REPORT

Project Title:

Enhanced Safety and Proximity Monitoring System for Urban Rail Transport using Ultrasonic Sensors Signal

1. Introduction:

The project aims to implement an advanced safety and proximity monitoring system for urban rail transport by integrating ultrasonic sensors into trains. The system is designed to detect obstacles, provide visual signals to the train driver, and relay real-time distance information between trains, thereby enhancing safety and efficiency in urban rail transportation.

2. Objectives:

Implement ultrasonic sensors on trains to detect obstacles in the train's path.

Display a red signal when an obstacle is detected and a green signal in the absence of obstacles.

Intensify signal color as the distance between trains decreases.

Provide accurate real-time distance information between trains to assist the train driver.

Integrate the ultrasonic system into the existing Communication-Based Train Control (CBTC) system that utilizes Wi-Fi signaling.

3. System Components:

Ultrasonic Sensors: Mounted on the front of each train to detect obstacles.

Signal Indicator: Displays red or green signals based on obstacle presence.

Distance Measurement: Utilizes ultrasonic sensor data to calculate and display real-time distance between trains.

Wi-Fi Signaling: Integrates with the CBTC system for seamless communication.

4. System Operation:

When an obstacle is detected, the ultrasonic sensor triggers a red signal, alerting the driver to the obstruction.

In the absence of obstacles, the signal remains green, indicating a clear path.

As trains approach each other, the signal color darkens proportionally to the decreasing distance between them.

Real-time distance information is displayed to the train driver, facilitating informed decision-making.

5. Benefits:

Improved safety: Early detection of obstacles ensures prompt response and accident prevention.

Enhanced efficiency: Real-time distance information allows for optimized train spacing and scheduling.

Driver assistance: The system aids the train driver in making informed decisions about speed and proximity.

6. Integration with CBTC System:

The ultrasonic system seamlessly integrates with the existing CBTC system, utilizing Wi-Fi signaling for communication.

Data exchange between trains and the control center ensures a synchronized and coordinated urban rail network.

7. Future Developments:

Continuous system optimization based on real-world data and feedback.

Exploration of additional sensors or technologies for further safety enhancements.

Collaboration with urban rail authorities to implement the system on a larger scale.

8. Conclusion:

The integration of ultrasonic sensors into the urban rail transport system represents a significant advancement in safety and efficiency. By providing real-time obstacle detection and distance information, the project contributes to the overall improvement of the urban rail network, ensuring a safer and more reliable transportation experience for both passengers and operators.

VIDEO

https://drive.google.com/file/d/1eBhOooUXYzev6FvySSr-l1GXvP2o3bXc/view?usp=sharing