Tracking of Train Crossing in Indian Railways

Purvi R Kulkarni[1], Likhita Jain B A[2], Priyanka N[3], Sridhar R[4]

[1,2,3]*Student, Department of Information Science and Engineering, Global Academy of* Technology, *Bangalore*

[4]*Assistant Professor, Department of Information Science and Engineering, Global Academy of Technology, Bangalore*

Abstract **- Advancement of populace is specifically related to transportation office. In India, transportation offices are primarily taken care of by Indian railroads. Indian railroads every day transporting 14 million travellers by 2 million kilometres rail track per day. Safety is of exceptional centrality to Indian railroads. With the fast advancement of society and the ceaseless advancement of people's quality of life, individuals have put forward higher prerequisites for the unwavering quality and reliability of high-speed railroad transportation. Within the current railroad framework, it is getting to be ever more essential to have safety components in arrange to maintain a strategic distance from mischances. One of the vital causes that can incite serious mischances is the presence of impediments on the tracks. Fitting appropriation of technology would help consistent organization of assets that would emphatically impact the country's economy**

Index Terms **–Online portal, IOT, Railway Tracking, Safety Prediction, Message alert.**

I.INTRODUCTION

We have seen how much of our lives have been made simple by means of live tracking apps. If we require to go to some place and require a cab, for that booking it's through Ola or Uber. Other executions incorporate tracking your online orders in real time, tracking trains and buses you wish to capture etc. This leads to a decrease in manual power to keep track of all such subtle elements. But this include isn't utilized as much because it can be. This include of live tracking is utilized in keeping track of stations right presently by railroads. But it is not utilized to keep track of the examinations and checks performed at the stations. This may reduce the sum of printed material and manual control included in such errand. Development of populace is specifically related to transportation facilities. In India, transportation offices are primarily taken care of by Indian railroads. Maintenance and schedule checking of railroad tracks may be a huge issue. In this paper we proposed a strategy for genuine time following of rail track for upgrade and schedule check-up. In Our proposed strategy, openlayer-2 is utilized for execution purposes. Within the proposed strategy, we give subtle elements on the prepare track inside openings of 30-40kms. Entire prepare track is partitioned into different openings with a range of 30-40kms length. Amid the support period or routine check-up of tracks, Support group is able to discover out the assessed track, and the uninspected track inside 3040kms range. Green line from one point to another point of rail track appears that the track is effectively reviewed and no assist review is required. Red line appears the track length which has not been reviewed effectively. The objective of this original copy is to supply data around reviewed and uninspected rail tracks inside 30-40kms extend consequently for the support group.

The railway track management system is a software project that supports the railway track system services as per train schedules. The project is designed with a good GUI that allows monitoring and controlling various trains on the network. It has happened so many times that you have been waiting at the railway station for someone to arrive and you don't have any exact information about train timing and other stuff. The track management system operates on train schedules and lays appropriate tracks for trains to pass as per their decided route. The Train management software has been designed to support and maintain data for multiple trains on the rail network.

II.LITERATURE REVIEW

India could be a exceptionally quick developing nation all through the world. Getting to be a developed country, by and large advancement is exceptionally much required like instruction, inquire about, most recent technology, quality of administrations, work and transport etc. In India, expansive volume of passengers are traveling through Indian railroads which increments additional stack on

rail tracks. Because of the active plan of railroad tracks, it is exceptionally difficult to oversee schedule maintenance of tracks physically. The traveller has the alternative to track the trains in real time. Train's physical area will appear within the outline with the place the train is voyaging. Passengers can select a specific prepare and after that prepare points of interest, such as past station, following station, prepare begun date and anticipated time to reach the following station are appeared to the client. Here if the crack is detected, then the system is automatically stopped. Further most of the modules can be embedded along with the microcontroller in a single board and thereby reduce the size of system. Infrared Sensors are used for detecting cracks and obstacles in the track.

III.LITERATURE SUMMARY

The summary of the literature is depicted in table 1.

