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ADVANCED RAILWAY TRACK FAULT DETECTION AND REPORTING OVER IOT

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ABSTRACT

In India, most of the commercial transport is being carried out by the railway network and therefore, any problems in the same has the capacity to induce major damage to the economy by impact of loss of life because of accidents. This paper proposes a cost effective yet robust solution to the problem of railway crack detection utilizing a method that is unique in the sense that while it is simple, the idea is completely novel.There is an increasing with the number of accidents at railroad railings. Now a days we use different types of transport facilities like Track, bus, flight and car etc., but above these facilities we chose to travel with rail because by travelling through the rail is cheap, takes less time to deliver the our product, system and it is the cost efficient but the number of accident on railway track due to fault on track and when any obstacle came in front of the train. This paper deals about one of the efficient methods to avoid Train accidents. Here we are using Microcontroller for automatic control of Infra Red sensor to detect the fault on railway track. After detecting the fault Microcontroller will give information about the fault to the loco pilot in the train indicating red led, gives buzzer alert and Train automatically stops, it sends the information to control room through IOT. The main components used in this project are Microcontroller (Arduino), IR sensor, IOT, Buzzer, DC motor . We are using Infra Red Sensors because it is the directional data transferring device it can show the output of fault and help us to take action according the fault on the track. With the help of this proposed project train can run on time during winter season on foggy condition and on night also where driver unable to see anything. It can be helpful for the Indian railway.

Keywords: Advance Railway Track, Fault Detection, Reporting Over IOT.

1. INTRODUCTION We belong to the edge of digitized and smart world. People are getting smarter day by day with the in-today's world, transport, being one of the biggest drainers of energy, its sustainability and safety are issues of paramount importance. In India, rail transport occupies a prominent position in quenching the ever urge owing needs of a rapidly growing economy. However, if we consider the reliability and safety parameters, India has not reached the global standard yet. The major problem is that there is no efficient and cost-effective technology to detect problems in the rail tracks and the lack of proper maintenance. However, the proper operation and maintenance of transport infrastructure has a large impact on the economy. This model says about a proposed proto type of testing train for detecting obstacles and cracks, which is similar to that of line following testing train. The proposed testing train is cost effective and analysis time is less. With this proposed system the exact location of the faulty rail track can be easily located, so that many lives can be saved. In today's world, transport, which is one of people's biggest consumers, is of utmost importance for its

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sustainability and safety. Rail transport occupies a leading position in India in reducing a fast-growing economy's growing needs. Nonetheless, if we find the criteria of reliability and health, India has still not achieved the global standard. The main problem is that there is no reliable and affordable equipment to diagnose train track issues and the lack of proper maintenance. The proper functioning and maintenance of transport infrastructure, however, has a significant impact on the economy. This model speaks of a proposed test train design for detecting obstacles and cracks, similar to the line following the test train. The proposed test train is convenient, and shorter analytical time. With this proposed system it is easy to identify the exact position of the faulty train track, so that many lives can be saved. The main objective is to locate the gaps in the railroad tracks and to determine if there are any hazards in the tracks to avoid and dissuade accidents. This type of model provides a cost-effective solution to the railroad crack detection problem by using a ultrasonic sensor and a IR sensor joint that responds to the exact situation of the faulty track, as well as forwarding the information to the control room via SMS, so that any incidents can be gridlocked. The main objective of the proposed system is to detect the tracks and avoid much accidents. The defect in crack can be found out easily and the preventive measures will 33be taken immediately. The proposed system not only replace the human inspection but also is beneficial in terms of time and money and makes the inspection very much easier and accurate. Basically, the system operations start with initiating the motor. Initially, the motor starts, which in turn actuates the ultrasonic sensor. Ultrasonic sensor is used to detect the cracks in the track. So, the motor operation is to drive the vehicle forward. Ultrasonic sensor performs its operation scanning and detecting the cracks on the track, when the crack is detected, it will stop the vehicle. Now, GPS will operate getting the coordinates of the location. So, now GSM Module comes into picture which operation is to transmit message to the control room of railway. So, GSM will send a message as "Obstacle Present" as shown in Figure 4 to the predetermined location. When both the messages are sent and the program will go again on the initial stage and the motor will start again, and it will scan the track. 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 3 to avoid accident. Figure1 depicts the crack on track. 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

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Service (SMS) to the nearest railway station. Railroads give the least expensive and most advantageous method of traveller for both separation and rural traffic. It likewise assumes an imperative job in the advancement and development of businesses. Railroads help in providing crude materials and different offices to the production line locales and completed merchandise to the market. In this way, wellbeing and dependability ought to be exceptionally considered on account of railroad. As it is assuming an imperative job in development of the economy, so the significance of having current and enhanced railroad framework is expanding step by step. Be that as it may, the present situation of the railroad is very unique. Railroad incident has turned into a typical issue now-a-days. This turn into an everyday news losing numerous lives by the train mishaps. Railroad support is difficult to oversee through any sort of manual framework. In this way, a computerized framework is an earnest need to stop a wide range of undesirable mishaps of railroad. This sort of mishap is fundamentally happens for the next to no obliviousness like little break on the rail track. Amid the advancement of this framework, essentially centres around some critical elements for example Unwavering quality, Accuracy, Efficiency and cost adequacy. Consistently, losing an immense measure of and the instability of physical work have advanced a requirement for a computerized framework to screen the nearness of split on the railroad lines. Attributable to the critical repercussions of this issue, this report shows an execution of a productive and savvy arrangement appropriate for substantial scale application by utilizing the operation based split discovery in railroad track.

