Automatic Speed Control in Restricted Areas using RF Modules

Abstract

This project demonstrates an automatic vehicle speed regulation system in restricted areas such as schools, hospitals, and crowded zones. Using RF transmitters and receivers, vehicles automatically detect the designated speed limit and regulate their motor speed accordingly. A notification module alerts the driver with both visual (LCD) and audio (buzzer) warnings.

System Overview

The system consists of RF transmitters placed in restricted zones, a vehicle-mounted RF receiver, a microcontroller (Arduino Uno), and a motor driver controlling the vehicle's motor. When the vehicle enters a zone, the receiver captures the zone code, decodes the speed limit, and adjusts the motor's PWM value. The notification module informs the driver of the current zone limit.

Hardware Components

Component	Function
Arduino Uno	Microcontroller to decode signals and regulate speed
RF Transmitter (433 MHz)	Placed in restricted zones, transmits unique codes
RF Receiver	Receives zone codes in vehicle
Motor Driver (L293D)	Controls motor speed based on PWM input
DC Motor	Prototype vehicle motor
LCD Display (16x2)	Displays zone and speed limit
Buzzer	Alerts driver on entering restricted zone

Working Principle

1. RF transmitters broadcast speed limit codes within restricted areas. 2. The vehicle's RF receiver captures the code and forwards it to the Arduino. 3. Arduino decodes the speed limit and compares it with the current vehicle speed. 4. If overspeeding, PWM to the motor is reduced gradually via the motor driver. 5. The LCD displays the zone and speed limit, and a buzzer alerts the driver. 6. Once the vehicle exits the zone, normal speed is restored.

Future Improvements

- GPS-based detection instead of RF modules. - Integration with CAN bus for real automotive systems. - Mobile app notifications linked with vehicle system. - Advanced braking integration for safety enforcement.

Conclusion

This project provides a proof-of-concept prototype for automatic speed control in restricted areas using RF communication. While demonstrated on a model vehicle, the concept can be extended to real-world automotive applications with enhancements like GPS, IoT connectivity, and integration with braking systems for improved road safety.