Table 1: Summary of Literature Survey

Sl. No	Paper Title	Year of Publication	Methodology	Findings
[1]	Train Tracker using GPS System	May- June 2018	When combined with other sensors, computers, and communications systems.	When we open the message URL in phone browser, it will show the location in the Google map and every 30 second page will be restarted.
[2]	Train Tracking and the Signalling System using Infrared and Radio Frequency Technology	Jan 2020	Infrared (IR) sensor, Rf Transceiver, AT89S52 microcontroller	Tracking of the system using IR sensors and RF Technology may enable the rail department to safeguard human life from accidents
[3]	TRAIN TRACKING SYSTEM BASED ON GPS & GSM	June 2019	GPS, GSM	System can pinpoint the location and other attributes of an operational train in an economically accurate manner
[4]	Real Time Train Track Monitoring System	March 2018	PIC16F877A Microcontroller, IR sensor,	The advantages include less cost, low power consumption and less analysis time
[5]	Train Tracking and the Signalling System using Infrared and Radio Frequency Technology	Jan 2020	AT89S52 microcontroller.	Technology may enable the rail department to safeguard human life from accidents.
[6]	An online railway traffic prediction model	Jan 2019	Railway traffic, Train describers, Monitoring, Timed event graph, Prediction	Train interactions are modelled with high accuracy by including the main operational constraints and relying on realized corresponding minimum headway times
[7]	Railway Applications for Monitoring and Tracking Systems	May 2020	This includes an overview of the development of Global Navigation Satellite Systems for rail applications and recent research and innovations	Particular attention is paid to the analysis and discussion of the application of satellite navigation systems for real-time tracking of railway assets, and the benefits these systems could bring
[8]	Real-Time Train Tracking from Distributed Acoustic Sensing Data	8 January 2020	DAS; fibber optic sensing; train tracking; pattern recognition	High accuracy differential satellite positioning systems (D-GNSS), such as GPS or Galileo, become available and are certainly planned to be applied in future railway systems.
[9]	GPS/GSM based train tracking system – utilizing mobile networks to support public transportation.	Aug 2018	ICT combined with latest mobile and wireless technologies can be used effectively to streamline government activities and public service delivery process to improve productivity	Positioning data along with train speed helps the administration to identify the possible safety issues and react to them effectively using the communication methods provided by the system.
[10]	Railway Track Monitoring Using Train Measurements: An Experimental Case Study	13 November 2019	Gsm, microcontroller, IR sensors	A new representation of the signal is proposed to show the signal energy level as a function of train location. It is shown that the forward speed of the train has a considerable influence on the energy level of the signals

[11]	Real Time Train Track Monitoring System	March 2018	GSM, GPS, MICROCONTROLLER, IR SENSOR, SIGNALS	For crack detection we are using the IR sensor which will be mounted in between the track where the two different tracks are getting joint
[12]	A multi-objective and dictionary-based checking for efficient rescheduling trains	18 January 2021	The GKACO algorithm is utilized for optimizing the constraints and attaining the optimum rescheduled timetable	The rescheduling of trains should make certain traffic order and effectiveness and adjust train movements as per the schedule as possible
[13]	Prediction of Train Arrival Delay Using Hybrid ELM-PSO Approach	JUNE 2021	This paper proposes a hybrid model of ELM and PSO for train delay prediction.	ELM can overcome the shortcoming of backpropagation training algorithms
[14]	Data Reading Algorithms for WSNs Railway Monitoring	August 8th, 2020	decision maker; railway; algorithm; information system	It is an information system and communication issue to read the maximum data sent from sensors to the control unit of the railway system, hence conducting to propose algorithms to solve it.

IV.METHODOLOGY

When there is some obstacle is present in front of the track or there is a presence of gap between two joining tracks, the IR sensor will detect the gap between the two tracks and indicate on LCD display and with the help wi-fi module the authorized person of railway will be informed via SMS function. When the LDR and LED pairs are cut in the sequence, the alert message is sent via wi-fi about the NEXT STATION and it is displayed on LCD display. When there is RED light on signal pole, the RF transmitter will send the notification to the loco pilot to stop the train which is in the particular range or else the train will be stopped automatically. The cost of the proposed system is very less. It also checks surface and near surface of the cracking position. Transmitting signals are immediately transferred and accidents are reduced.

