RAILWAY TRACKS USING IOT BASED ROBOT**

**Mr. Ch. Vijaya Sekhar Babu, Smt. K.Kavitha**

*We Assistant Professors*

*Department of ECE, Krishna University College of Engg & Tech, Machilipatnam, Andhra Pradesh, India*

## **ABSTRACT**

Railways provide the cheapest and most convenient mode of passenger transport both for long distance and suburban traffic. But Recent years Accidents are the major concern in terms of railway track crossing and unidentified crack in rail tracks in Indian railway. Therefore, there is need to think about new technology which is robust, efficient and stable for crack detection in railway track. This project discusses a Railway track crack detection using Arduino uno and IR sensors is a dynamic approach which combines the use of GPS tracking system and WIFI module to send alert messages and the geographical coordinate of location. This project prevents train derailment by detecting a crack in railway track using internet of things technology. In addition to these we are adding the ESP32 camera for capturing the cracked part and it will send to the authorized person through the telegram application.

**Keywords:** Arduino, IR sensors, ESP-32 Camera, L298N Motor Driver, Telegram Bot

## **INTRODUCTION**

Railway is one of the most significant transportation modes of our country but it is a matter of great sorrow that, railway tracks of our country are very prone.

That's why, a vast number of accidents are occurred every year due to this primitive type of railway tracks and as the consequences of those accidents we lose huge number of lives every year.

These types of incidents motivate us to think over the above-mentioned issue and take necessary steps to protect those lives. Through our proposed system, we need to establish more modern and secure railway system. Besides this, there is no such type of technology or system in our country which can stop the collision between two trains coming from the opposite direction of each other on the same track. We actually think over this matter and motivated to do so. Moreover, natural disaster can throw any object on the rail track which cannot be removed very quickly in the remote area. We thought if our system can detect those object or barrier and inform to the control room then they can take necessary steps to avoid accident. The Rail transport is growing at a rapid pace in India. It is one of the major modes of transport but still our facilities are not that accurate, safer as compared to international standards. A survey on the internet states that about 60% of all the railway accidents is due to derailments, recent measurements shows that about 90% are due to cracks on the rails. Hence, it is not safer for Human Life. This needs to be at the utmost attention. These goes unnoticed and the properly maintenance of tracks is not done.

In previously existing system, the work is to be done manually, but the proposed system has a robot which will run automatically on the tracks. System having LED and LDR sensor assembly, but the main disadvantage is that the LED and LDR must be placed opposite to each

other and also the environment needs to be perfect to detect the track. To overcome this disadvantage, here sensors are used, which will detect the crack accurately. The existing system is slow, tedious and time consuming. This system has GSM and GPS module which will give the real time location or coordinates in the form of Short Message Service (SMS) to the nearest railway station.

## PROPOSED SYSTEM

Here we use Arduino UNO board in this proposed system to overcome the existing system limitations. Arduino is an integrated opensource development environment, which simplifies coding considerably. The system proposed is consisting of an Ir sensor designed to detect obstacles and IR sensors used to detect cracks.

Arduino controller is primarily used for and GPS module is to obtain altitude and longitudinal direction of the faulty track. controlling the sensor outputs. In case of crack or obstacle detected, the information is transmitted through GSM module to the nearest base station via an SMS. In this device subtle cracks that are not visible to the naked eye can also be observed. The proposed system is therefore productive and minable.

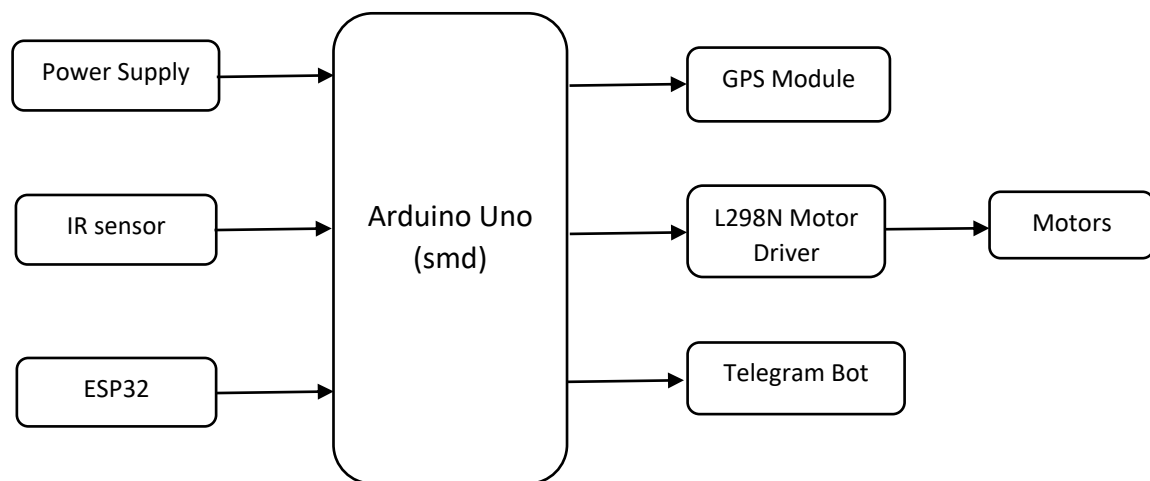


Fig. Block Diagram

### Arduino UNO



Fig. Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010. The board is equipped with 14-digital and 6-analog set of input/ output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

