International Journal of Web of Multidisciplinary Studies
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
website: http://ijwos.com
Volume.03 Issue.01.
OPEN ACCESS
E-ISSN : 3049-2424
DOI: https://doi.org/10.71366/ijwos

Car Distance Signal For Safe Overtaking System

Prof. Jaybhaye Sumit R[1], Mr. Hembade Karan R[2], Mr. Pansare Bhushan S[3], Mr. Pathade Vedant R[4], Mr. Pawar Shubham K[5]

[1] *Lecturer, Electrical Engineering Department, Santosh N Darade Polytechnic, Yeola, Maharashtra, India.*
[*2, 3, 4, 5] *Students, Electrical Engineering Department, Santosh N Darade Polytechnic, Yeola, Maharashtra, India.*

Article Info

Article History:

Published:25 Jan 2026

Publication Issue:
Volume 3, Issue 01
January-2026

Page Number:
552-556

Corresponding Author:
Prof. Jaybhaye Sumit R

Abstract:

Research papers on car distance signals for safe overtaking focus on using sensors (like vision, radar) and AI (YOLO, VNet) to detect vehicles, estimate distance/speed, and provide real-time alerts (lights, audio, HMI) to drivers or autonomous systems, aiming to prevent accidents by signaling when a maneuver is safe, often incorporating time-to-collision (TTC) or time-to-lane-crossing (TLC) metrics to advise on lane changes, especially on two-lane roads. Key systems involve V2V communication, vision-based detection, fuzzy logic, and model predictive control for both human-driven and autonomous vehicles.

Keywords: Microcontroller, vision, radar, AI (YOLO, VNet), lights, audio, HMI

1. Introduction

Road accidents during overtaking are a major concern. Drivers often misjudge the distance and speed of other vehicles, leading to collisions. This project introduces a system that helps drivers maintain a safe distance and provides signals for safe overtaking.

A Car Distance Signal for a Safe Overtaking System is a driver-assistance technology designed to measure the gap between vehicles and provide real-time alerts to prevent accidents during passing maneuvers. These systems use sensors to determine if a safe distance exists for overtaking, often utilizing visual indicators (LEDs) or auditory signals in the cockpit to guide the driver.

Key Components and Technologies

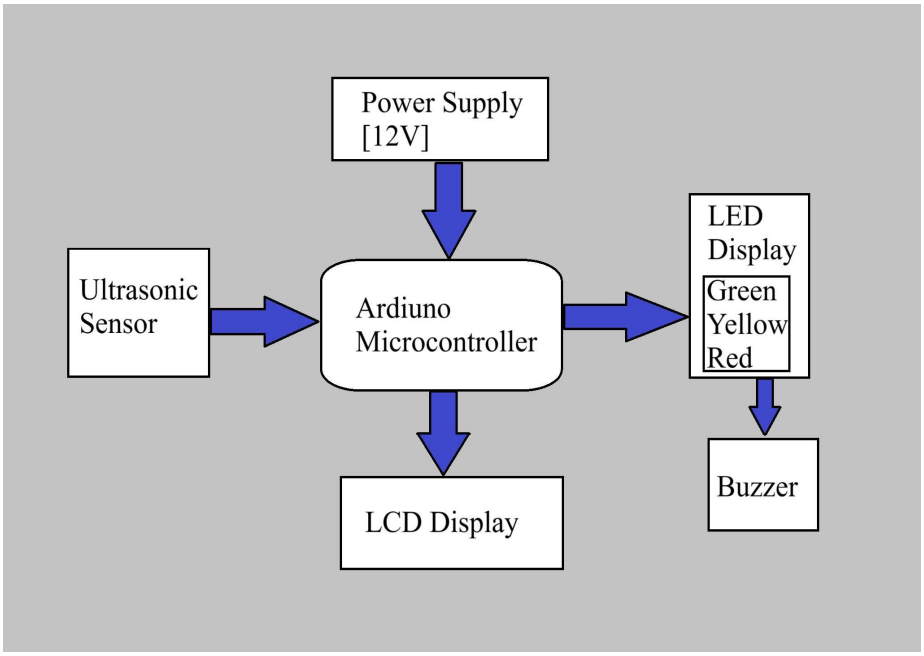
- **Sensors:** The system commonly employs ultrasonic sensors (e.g., HC-SR04) for short-range detection, radar, infrared, or cameras to measure the distance to vehicles in front, behind, or in adjacent lanes.
- **Microcontroller:** An Arduino or similar microcontroller acts as the central processor, receiving sensor data and controlling the alert signals.
- **Warning Interface:** Visual aids, such as Green (safe to overtake) and Red (unsafe) LED lights, are placed in the driver's view. Some systems also use external lights or sound, according to research from Bangladesh.

