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Automatic Vehicle Speed Control in Public Zone

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Abstract: *The project "Automatic Vehicle Speed Control in Public Zone" focuses on improving road safety by automatically controlling vehicle speed in sensitive areas such as school zones, hospital areas, residential streets, and accident-prone regions. The system uses RFID technology to detect restricted zones and an Arduino-based embedded system to automatically limit vehicle speed without depending on driver awareness. An ultrasonic sensor is used for obstacle detection, while a buzzer and LCD provide alerts and information. The proposed solution reduces accidents caused by overspeeding, protects pedestrians, and enhances public safety. The system is cost-effective, reliable, and suitable for smart city applications.*

Keywords: *Automatic Speed Control, RFID Technology, Arduino Uno, Embedded System, Road Safety, Public Zones, Ultrasonic Sensor, Smart Transportation, Accident Prevention, Intelligent Traffic System*

I. INTRODUCTION

Road safety has become a major concern in modern society due to the increasing number of vehicles and rising cases of accidents, especially in sensitive public areas such as school zones, hospital surroundings, residential streets, and busy marketplaces. In these areas, maintaining a controlled vehicle speed is very important to ensure the safety of pedestrians, children, elderly people, and patients. However, traditional speed control methods rely mainly on drivers following traffic rules and signboards, which are often ignored or unnoticed due to human errors like distraction, negligence, or lack of awareness.

To overcome these limitations, there is a need for an intelligent and automated system that can control vehicle speed without depending entirely on driver behavior. The

project "Automatic Vehicle Speed Control in Public Zone" proposes a smart embedded system that automatically detects restricted zones and adjusts the vehicle speed accordingly. This system uses RFID technology to identify specific zones and an Arduino-based controller to regulate speed. Additionally, sensors like ultrasonic sensors help in detecting obstacles and preventing collisions.

The proposed system not only reduces the chances of accidents caused by overspeeding but also improves overall road safety and efficiency. It is a cost-effective, reliable, and innovative solution that can be widely applied in smart cities and modern transportation systems to ensure safer and more controlled driving environments.

II. LITERATURE SURVEY

Existing speed control methods like signboards and speed breakers depend on driver attention and are often ignored, leading to accidents. GPS-based systems were introduced but have limitations such as high cost and low accuracy in some areas.

RFID-based systems provide a better solution by automatically detecting zones and controlling vehicle speed. Ultrasonic sensors further improve safety by detecting obstacles.

Thus, modern embedded systems using Arduino, RFID, and sensors offer a reliable, cost-effective, and automatic solution for controlling speed in public zones.

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III. METHODOLOGY

"Automatic Vehicle Speed Control in Public Zone" is implemented using an embedded system approach with the following steps:

Zone Identification using RFID

RFID tags are placed in restricted areas such as school zones, hospitals, and residential areas. The RFID reader installed in the vehicle detects these tags when the vehicle enters a specific zone.

Signal Processing by Controller

The detected signal is sent to the Arduino Uno (ATmega328P), which acts as the main controller. It processes the information and identifies the type of zone.

Automatic Speed Control

Based on the detected zone, the controller sends signals to the L293D motor driver to reduce or limit the speed of the vehicle automatically.

Obstacle Detection

An ultrasonic sensor continuously monitors the distance of objects in front of the vehicle. If an obstacle is detected within a safe range, the system either slows down the vehicle or provides a warning.

Alert and Display System

A piezoelectric buzzer gives warning alerts, and a 16×2 LCD display shows important information such as zone type and speed status.

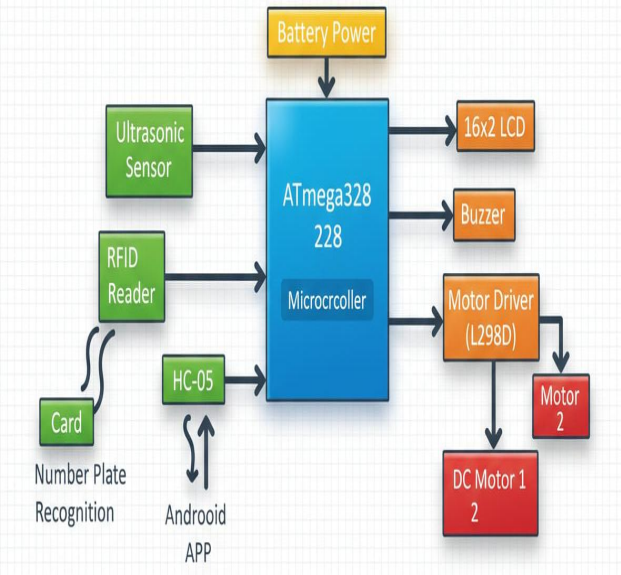
Wireless Monitoring (Optional)

The HC-05 Bluetooth module allows wireless communication for monitoring system data.