## IR Sensors

IRLEDemits light, in the range of Infrared frequency. IR light is invisible to us as its wavelength (700nm – 1mm) is much higher than the visible light range. IR LEDs have light emitting angle of approx. 20-60 degree and range of approx. few centimetres to several feet's, it depends upon the type of IR transmitter and the manufacturer. Some transmitters have the range in kilometres. IR LED white or transparent in colour, so it can give out amount of maximum light.

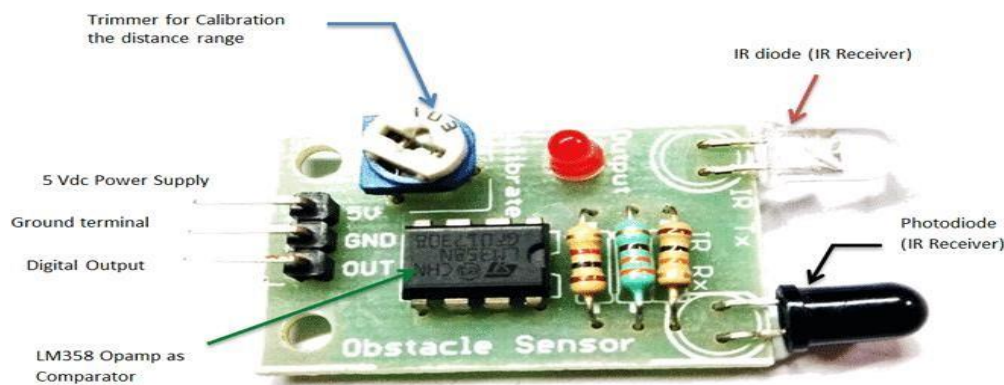


Fig. IR Sensor

## GPS Module

The **NEO-6MV2** is a **GPS** (Global Positioning System) module and is used for navigation. The module simply checks its location on earth and provides output data which is longitude and latitude of its position. It is from a family of stand-alone GPS receivers featuring the high-performance u-box 6 positioning engine. These flexible and cost-effective receivers offer numerous connectivity options in a miniature (16 x 12.2 x 2.4 mm) package. The compact architecture, power and memory options make **NEO-6 modules** ideal for **battery operated mobile devices** with very strict **cost and space constraints**. Its **Innovative design** gives **NEO-6MV2** excellent navigation performance even in the most challenging environments.

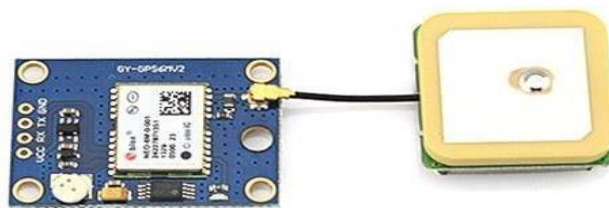


Fig. GPS Module

### ESP32 Camera

ESP camera module The ESP32-CAM is a small size, low power consumption camera module based on ESP32. It comes with an OV2640 camera and provides onboard TF card slot. Figure 2.2: ESP32 camera pinout 2.2 ESP camera module In this project we have used cp2102(6-pin) usb 2.0 to ttl uart serial converter module. this is a great little tool for embedded systems that require a serial connection to a computer. the board can simply attach to a usb bus and will appear as a standard com port. Figure 2.3: USB to TTL converter CP2102



Fig. ESP32 Camera

### L298N Motor Driver

L298N Motor driver In this project we have used L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control

The L298N Motor Driver module consists of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in an integrated circuit

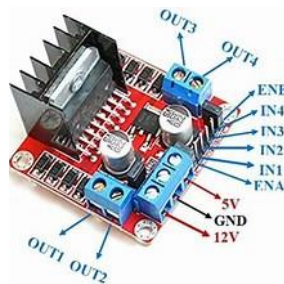


Fig. L298N Motor Driver module

### Result

As per the study the existing systems are time consuming as well as uneconomical. The proposed system is not only overcome these problems but also improve accuracy and crack detection in rails. It is the most economical solution provided in order to achieve good results of railways of our country in order to minimize the stats of accidents caused. There by possible to save precious lives of passengers and loss of economy. It also saves the time and money for identification of crack.