- **V2V Communication:** Advanced systems use Vehicle-to-Vehicle (V2V) technology (e.g., LoRa) to communicate speed and position data between cars to calculate safe passing distances.

2. OBJECTIVE

- Continuously measure the distance between vehicles.
- Alert the driver when the distance becomes unsafe.
- Indicate safe overtaking conditions using LEDs.
- Improve road safety and reduce accidents.

3. Block Diagram



Block Diagram Review

The system consists of:

Ultrasonic Sensor – measures distance. Microcontroller (Arduino) – processes signals. LEDs – provide visual alerts.

Buzzer – gives sound alert.

Power Supply – provides 12V regulated power.

1. Working Principle

The ultrasonic sensor measures the distance between vehicles.

The microcontroller compares the distance with preset values.

LEDs indicate safe, caution, or danger zones. Buzzer sounds when distance becomes unsafe. Helps driver make safe overtaking decisions.

2. Components Used

Arduino Uno Ultrasonic Sensor

LEDs (Green, Yellow, Red) Resistors (1kΩ)

Buzzer

LCD Display

12V Power Supply or Battery

Arduino Uno

The Arduino Uno is one of the most popular microcontroller boards used for electronics projects and embedded systems. It is based on the ATmega328P microcontroller.

Ultrasonic Sensor

He HC-SR04 Ultrasonic Sensor is a popular distance measuring sensor that works on the principle of sound wave reflection. It measures the distance between the sensor and an object by sending ultrasonic waves and calculating the time taken for the echo to return.

LCD Display

A 16×2 LCD (Liquid Crystal Display) is one of the most commonly used display modules in embedded systems and Arduino projects. It can display 16 characters per line and has 2 lines, hence

LEDs (Green, Yellow, Red)

LED Colors and Their Meaning

LED Color	Status	Description
Green LED	Safe Distance	Vehicle ahead is at a safe distance — overtaking is possible.
Yellow LED	Caution Zone	Vehicle is moderately close — overtaking should be done carefully.
Red LED	Danger Zone	Vehicle is too close — **do not overtake**, maintain distance.

Battery

The 12V DC battery is the main power source of the project.

It supplies the electrical energy required to operate components such as the Arduino Uno, Ultrasonic Sensor, LEDs, Buzzer, and LCD Display (through a voltage regulator). This battery is commonly used in automotive and electronic circuits because of its reliability and sufficient capacity.

Applications

Used in cars, buses, and trucks.

Helpful on highways and single-lane roads. Can be integrated with ADAS (Advanced Driver Assistance System) systems.

Useful for driver assistance and awareness.

Advantages

- Reduces road accidents.
- Enhances driver awareness.
- Simple and low-cost design.

Future Scope

- Integration with camera sensors.
- Vehicle-to-Vehicle (V2V) com
- munication. Automatic braking system integration.

5. Conclusion

The Car Distance Signal for Safe Overtaking system improves road safety by providing real- time distance monitoring

And driver alerts. It is a simple yet effective approach towards intelligent driving assistance systems.

References

1. E. Olsen, "Modeling slow lead vehicle lane changing," Ph.D. dissertation, Citeseer, 2003.
2. W. Van Winsum, D. De Waard, and K. Brookhuis, "Lane change manoeuvres and safety margins," Transportation Research Part F: Psychology and Behaviour, vol. 2, no. 3, pp. 139-149, 1999.
3. T. Wilson and W. Best, "Driving strategies in overtaking." ACCID. ANALY. & PREV., vol. 14, no. 3, pp. 179-185, 1982.
4. S. McCanne, S. Floyd, K. Fall, K. Varadhan et al., "Network simulator ns-2," 2000.
5. M. Shuttleworth, "Ubuntu: Linux for human beings," 2011. [17] M. Nakagami, K. Tanaka, and M. Kanehisa, "The mDistribution As the General Formula of Intensity Distribution of Rapid Fading," Memoirs of the Faculty of Engineering, Kobe University, vol. 4, pp. 78-125, 1957. [18] D. Musser and A. Saini, The STL Tutorial and Reference Guide: C++ Programming with the Standard Template Library. Addison Wesley Longman Publishing Co., Inc. Redwood City, CA, USA, 1995.