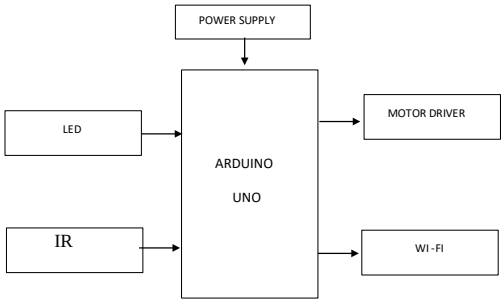

Figure 1: Methodology

It can work in any terrain 24*7 and detects cracks accurately. The system is robust and rugged to environmental changes. As more relevant data is acquired it is expected that the present system may assist loco pilot in averting accidents effectively. Since robot is made up of sensor unit it may get damaged anywhere while detecting and power consumption is more. The project is developed and designed to improve rail track management. The main aim of project is to reduce man power. By using this project, we can detect crack in railway track and obstacle on the track.

V.DESIGN AND IMPLEMENTATION

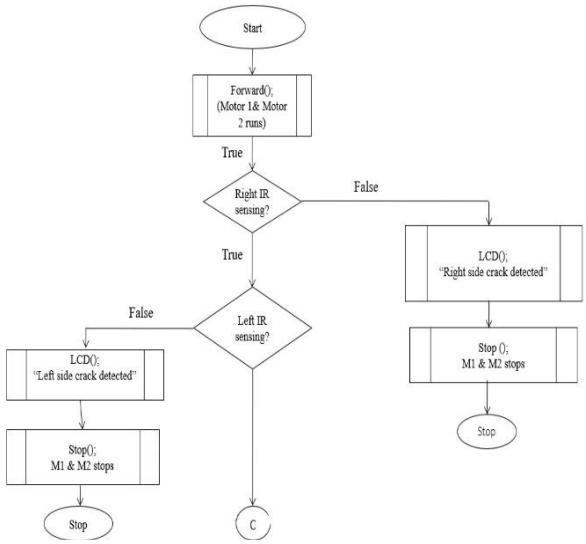

Figure 2: Flowchart of crack detection

When the machine is started Motor 1 and Motor 2 run, which gives out a way for IR sensors to detect. Right IR sensor detection is false is shown if Right side crack is detected on the track and the robot stops if Right IR sensor detection is true then the robot continues to move forward and there is no detection of the crack found on the track. If Left IR sensor detection is false then the robot's Left side crack is detected and the robot stops if Left IR sensor detection is true then the robot continues to move forward and there is no detection of the crack found on the track.

Hardware Requirements are Arduino Board, IR, LED, WI-FI, Motor Driver, DC Motor Software Requirements are Arduino IDE and Embedded C

Arduino UNO is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a 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.An infrared (IR) sensor a proximity sensor, or a 'nearness' sensor that senses whether there is an object near it or not. The IR stands for Infrared sensor. Infrared is the light out of our visible spectrum.The white LED here is an IR LED which works as the transmitter and the component next to the IR LED is a photodiode that works as the receiver in the IR sensor.The IR transmitter continuously emits the IR light and the IR receiver keeps on checking for the reflected light. If the light gets reflected back by hitting any object in front it, the IR receiver receives this light. This way the object is detected in the case of the IR sensorThe most commonly used actuator in any electronic device/machine will be motors next to solenoids, pneumatics and hydraulics. From a simple vibration motor inside a mobile phone to complex stepper motors in CNC machines, these DC machines can be found everywhere. To control a motor using a Microcontroller or processors we need something called Motor Driver or Motor Controller. Depending upon the type of motor and type of control required the type of Motor Drivers will also change. In this article we will focus only of DC motors and how to control a DC motor using a Motor Driver with the most popular H-bridge Topology.

