Train Accident Prevention System

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Abstract

The Train Accident Prevention System is a basic safety mechanism designed to detect approaching trains using ultrasonic sensors. When a train is detected within a predefined range, the system activates a buzzer and an LED light as warning signals. This alert system helps prevent accidents at unmanned railway crossings or maintenance zones by providing a simple, real-time visual and audio indication of an incoming train. It is a cost-effective and easy-to-implement solution aimed at enhancing safety in railway environments.

Keywords:- *Ultrasonic Sensors (6x); Arduino Board; Buzzers (6x); LED s (6x)*

Software:- Arduino IDE, Proteus 8 professional.

1. Introduction

This project aims to develop a cost-effective train accident prevention system using Arduino and ultrasonic sensors to detect obstacles on tracks in real-time. It enhances rail safety by providing early warnings for objects, people, or animals, helping prevent potential collisions.

Material:- Ultrasonic Sensors (6x),Arduino Board, Buzzers (6x),LED s (6x)

2. Methodology

The Train Accident Prevention System is designed to detect an approaching train using an ultrasonic sensor placed near the railway track. The ultrasonic sensor works by emitting high-frequency sound waves and measuring the time it takes for the echo to return after bouncing off an object. When a train enters the sensor's predefined detection range, it reflects the sound waves back to the sensor. The system identifies this as a train based on the distance and size of the reflected signal. Once the train is detected, the system activates a buzzer and an LED to provide audio and visual alerts, warning people near the track or crossing. These alerts remain active as long as the train is within range, turning off automatically after the train passes. The entire process is controlled by an Arduino microcontroller, which processes the sensor input and manages the output signals in real time, offering a simple yet effective train detection and alert solution.

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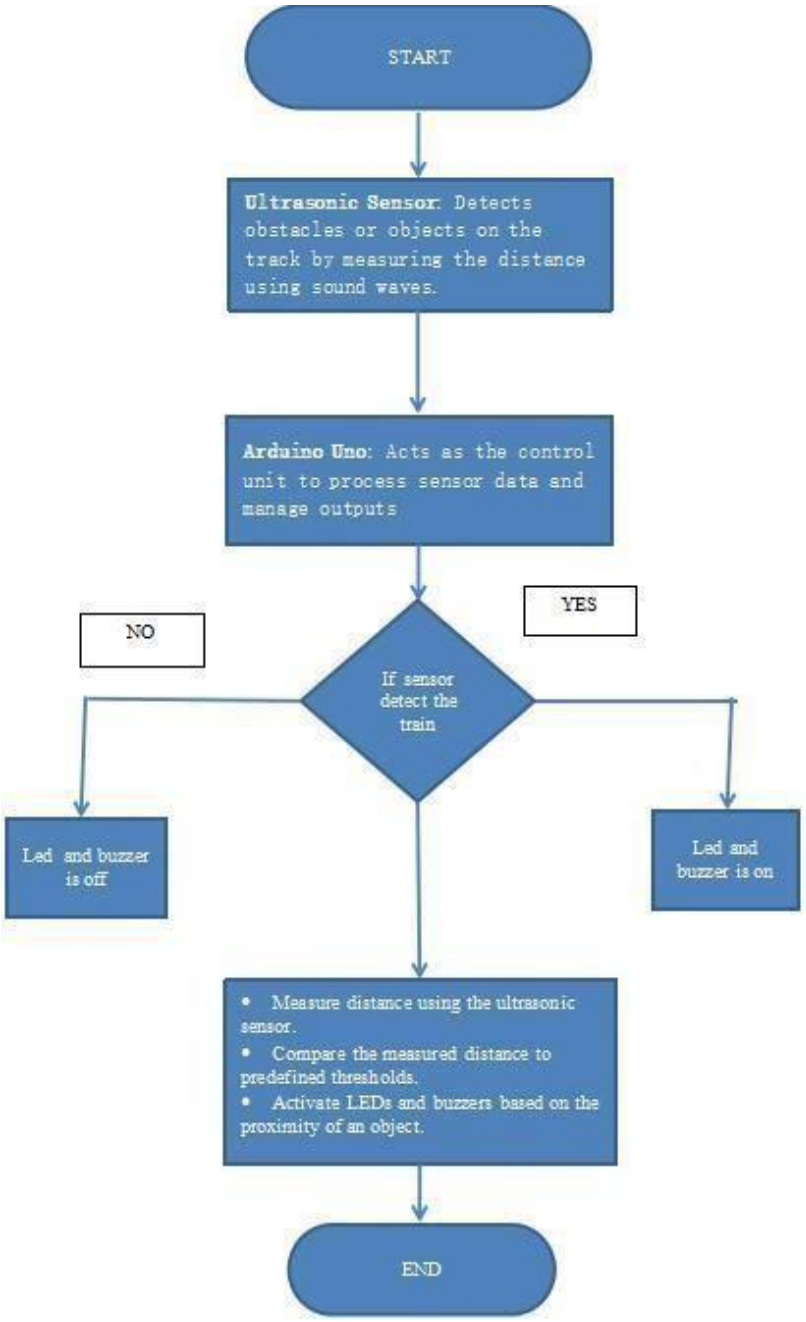
3. Flow Chart


START
Ultrasonic Sensor: Detects obstacles or objects on the track by measuring the distance using sound waves.
Arduino Uno: Acts as the control unit to process sensor data and manage outputs
If sensor detect the train
NO
YES
Led and buzzer is off
Led and buzzer is on
Measure distance using the ultrasonic sensor.
Compare the measured distance to predefined thresholds.
Activate LEDs and buzzers based on the proximity of an object.
END

4. Result

a) Early Obstacle Detection:

The system successfully detects train within the specified range. Accuracy depends on the sensor's placement and calibration.

b) Improved Safety:

Early warnings allow train operators to take necessary actions, reducing accident risks.

c) Real-Time Alerts:

LED s and buzzers activate reliably when train are detected.

d) Potential Limitations:

False positives (e.g., due to animals or environmental factors like rain). Sensor malfunctions or interference with ultrasonic waves.