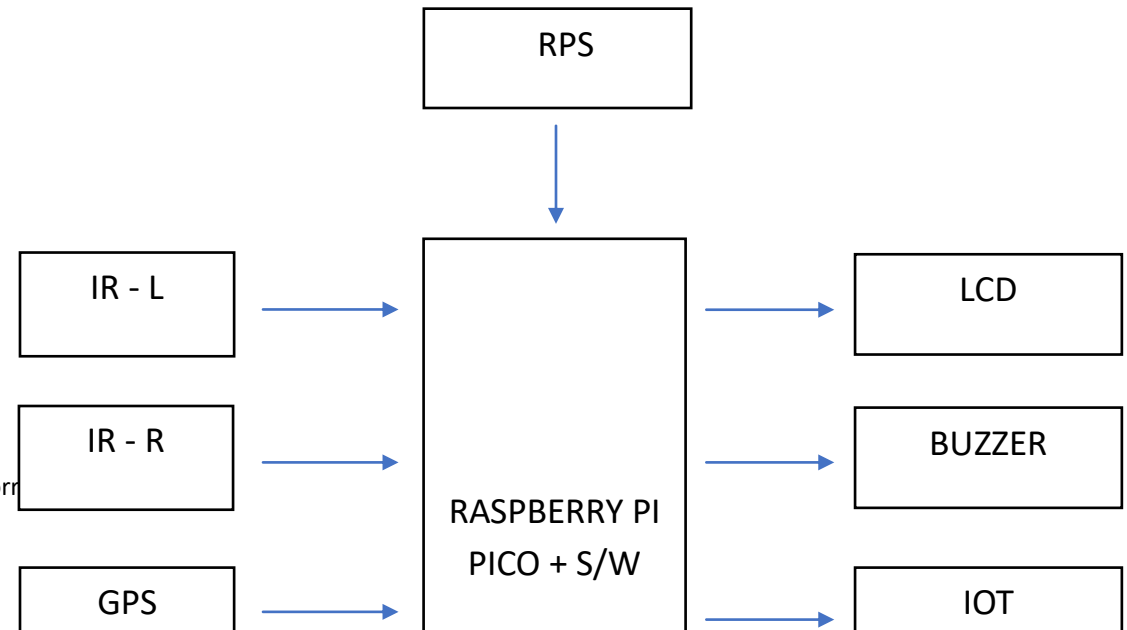
2. LITERATURE SURVEY

Indian railways is one of busiest network in the world covering track network of 1,27,000 sq.km. Almost 2/3rd of the population use the railway network in India. Almost 60% of the accidents are occurring at railway track crossing and due to crack in railway tracks resulting in loss of precious life and loss of economy. So in current scenario this problem has immense potential in having an ideal solution to this problem. Now I want to put some light on existing systems that railways in order to counter this problem. So, basically we have the manual surveying and maintenance of tracks done by person and other is systems that they use like SPURT Car and USFD manual machine that are used in detecting and monitoring of cracks[1]. Basically in the both the methods, surveying and detection of cracks is been done but the limitation is basically maintenance people are required for both methods to monitor the crack in the track. Also this method is limited for certain routes and not all routes and divisions of railways can be covered. Also sometimes accuracy is faulted .Also eddy current method ultrasonic crack detector is also used in some instances. We have inferred the ideas in designing railway crack detection system using. Arduino Microcontroller and sensors in order to detect the cracks and location of cracks been given by GPS module and alert through messages through GSM module. We are committed in building such system which will give an optimal solution to the crack detection problem and also reach in achieving higher accuracy and precision than existing systems [2]. Also our project aims in giving safety assurance to railways, whereas the existing systems lag it completely. The cracks and other problems with the rails generally go unnoticed due to improper maintenance and irregular manual track line monitoring that is being carried out in the current situation. Nowadays 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. In the literature survey, the commonly employed rail crack detection schemes in foreign countries are usually ultrasonic or eddy current based techniques which are the reasonably good accuracy in most cases. However, the one characteristic which the above mentioned methods have in common is that they are both expensive, which makes them ineligible for implementation in

