Efficient Railway Track Crack Detection System

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Abstract —**India, the country with the fourth-largest railway community in the world, uses trains more frequently than any other country. Despite the remarkablegrowth of Indian Railways, the organization is still beset byseveral severe problems, including an unmonitored track that can lead to derailments, problems at gate crossings, and fire mishaps. As the seasons change, the tracks get smaller and bigger. As a result, the track may develop cracks. The suggested system uses sensors to detect fractures and impediments on the track, and it uses a GSM and GPS module to send an SMS to the control room informing them of the situation. The majority of accidents are caused by improper train navigation, which can be reduced with the use of ultrasonic sensors. The sensor stops the train if it senses any obstacle on its way. Likewise, the majority of accidents can be reduced.**

Keywords: crack detection, GSM, GPS, ultrasonic sensor, infrared sensor.

I.INTRODUCTION

Since transportation is one of the main energy consumers in themodern world, concerns about its sustainability and safety are critical. In India, rail transportation plays a significant role in meeting the constantly increasing demands of a quickly expanding economy. But when it comes to safety and dependability, India still lags behind the rest of the world. The key issue is the lack of effective and affordable technologies toidentify issues with the train tracks and improper maintenance.Nonetheless, the economy is significantly impacted by the appropriate operation and upkeep of transportation infrastructure. This model describes a suggested prototype testing train that is comparable to line-following testing in that it detects obstructions and cracks. The prototype also detects theobstacle in front of the train and avoids the collision by immediately halting the train.

II.LITERATURE SURVEY

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III.BLOCK DIAGRAM

Fig 1. shows the block diagram of the system. The GSM moduleis used to transmit alert messages to the user on his cell phone, and the Arduino is used to regulate the entire process. The sensors that are used are ultra sonic sensor and ir sensor. The ultra sonic sensor detects an crack on the track and sends the location of the track to the user, the ir sensor will detect any object or obstacle on its way and immediately stop the train as a result. Using GSM, the two mobile devices are connected. A GPS module is connected in order to get the location of the trainif the sensor detects any obstacle
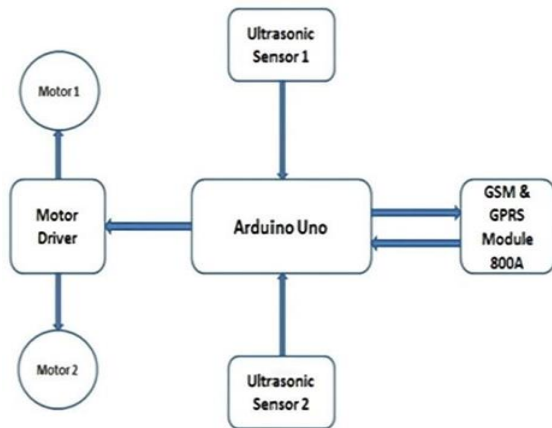

Fig 1. Block diagram

IV HARDWARE REQUIREMENTS

The hardware requirements for the EFFICIENT RAILWAYTRACK CRACK DETECTION include:
1. AURDINO UNO:
Arduino is an open-source programmable circuit board based on top of easy-to-use hardware and software. 2. GPS MODULE: A satellite navigation system used to position the ground place of an object. A GPS receiver calculates the position by timing the signals send by the GPS satellites high above the earth.
3. ULTRA SONIC SENSOR: An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal.
4. IR SENSOR: The IR transmitter continuously emits the IR light and the IR receiver keeps on checking for the reflected light. If the light get reflected back by hitting any object in front of it, the IR receiver receives this light.
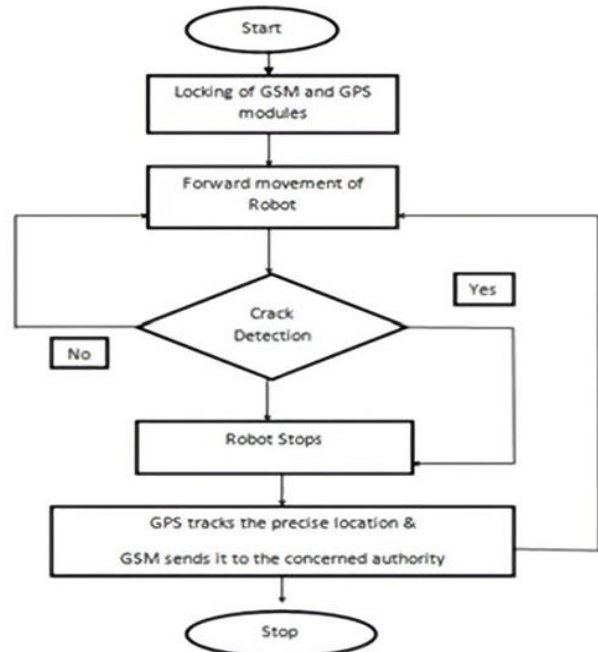
V FLOW CHART

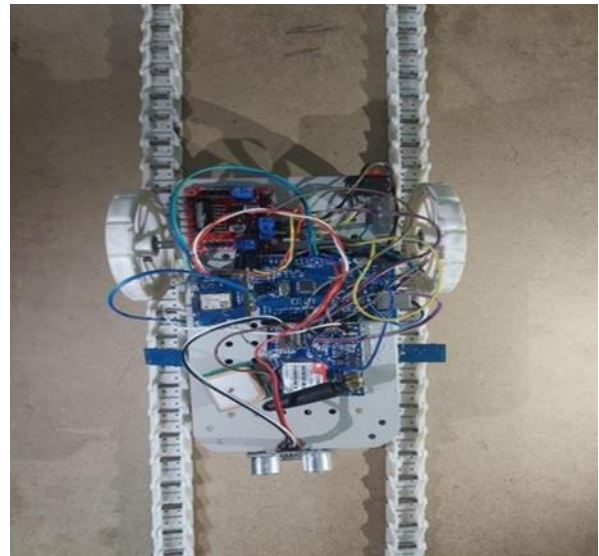Fig 2. Flow chart

VI PROTOTYPE

Fig 3. Prototype

VII. RESULT

As a result, we were able to design the prototype with the following features and the sensors described above.
1. The trainwill halt when an ultrasonic sensor detects a moving object or impediment on the track, and the

GPS module will get the exact location. 2. Another significant accomplishment of this prototype is its ability to use an IR sensor to identify track cracks and halt trains before they cause accidents.

ADVANTAGES

1. Efficient and low cost design
2. Low power consumption.
3. Real time monitoring.
4. GSM based user-friendly interfacing
5. Fast response and long life
6. GSM message alerts
7. Controls low and high voltage and current devices
8. Devices can be operated from anywhere in the world.
9. Feedback of the devices being operated is present.
10. The immediate attention can take place if a variation happens in the sub-station parameters.

VIII.CONCLUSION

The real-time monitoring of different parameters is done which can provide safety to the substation and its equipment. The substation is monitored and controlled to avoid heavy blasts caused due to overload. By using GSM, the critical condition is informed to the authorized person as SMS to prevent the substation from overloading. In advancement, tapping of current can be analyzed. Secondly, using highly advanced ICs with the help of growing technology gives effective results in the project. The main component of the system is the crack detection circuit. The GSM Modem helps to alert the railway authorities about the crack in the tracks. The ultra sonic sensor detects any object in front of the train and avoids collision. The other main component is the IR sensor which monitors the movement of the train on the track, if the track is derailed then immediately it senses and stops the train. Thus, an automated crack detection and security system is proposed in this paper which makes the system more reliable, less time-consuming, and has reduced manpower requirement.

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