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SMART SYSTEM FOR COLLISION AVOIDANCE AND CRACK DETECTION ON RAILWAY TRACKS

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ABSTRACT

Wireless Sensor Networks (WSNs) have been employed in a wide range of applications due to the low-cost and ease of installation features. One of the applications is in the road safety and highways, in a wide range of scenarios. In this paper, an GSM-based system for collision detection on rail track inspection is presented. In this project, we develop an automatic rail track inspection.The ultrasonic sensor is used to detect the obstacles on the railway tracks. The mems sensor senses the angular change in the railway track. If any change occurs on the railway track then the location will be sent to the particular mobile number with the help of GPS and GSM module.

Keywords: Ultrasonic Sensors, Mems Sensor, GSM Module.

I. INTRODUCTION

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. 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 inspection takes too much time to inspect the rail collision and then inform to the railway authority people. In this way it may lead to disaster. Hence to avoid delay and improve the accuracy, our proposed system will automatically monitor the rail by using vision-based method and vibration based method. This monitoring is unacceptable for slowness and lack of objectivity because the results are related to the ability of the observer to recognize critical situations. So we proposed automatic visual inspection of rail using Arduino UNO microcontroller and GSM.

OBJECTIVE:

The objective is to enhance rail safety by implementing a sophisticated, real-time monitoring system. This system aims to proactively detect potential collisions and identify track cracks, ensuring swift response measures to prevent accidents and maintain the integrity of the railway infrastructure.

PROBLEM STATEMENT:

The instant detection of collisions with the guardrails will allow to minimize the consequences of an accident or disaster. In a collision detection, all the intervention mechanisms in emergency aid and support to victims can be triggered, allowing a fast response by the emergency and rescue teams. At the same time, the security procedures are activated in order to inform in real time other drivers prior to arrive. In this context, wireless sensors have been employed in order to monitor and report the conditions of the highways The Wireless Sensor networks (WSN) are being adopted in a multitude of environments and applications. Composed by tiny and very lower-power sensors capable of sensing a wide range of environmental parameters and other physical quantities, they provide the best solution for small data processing sensor applications.

II. LITERATURE SURVEY

1. Alia Rifat, P.Pandao

The proposed system is an enhanced technique for monitoring the obstacle which uses arduino microcontroller, ultrasonic sensor, and radar module. The radar will obtain the distance from the obstacle and ultrasonic sensor will ensure to avert the accidents that may occur by the collision between the train and obstacle.

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2. Nagib Mahfuz, Omar Ahmed Dhali, Safayet Ahamed

Proposed a system which detects cracks by the help of ultrasonic sensors, GPS and GSM module once the crack is detected the message along with the location is send to the officials.

3. Trehag, P. Handel, and M. Ögren.

Onboard estimation and classification of a railroad curvature IEEE Trans. Instrum. Meas., vol. 59, no. 3, pp. 653 - 660, Mar. 2010. The aim is to determine where the transition curves, straight tracks and circular curves are located along the railroad. For this purpose, the railroad curvature measurements are used. The method is based on a Double Exponential Smoothing algorithm (DES). The DES algorithm is described with the aid linear filters, where the outputs are the estimate of the curvature and its rate of change

4. A.K. Shrivastava, A. Verma and S. P. Singh.

The system is implementable in the robotic sewer blockage detection system. The distance of the blockage from a specified entry point in the sewer pipeline can be calculated by adding travelled distance by the robotic vehicle and the distance of the blockage from the robotic vehicle. The accuracy of distance of blockage will be sufficient for normal practical uses. The system can be easily implemented in other devices and systems requiring the measurement of distance of an object or an obstacle from stationary or moving observation point where the ultrasonic sensor will be located.

III. METHODOLOGY

The project's design and methodology involve several stages. Initially, ultrasonic sensors are employed for detecting objects on the railway tracks. Upon detection, these sensors trigger an alert, prompting the train to decelerate by activating the air brakes. Simultaneously, an alarm system positioned along the tracks notifies nearby individuals to vacate the area promptly. Furthermore, a crack detection system utilizing IR sensors is implemented to identify any fissures along the tracks. When a crack is detected, the system alerts the train operator and transmits the train's location to authorities via GPS modules. Additionally, barriers are installed at railway platforms to prevent accidents on the tracks. Moreover, fire sensors are utilized to detect fires on the tracks, ensuring timely intervention. Lastly, sensors are deployed at rail crossings to automate the opening and closing of gates, enhancing safety measures.

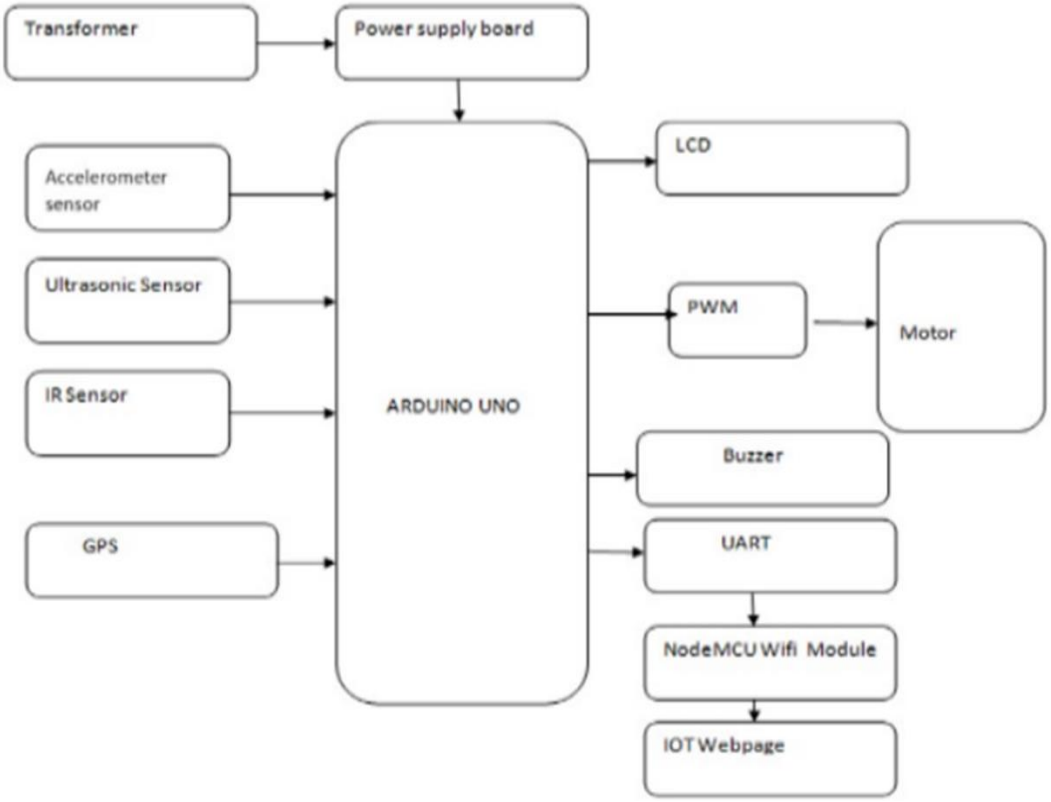

Figure 1: Block Diagram

IV. CONCLUSION

Overall, the implementation of a smart system for collision avoidance and crack detection represents a significant investment in railway safety and efficiency, with long-term benefits for both passengers and operators. Continued research and development in this field will further advance the capabilities and effectiveness of such systems, ultimately contributing to a safer and more reliable railway transportation system.

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