DC motors operation is based on simple electromagnetism,three 45 r.p.m DC motors and requires 12 volts of DC supply

Proposed Algorithm:

1)Start the Module

2)Check Wi-Fi Connection.

3)Movement of Robot

4)Detecting the Crack in Track, we find through the IR Sensors

5)When it detecting LED will be ON condition.

6) Through Wi-Fi we get the Information.

7)Display on Railway Department control Room/station master.

8)It continue our robot will Move.

9)STOP.

Performance Analysis:

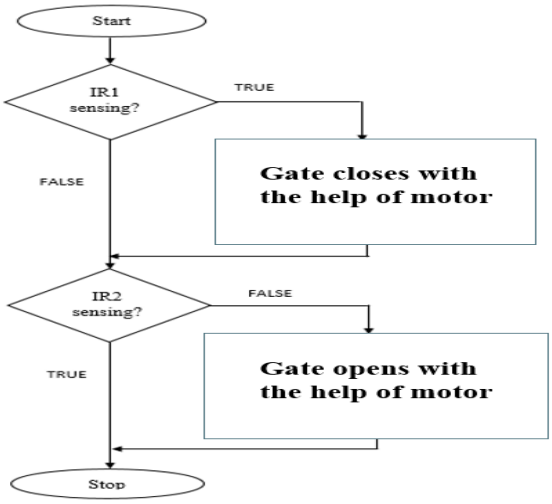

Figure 3: Flowchart of automated gate system

The above figure depicts the flowchart of automated gate system in Indian Railways.By employing the automated railway gate control at the level crossing,the arrival of train is detected by the IR sensors which is placed on either side of the arrival of train.Once the train is sensed by IR sensors then the gate closes with the help of motors,if there is no train detected by IR sensors then the motor is activated and gates are opened.