the current Indian scenario. Also, the ultrasonic can only inspect the core of materials; that is, the method cannot check for surface and near surface cracking where many of the faults are located. Many of the most serious defects that can develop in the rail head can be very difficult to detect using the currently available inspection equipment [3]. This system is mainly concerned in identifying the cracks in railway tracks and helps to prevent the accidents without manual power. It's not only concentrated on finding damaged tracks but also helpful to find out the derailment and the exact place where it is. In this technical solutions offered by many companies in the detection of cracks in rails involve periodic maintenance coupled with occasional monitoring usually once a month or in a similar time frame. But the robotics possesses the inherent advantage of facilitating monitoring of rail tracks on a daily basis during nights, when the usual train traffic is suspended. Further, that the simplicity of this idea and easy availability of the components make for implementation on a large scale with very little initial investment [4]. The simplicity of this work ensures robustness of operation and also the design has been carefully modified to permit rugged operation. Another disadvantage that can be attributed to the conventional commercially available testing equipment's is that they are heavy which poses a practical limitation. This important disadvantage has been rectified in robotics project as the design is simple and sensible enabling the device to be easily portable. While designing the mechanical parts of the robot, due consideration has been given to the variable nature of the tracks and the unique challenges possessed by the deviations in the Indian scenario. For example, in areas near road crossings the outer part of the track is usually covered with cement. Also, there is always the problem of rocks obstructing the path on the inside parts of the rails. So the specialized wheels that have been provided in robot that has taken into account and are specifically designed to overcome this aforementioned problem. The railway track crack detection is used to detect the crack whiles the train running on the track [5]. The proposed system is used to detect the crack on railway track before 10km.

3.. PROPOSED SYSTEM

The proposed system overcomes the limitations of the existing system that are used for the detection of faulty tracks. In this proposed system, we are using a Raspberry Pi board. The Raspberry Pi is a versatile, low-cost, credit-card sized computer that can be used for various projects and applications. The proposed system consists of an IR sensor for crack detection and Ultrasonic sensor for obstacle detection. A motor driver L293D is used to drive the DC motors.



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SYSTEM OPERATION:

a. Data Acquisition: IR sensors continuously monitor the tracks for cracks while the ultrasonic sensor detects obstacles in the train's path.

b. Data Processing: The Raspberry Pi processes the sensor data in real-time, analyzing for any abnormalities or faults.

c. Fault Detection: Algorithms implemented on the Raspberry Pi identify potential faults based on sensor readings.

d. Reporting: Upon detection of faults, the system establishes an IoT connection to report the findings to the station.

e. Actionable Alerts: Railway authorities receive real-time alerts regarding track faults, enabling timely maintenance and repair operations.

WORKING:

Upon system initialization, all sensors are activated, and IoT connectivity is established. Throughout train operation, IR sensors and an ultrasonic sensor continuously monitor track conditions. The Raspberry Pi processes the sensor data in real-time, aiming to detect anomalies indicative of track faults. Utilizing advanced algorithms, the system analyzes the sensor data to identify cracks and obstacles along the railway tracks. Upon detection of faults, the system promptly transmits alerts and fault reports to the station over the IoT network. Railway authorities receive these alerts, facilitating swift response and enabling them to dispatch maintenance teams for inspection and repair. This systematic approach ensures proactive maintenance, enhancing railway safety and reliability. By leveraging IoT technology and real-time monitoring, potential accidents resulting

from track faults are minimized, and operational efficiency is optimized. The seamless integration of sensor monitoring, data processing, fault detection, and reporting streamlines maintenance procedures, reducing downtime and enhancing overall railway infrastructure management. As a result, the system provides a robust solution for addressing track faults and ensuring the smooth operation of railway networks.

4. RESULT

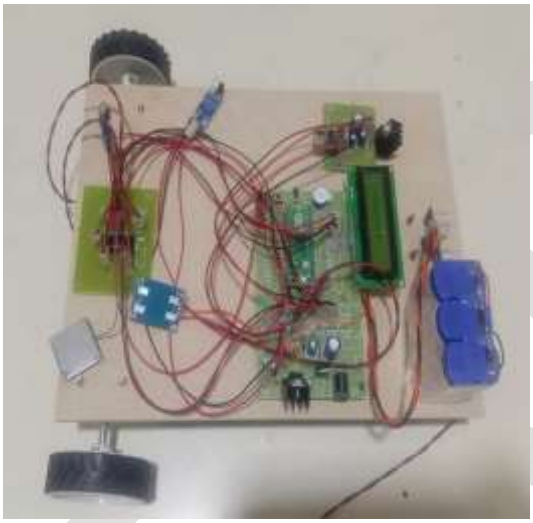

Figure.1: advanced railway track fault detection and reporting over iot

Figure.2: LCD Display Showing Railway Tract Fault Detection

5. CONCLUSION

The railway is the most commonly used mode of transportation by the people and for goods. The transport system must always be secure. Utilizing the benefit of embedded system we can build a system which helps the cause of safe travel. The proposed system is an amalgamation of the conventional method of crack detection and the innovative method of live video streaming and IoT. The entire system is placed on a four wheeler bot which travels along the rails. When compared to existing system which uses IR transmitter and receiver, the proposed system is an innovative technique which lowers the burden of the authorities and increases the accuracy of the crack detection. The process is done at a periodic rate to check for cracks so that causalities can be avoided entirely. The entirety of the model is to ensure that defective rails can be found in time to stop derailment of trains, to save the loss of lives and property.

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