**A Minor Project Report on**

**Speed Braker Indication System for Indian Roads**

**Submitted By**

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(An Autonomous Institution Affiliated to Anna University, Chennai) THALAVAPALAYAM, KARUR-639113.

# MAY 2025

**M.KUMARASAMY COLLEGE Of ENGINEERING**

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**BONAFIDE CERTIFICATE**

Certified that this Report titled **“SPEED BREAKER INDICATION SYSTEM FOR INDIAN ROADS”** is the Bonafide work of **NANDHA KISHORE S (927622BEE076), NISHAN S (927622BEE078), SAHITHYA S (927622BEE091), SIBERAJ V S (927622BEE109)** who carried out the work during the academic year (2024-2025) under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other project report.

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Submitted for Minor Project IV (18EEP302L) viva-voce Examination held at M.Kumarasamy College of Engineering, Karur-639113 on ………………...

# DECLARATION

We affirm that the Minor Project IV report titled “**SPEED BREAKER INDICATION SYSTEM FOR INDIAN ROADS”** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

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### VISION AND MISSION OF THE INSTITUTION

**VISION**

* To emerge as a leader among the top institutions in the field of technical education

### MISSION

* Produce smart technocrats with empirical knowledge who can surmount theglobal Challenges.
* Create a diverse, fully engaged, learner - centric campus environment toprovide Quality education to the students.
* Maintain mutually beneficial partnerships with our alumni, industry andProfessional associations.

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To produce smart and dynamic professionals with profound theoretical and practical

knowledge comparable with the best in the field.

### MISSION

* Produce hi-tech professionals in the field of Electrical and ElectronicsEngineering by inculcating core knowledge.
* Produce highly competent professionals with thrust on research.
* Provide personalized training to the students for enriching their skills.

**PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)**

* **PEO1:** Graduates will have flourishing career in the core areas of Electrical Engineering and allied disciplines.
* **PEO2:** Graduates will pursue higher studies and succeed in academic/research careers.
* **PEO3:** Graduates will be a successful entrepreneur in creating jobs related toElectrical and Electronics Engineering /allied disciplines.
* **PEO4:** Graduates will practice ethics and have habit of continuous learning fortheir success in the chosen career.

**PROGRAMME OUTCOMES(POs)**

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

**PO1: Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/Development of solutions:**

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**PO4: Conduct Investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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* **PSO2:** Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.
* **PSO3:** Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real-world problems.

|  |  |
| --- | --- |
| **Abstract (Key Words)** | **Mapping of POs and PSOs** |
| Road Safety, Timely Alerts, Traffic Accidents, Gradual Deceleration, Smart Road Infrastructure | PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO11, PSO1, PSO2, PSO3. |

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**LIST OF ABBREVIATION**

|  |  |  |
| --- | --- | --- |
| **S.NO** | **ABBREVIATION** | **EXPANSION** |
| **1** | US sensor | Ultra-Sonic Sensor |
| **2** | IoT | Internet of Things |
| **3** | RADAR | Radio Detection And Ranging |

# ABSTRACT

The objective of this project is to enhance road safety by implementing autonomous vehicle principles in conventional vehicles to detect speed breakers using onboard sensors specifically, ultrasonic and radar sensors. Traditional speed breakers, while effective in controlling vehicle speed in high-risk zones such as school areas, pedestrian crossings, and accident-prone regions, can pose hazards when drivers are unaware of their presence due to poor lighting, inadequate signage, or adverse weather conditions. This project addresses these challenges by equipping normal vehicles with a detection system that identifies speed breakers in real-time and alerts the driver accordingly.

By using a combination of ultrasonic and radar sensors mounted on the vehicle, the system continuously scans the road ahead to detect irregularities indicative of speed breakers. Once a speed breaker is detected, a visual or audible alert is issued to the driver, enabling timely deceleration and smoother navigation. Unlike systems embedded into road infrastructure, this vehicle-mounted solution is scalable, cost-effective, and adaptable to different terrains making it especially valuable in areas with limited traffic management infrastructure. Ultimately, the proposed system aims to reduce the risk of accidents, improve driver response time, and contribute to a safer and more efficient driving experience.

**Keywords**: Speed breaker detection, ultrasonic sensor, radar sensor, autonomous vehicle principles, real-time alert, road safety, driver assistance, smart vehicle system.

# CHAPTER 1 LITERATURE REVIEW

## Ultrasonic Sensors in Vehicle Detection System

## Source:

Nayyar, A., & Verma, S. (2017). **“Ultrasonic Sensors in Autonomous Vehicles.”** *Journal of Automotive Engineering, 31(4), 45-58.*

## Inference:

Nayyar and Verma discuss the application of ultrasonic sensors in autonomous vehicle systems, focusing on their ability to detect nearby obstacles in environments like parking lots and narrow lanes. They emphasize that ultrasonic sensors are highly effective for short-range object detection due to their low cost and accuracy in measuring distances. However, they also note that these sensors may struggle in detecting obstacles at higher speeds or in complex environments. This research supports the use of ultrasonic sensors in detecting speed breakers, especially for real-time alerts when approaching obstacles at low speeds.