VI. RESULTS

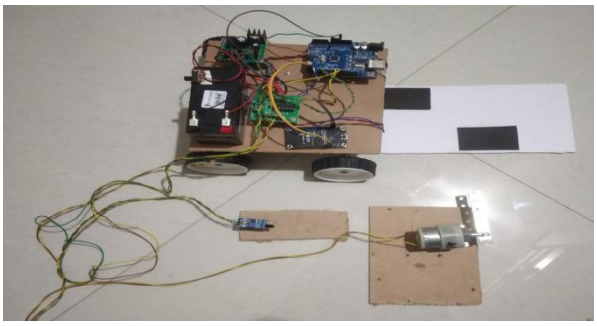

Figure 4: Crack Detection Robot with Automated Gate System

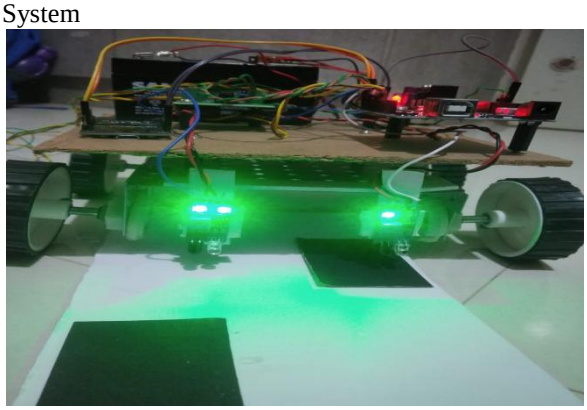

Figure 5: Right side crack detected

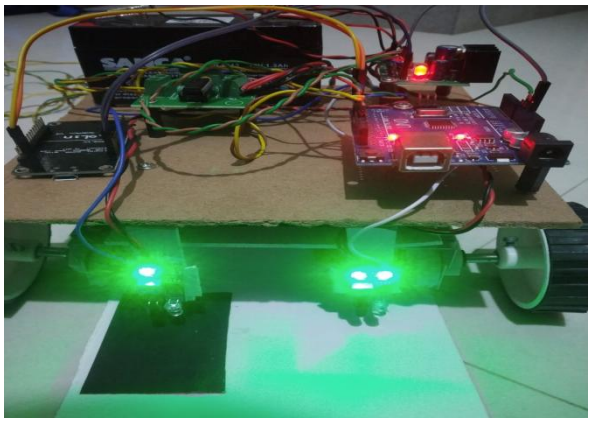

Figure 6:Left side crack detected

Figure 7: Updating of crack detection to the station master

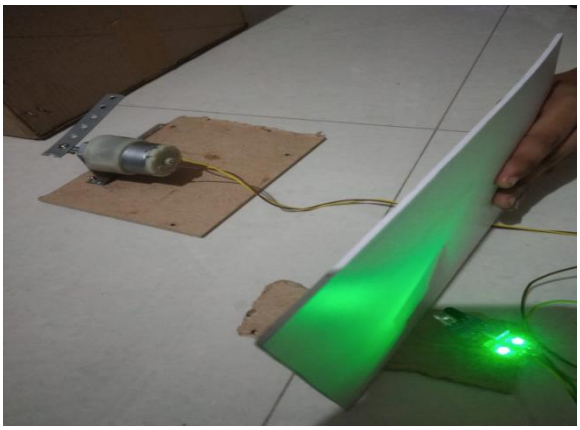

Figure 8: Closing of gate when sensor detects the train

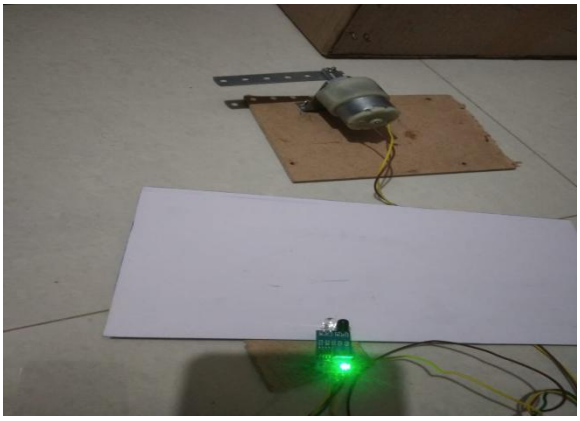

Figure 9: Opening of gate when sensor does not detect the train

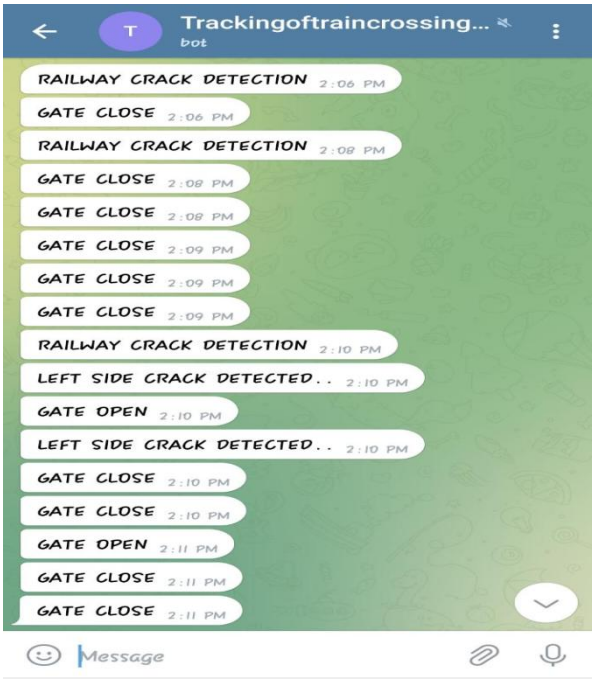

Figure 10: Updating about the automated gate system to the station master

VII.CONCLUSION

To release a real time railway track tracking system to minimize the search time required to find out inspected or uninspected track with cost effective. The proposed robot provides the capability to track 30-40kms from current position of the railway track. The proposed robot also provides information regarding the inspected track and uninspected track with other relevant information such as last inspected date, expected date of inspection, name of inspected team and major faults identified and correct during last inspection etc. Cracks in rails have been identified to be the main cause of accident in the past. Hence,

solution of this problem, using robot to detect the cracks in railway track and when robot detect the fault it sends the message to base station. This system automatically detects the faulty rail track without any human interaction. There are many advantages with the proposed robot when compared with the traditional detection techniques. The advantages include less cost, low power consumption and less analysis time. In Railway track fault detection, we are going to deal with two functions 1. Track fault detection and alerting 2. Alerting the station master about automated gate master without updating manually.