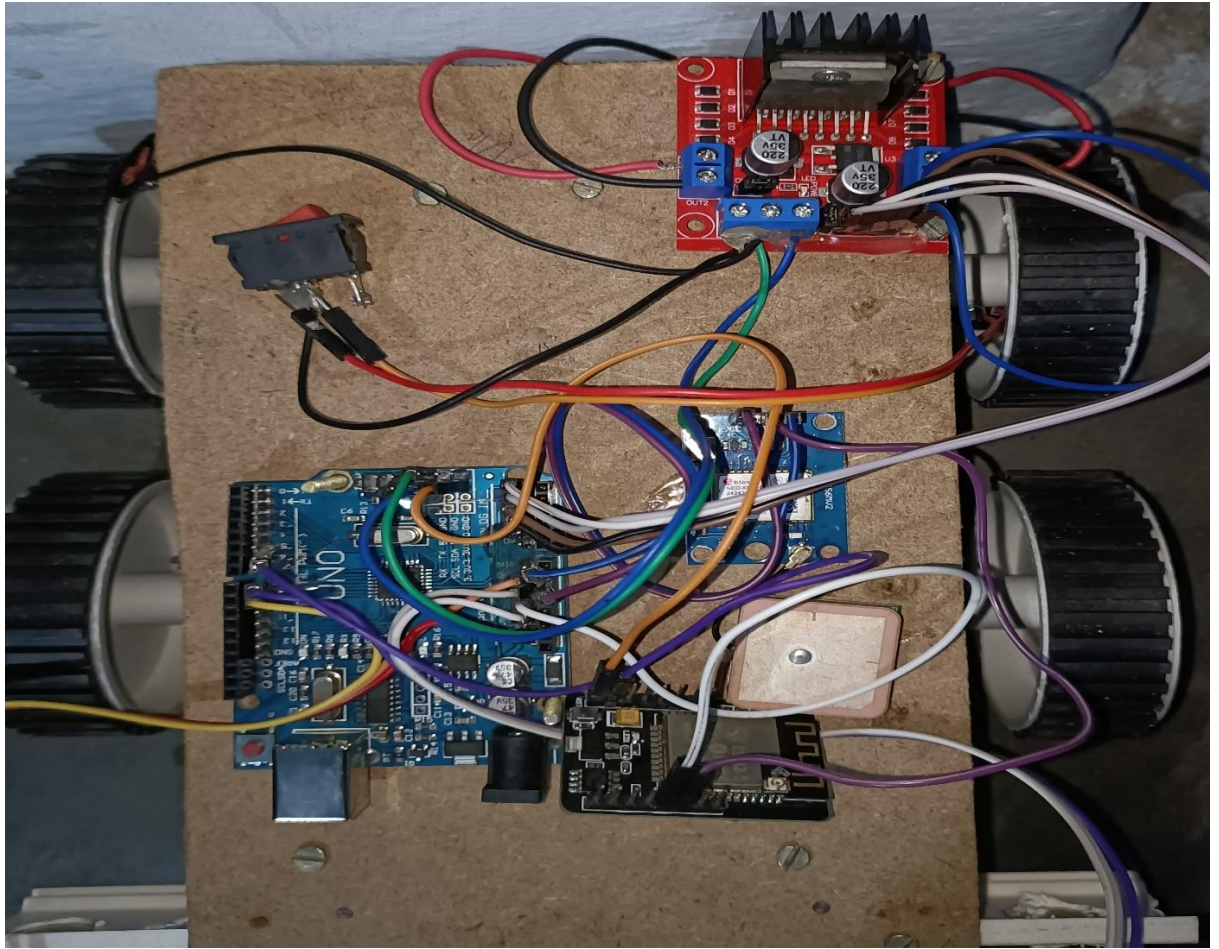


Fig System Indicating the Crack detected and an object

## Conclusion

As per the study the existing systems are time consuming as well as uneconomical. The proposed system is not only overcome these problems but also improve accuracy and crack detection in rails. It is the most economical solution provided in order to achieve good results of railways of our country in order to minimize the stats of accidents caused. There by possible to save precious lives of passengers and loss of economy. It also saves the time and money for identification of crack.

## References

1. Ch. Muneendra Rao , B. R. Bala Jaswanth and Ch.Muneendra Rao “ Crack Sensing Scheme in Rail TrackingSystem” in Int. Journal of Engineering Research andApplications, January 2014, pp. 13-18.
2. A. Rizvi, P. Khan and D. Ahmad, "Crack Detection In Railway Track Using Image Processing", International Journal of Advance Research, Ideas andInnovations in Technology., vol.3, no. 4, 2017.
3. Gokula Chandar ,Leeban MosesM; T. Perarasi M; Rajkumar; “Joint Energy and QoS-Aware Cross-layer Uplink resource allocation for M2M data aggregation over LTE-A Networks”, IEEE explore,doi:10.1109/ICAIS53314.2022.9742763.
4. Mustafa Alper Akkaş, Radosveta Sokullu, "An IoT-based greenhouse monitoring system with Micaz motes", <https://doi.org/10.1016/j.procs.2017.08.300>.