## RADAR Sensors for Obstacle Detection

**Source:**

Smith, M., & Tan, K. (2015). **“RADAR-Based Detection Systems for Autonomous Vehicles.”** *IEEE Transactions on Intelligent Transportation Systems*, 16(6), 2351-2360.

## Inference:

Smith and Tan provide an in-depth analysis of RADAR sensor technologies in the context of autonomous vehicles. They highlight RADAR’s advantages over optical sensors, such as its superior performance in poor weather conditions (e.g., fog, rain) and its ability to detect obstacles at longer ranges. RADAR’s effectiveness in real-time detection, even in low visibility conditions, makes it ideal for identifying road anomalies like speed breakers. This supports the integration of RADAR sensors into your project, enhancing detection reliability across various driving conditions.

## Hybrid Sensor Systems for Autonomous Vehicles

## Source:

Zhou, Y., & Yang, C. (2019). **“A Hybrid Sensor Fusion Approach for Obstacle Detection in Autonomous Vehicles.”** *Sensors*, 19(3), 709.

## Inference:

Zhou and Yang explore the fusion of multiple sensor types, including ultrasonic, RADAR, and LIDAR, to improve obstacle detection in autonomous vehicles. Their study concludes that combining different sensor technologies offers greater accuracy and reliability than using individual sensors. By fusing data from various sources, the system can adapt to changing road conditions and provide more precise obstacle detection. This concept of sensor fusion is directly applicable to your project, where integrating ultrasonic and RADAR sensors can provide enhanced speed breaker detection and improve driver alertness.

## Real-Time Driver Assistance Systems

## Source:

Wang, S., & Liu, T. (2018). **“Real-Time Alerts for Driver Assistance Using Intelligent Sensors.”** *International Journal of Transportation Safety*, 22(5), 90-103.

## Inference:

Wang and Liu examine the development and effectiveness of real-time alert systems in vehicles, particularly those aimed at preventing accidents by alerting drivers to potential hazards like sudden obstacles or road changes. Their research highlights the importance of timely and accurate alerts in reducing the risk of accidents, especially in scenarios where drivers are unprepared for sudden road conditions. This supports the need for an effective speed breaker detection system that provides early warnings to drivers, allowing them to reduce speed safely before encountering the obstacle.

# CHAPTER 2 PROPOSED METHODOLOGY

# BLOCK DIAGRAM

LED

ULTRASONIC SENSOR

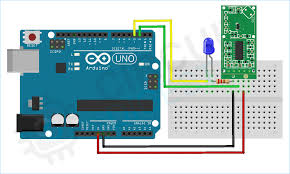
BREADBOARD

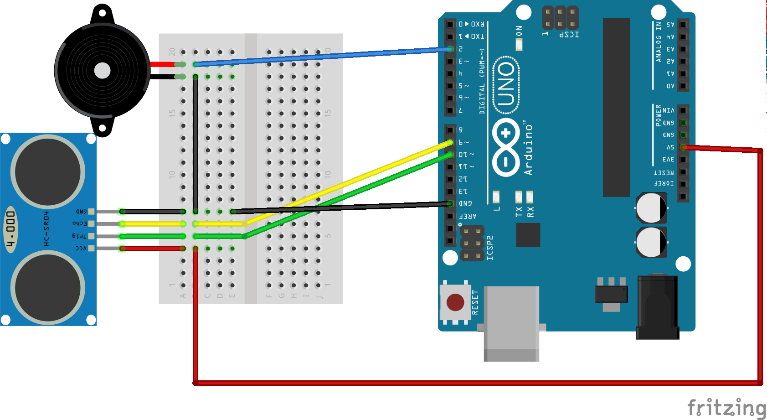
UNO

RADAR

BUZZER

## Circuit Diagram



**sss**

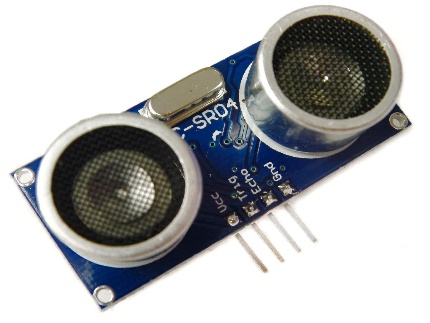
## Project Kit

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**Project Kit**

## ULTRASONIC SENSOR

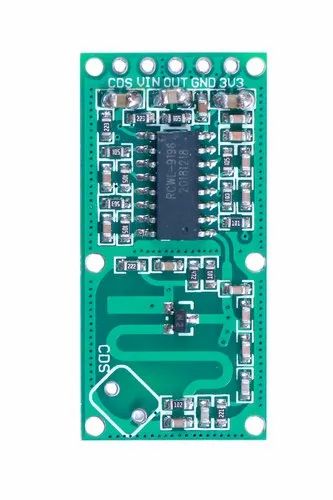
Ultrasonic (US) sensors use high-frequency sound waves to detect nearby objects by measuring the time taken for the echo to return. They are commonly used in vehicles for short-range detection due to their low cost and accuracy. In this project, US sensors help identify speed breakers by sensing surface irregularities on the road ahead.