VIII. FUTURE SCOPE

To avoid the different types of accidents happening in the day-to-dayrailway transportation.Automatic detachment of compartment when fire detected and activation of sprinklers.To avoid the accidents happening due to derailment by using sensors to detect the cracks in the rails. To implement the concept of automatic locking of crossings whenever the train approaches.

REFERENCE

[1] PLC Based Automatic Fault Detection of Railway andAccident-Avoidance System, Kiran Kumar P. and ShankaraBS, 2015

[2] RAILWAY TRACK CRACK DETECTION AND DATA ANALYSID. NARENDHAR SINGH 1,D. NARESH2, 2017 IJCRT | Volume 5, Issue 4 December 2017 | ISSN: 2320-2882

[3] Train Track Fault Detection System Prof.Swati. D. Patil1, Prof.Pallavi.M. Taralkar2, ISSN (PRINT): 23938374, (ONLINE): 2394-0697, VOLUME-5, ISSUE-2, 2018

[4] Automated vehicle for railway track fault detection M Bhushan et al 2017

[5] Crack Detection for Railway Tracks and Accident PreventionVarada Divya1, Ritika Sreekumar2 Volume 5 Issue II, February 2017 IC V ISSN: 2321-9653

[6] Railway Fault Detection System using Mobile Communication and Sensor Technology Mr. P. Madhusudan Reddy1, Mr. I. Sharath Chandra2, Prof. B. Kedarnath3 Volume 5 Issue V, May 2017 IC Value: 45.98 ISSN: 2321-9653

[7] al Fayez, Fayez, LoaiKayed B Melhim, and Mahdi Jemmali. "Heuristics to Optimize the Reading of Railway Sensors Data." Paper presented at the 2019 6th International Conference on Control, Decision and Information Technologies (CoDIT), 2019.

[8] Bin, Sheng, and Gengxin Sun. "Optimal Energy Resources Allocation Method of Wireless Sensor Networks for Intelligent Railway Systems." Sensors 20, no. 2 (2020): 482.

[9] Burdett, Robert L, and Erhan Kosan. "Performance Profiling for Predictive Train Schedules." Journal of Rail Transport Planning & Management 4, no. 4 (2014): 98- 114.

[10] Enshaei, Nastran, Amin Hammad, and FarnooshNaderkhani. "A Comprehensive Review on Advanced Maintenance Strategies for Smart Railways." In Handbook of Research on Interdisciplinary Approaches to Decision Making for Sustainable Supply Chains, 433-57: IGI Global, 2020.

[11] Hammoud, Mohammad, Fayez Al-Fayez, Huw Lloyd, Robert Newman, Bamidele Adebisi, AhcèneBounceur, and Abdelrahman Abuarqoub. "A Wireless Sensor Network Border Monitoring System: Deployment Issues and Routing Protocols." IEEE Sensors Journal 17, no. 8 (2017): 2572-82.

[12] Lan, Jinhua, Yao liang Jiang, Guoliang Fan, Zongyang Yu, and Qi Zhang. "Realtime Automatic Obstacle Detection Method for Traffic Surveillance in Urban Traffic." Journal of Signal Processing Systems 82, no. 3 (2016): 357-71

[13] Lu, Chen, and Yong Shen. "Research on Location Detection of Railway Track Spike Based on Neural Network." Paper presented at the IOP Conference Series: Materials Science and Engineering, 2020.

[14] Melhim, LoaiKayed B, Mahdi Jemmali, and Mafawez Alharbi. "Intelligent Realtime Intervention System Applied in Smart City." Paper presented at the 2018 21st Saudi Computer Society National Computer Conference (NCC), 2018.