5. Experimental setup

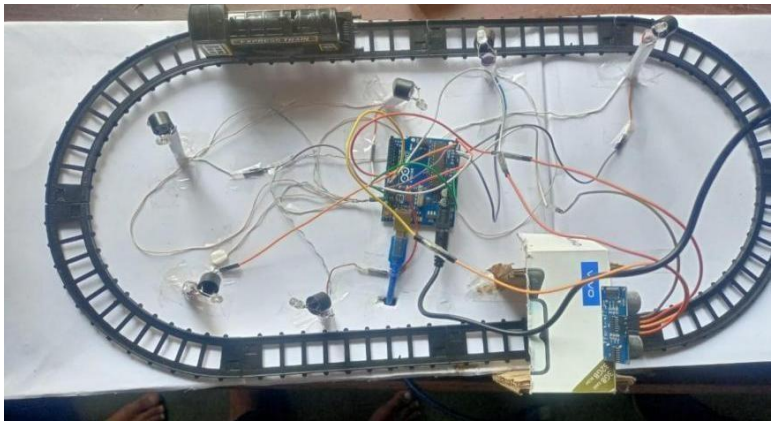


Fig4.1 project setup

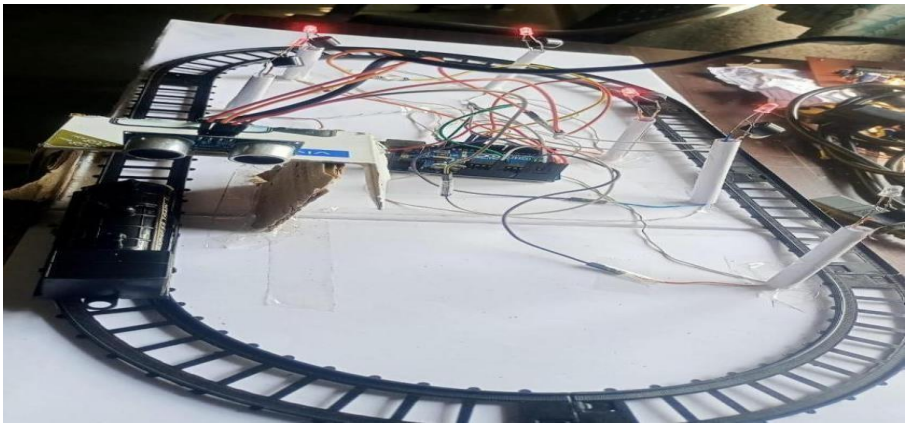


Fig 4.2 output of the project

6. Conclusion

The train accident prevention system, which uses ultrasonic sensors, an Arduino, LEDs, and buzzers, offers an effective and low-cost solution to improve railway safety.. The system ensures real-time detection of obstacles on or near the tracks, providing both visual and auditory alerts. This enables train operators to take timely action, reducing the risk of collisions and other accidents.

7. Acknowledgement

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8. Conflict of Interest

The authors declare that they have no conflict of interest.

9. Funding Declaration

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10. Reference

Anil, M. D., Sangeetha, S., Divya, B., Niranjana, B., & Shruthi, K. S. (2014). Advanced railway accident prevention system using sensor networks. *International Journal of Advanced Research in Computer and Communication Engineering, 3*(5).

Balamurugan, M., Parthinban, T., & Kumar, S. M. (n.d.). Automation of animal and fault detection in railway tracks using PLC. *International Journal of Current Research and Modern Education (IJCRME)*. ISSN 2455–5428.

Chethan, S., Vivek Purushotham, Raghu, J., & Vineeth. (2019). Railway track crack and break detection system with onboard signalling. *Journal of Emerging Technologies and Innovative Research (JETIR), 6*(5).

Kalaivani, A., & Hemalatha, J. (n.d.). Prevention of wildlife collisions on railway tracks. *Sathyabama Institute of Science and Technology*.

Rong, C., Zhu, J., Giardina, F., et al. (2021). Railway track tracer system for creature detection. In M. Deepa et al. (Eds.), *IOP Conference Series: Materials Science and Engineering*. IOP Publishing.

Verma, Y., Kesharwani, V., Kesharwani, T., & Agrawal, V. (2022). Accident Prevention System (T.A.P.S). *Journal of Emerging Technologies and Innovative Research (JETIR), 9*(5).

About Author

Ms. Rutuja VijayKumar Kolekar holds a degree in Electronics and Telecommunication Engineering from Dr. Babasaheb Ambedkar Technological University. She is the lead author of the research paper titled "Train Accident Prevention System," which was published on May 14, 2025, in the IJAER (International Journal of Advanced Engineering Research). As both the author and co-author of the publication, she has demonstrated strong research and analytical skills in developing safety technologies for railway systems. Rutuja possesses technical proficiency in programming languages such as Java and C, which she has effectively applied in her academic and research projects.

Her interests lie in the intersection of embedded systems, communication technologies, and safety automation. She aims to contribute to innovations that enhance public transportation safety And reliability.