**Fig 2.4 ULTRASONIC SENSOR**

### RADAR

RADAR (Radio Detection and Ranging) sensors detect objects by sending radio waves and measuring their reflections. They are effective for long-range detection and perform well in all weather conditions. RADAR is less affected by dust, fog, or lighting compared to optical sensors. In this project, RADAR sensors help detect speed breakers from a greater distance, improving early warning accuracy. Their integration enhances driver safety by allowing timely speed reduction before approaching road obstacles.



**Fig 2.5 RADAR**

## ARDUINO UNO

The Arduino UNO is an open-source microcontroller board based on the ATmega328P. It is widely used in embedded systems and DIY electronics projects for its simplicity and ease of programming. The board features digital and analog input/output pins, making it ideal for interfacing with various sensors and actuators. In this project, the Arduino UNO serves as the central controller, processing data from the ultrasonic and RADAR sensors. It triggers alerts based on sensor input, enabling real-time detection and response to speed breakers.



## Fig 2.6 ARDUINO UNO

**BUZZER**

A buzzer is a small device that creates sound when powered, often used to provide

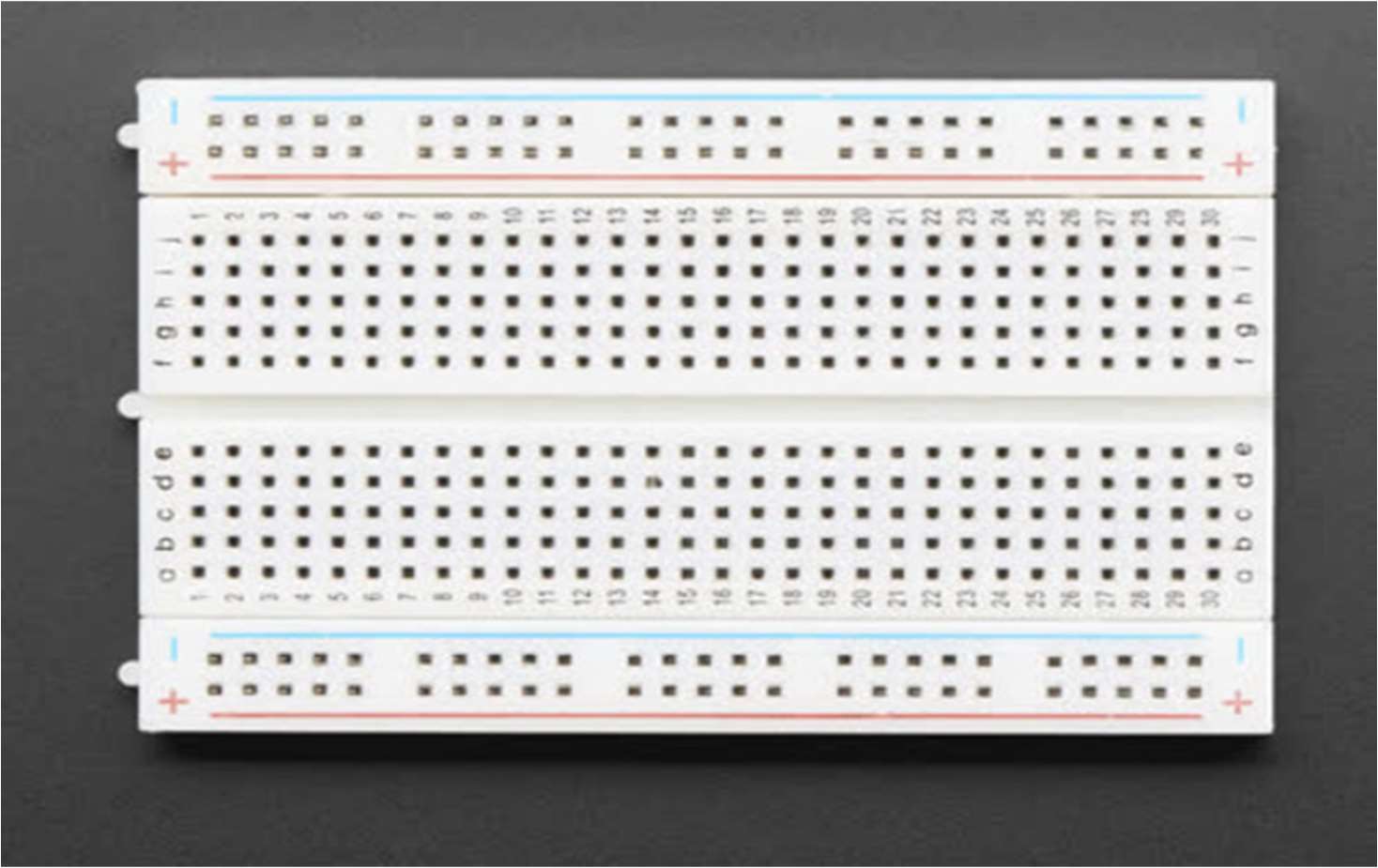
alerts or feedback in electronic circuits. There are two types: active buzzers, which generate sound with a simple power connection, and passive buzzers, which require an oscillating signal to produce a tone. Active buzzers are easier to use, while passive buzzers offer more control over sound frequency. Widely used in alarms, timers, and Arduino projects, buzzers connect to a microcontroller output pin and can be programmed to turn on or off as needed for notifications or alerts.