Power Supply and Execution

The system is powered by a regulated 5V/12V supply, and the entire process runs continuously to ensure real-time speed control and safety.

IV. SYSTEM DESIGN



The main components of the system include :

- Arduino Uno (ATmega328P) – Main controller
- RFID Tag & RFID Reader – Zone detection
- L293D Motor Driver IC – Motor speed control

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- Ultrasonic Sensor – Obstacle detection
- Piezoelectric Buzzer – Warning alert
- 16×2 LCD Display – Display information
- HC-05 Bluetooth Module – Wireless monitoring.

Working Principle

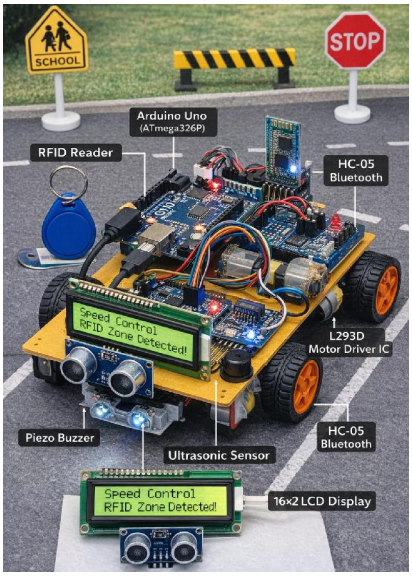
The "Automatic Vehicle Speed Control in Public Zone" system works on the principle of automatic detection and control using RFID and embedded technology.

When the vehicle enters a restricted area, the RFID reader installed in the vehicle detects the RFID tag placed in that zone. Each tag contains specific information about the type of zone (such as school, hospital, or residential area). This information is sent to the Arduino Uno, which processes the data and determines the required speed limit.

Based on this input, the Arduino sends control signals to the L293D motor driver, which automatically reduces the speed of the vehicle by controlling the DC motor. This ensures that the vehicle follows the appropriate speed without requiring driver intervention.

At the same time, the ultrasonic sensor continuously checks for obstacles in front of the vehicle. If any object is detected within a safe distance, the system either slows down the vehicle further or activates a warning.

The buzzer provides an alert to the driver, and the LCD display shows important information such as zone type and speed status. Additionally, the Bluetooth module (HC-05) can be used for wireless monitoring.



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Thus, the system operates automatically in real-time to control speed, reduce accidents, and improve road safety.

V. RESULT

The system successfully detects public zones using RFID and automatically controls vehicle speed. The ultrasonic sensor detects obstacles and provides warnings.

Overall, the system works accurately, reduces accidents, and improves road safety in a cost-effective and reliable way.

VI. ADVANTAGES

- Improved Road Safety: Automatically controls vehicle speed in sensitive areas, reducing accidents.
- Protection of Pedestrians: Ensures safety of children, elderly people, and patients in public zones.
- Automatic Operation: Detects zones and controls speed in real-time.
- Obstacle Detection: Ultrasonic sensor helps prevent collisions.
- Cost-Effective: Uses low-cost and easily available components like Arduino and RFID.
- Easy Implementation: Simple design and easy to install in vehicles.
- Reliable System: Provides accurate and consistent performance.
- Suitable for Smart Cities: Can be integrated into modern traffic management systems.

VII. APPLICATIONS

- School Zones
- Hospital Areas
- Residential Areas
- Accident-Prone Zones
- Public & Commercial Areas
- Industrial Zones
- Public Transportation
- Smart Cities

VIII. FUTURE SCOPE

- Integration with GPS: The system can be enhanced by combining RFID with GPS for wider and more accurate zone detection.
- IoT-Based Monitoring: Data can be sent to cloud platforms for real-time monitoring and traffic analysis.
- Automatic Braking System: Future versions can include automatic braking for better safety.
- AI-Based Decision Making: Use of Artificial Intelligence to predict accidents and adjust speed dynamically.
- Mobile Application Support: A mobile app can be developed for monitoring and controlling vehicle data.
- Advanced Sensors: More accurate sensors (camera, LiDAR) can be added for better obstacle detection.
- Integration with Smart Traffic Systems: Can be connected with traffic signals and smart city infrastructure.
- Scalability: Can be implemented in all types of vehicles including public transport and emergency vehicles

IX. CONCLUSION

The project “Automatic Vehicle Speed Control in Public Zone” provides an effective solution to reduce accidents caused by overspeeding in sensitive areas such as schools, hospitals, and residential zones. The system uses RFID technology and an Arduino-based controller to automatically detect restricted zones and control vehicle speed without relying on driver awareness.

It is a cost-effective, reliable, and easy-to-implement system using simple components like RFID reader, ultrasonic sensor, and motor driver. The inclusion of obstacle detection further enhances safety by preventing collisions.

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Overall, the project demonstrates a practical and innovative approach to improving road safety and can be widely used in smart cities and modern transportation systems.

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