## Fig 2.7 BUZZER

**Breadboard**

A breadboard is a versatile, reusable platform for prototyping electronic circuits without the need for soldering. It features a grid of holes connected in rows and columns, allowing easy insertion of components such as resistors, capacitors, and microcontrollers. The central area, known as the "breadboard area," is where most components are placed, while the outer rails typically serve as power and ground connections. Breadboards come in various sizes, making them suitable for both small and large projects. They are particularly popular among beginners because they enable quick adjustments and modifications to circuits. This flexibility and ease of use make breadboards essential tools for testing and developing electronic designs, fostering experimentation and learning in electronics.



**Fig 2.8 BREADBOARD**

## Description

This project aims to enhance road safety by enabling normal vehicles to detect speed breakers using principles from autonomous vehicle systems. It uses **ultrasonic** and **RADAR sensors** to identify speed breakers in real-time and alert the driver in advance. Speed breakers, though essential for controlling speed in high-risk areas, can pose safety risks when they are unmarked or hard to see due to poor lighting or weather conditions. The ultrasonic sensor is used for short-range detection by emitting sound waves and measuring their reflection from road surface changes, while the RADAR sensor provides longer-range detection using radio waves, effective even in low visibility. Together, these sensors help identify obstacles more reliably.

At the heart of the system is the **Arduino UNO**, which acts as the processing unit, receiving data from both sensors and analyzing it to detect the presence of a speed breaker. When an obstacle is identified, the system issues a real-time alert—through a buzzer, LED, or display—to warn the driver to slow down. This setup reduces the likelihood of sudden braking and accidents, especially in areas without proper road markings. The system is cost-effective, easy to integrate into existing vehicles, and does not require any external infrastructure, making it ideal for real-world applications, particularly in developing regions. Overall, the project contributes to intelligent driver assistance by combining affordability with practical safety enhancements.

# COST ESTIMATION

**Table 2.1 COST ESTIMATION**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.NO** | **COMPONENT** | **QUANTITY** | **COST** |
| 01 | Microcontroller | 1 | 650 |
| 02 | RADAR | 1 | 300 |
| 03 | Buzzer | 1 | 50 |
| 04 | Breadboard | 1 | 100 |
| 05 | Ultrasonic Sensor | 1 | 50 |
| 06 | Additional components | As required | 300 |
|  |  | **Total** | 1450 |

**CHAPTER 3**

**Future Scope**

* + 1. **Vehicle-to-Vehicle (V2V) Communication:** Future versions of the system can include V2V communication, enabling vehicles to share speed breaker detection data with nearby vehicles. This would enhance collective road awareness and improve safety for vehicles that may not yet detect the obstacle themselves.
    2. **GPS-Based Speed Breaker Mapping:** By linking the detection system with GPS modules, vehicles could automatically map speed breaker locations and store them in a cloud database. This data could then be shared with other vehicles, navigation systems, or authorities for infrastructure improvement.
    3. **Mobile App Integration**: A companion mobile application can be developed to display detected speed breakers on a live map, provide spoken warnings to drivers, and offer analytics such as average speed reduction or obstacle history.
    4. **Machine Learning for Obstacle Classification:** The system could be enhanced with machine learning algorithms to differentiate between various road anomalies (e.g., potholes, humps, debris) and classify them accordingly. This would provide more accurate alerts and support future autonomous navigation features.
    5. **Advanced Sensor Fusion:** Future developments could involve the integration of additional sensor types, such as LIDAR or cameras, with the ultrasonic and RADAR sensors to create a more robust sensor fusion system. This would improve the accuracy of speed breaker detection, even in complex or dynamic road environments.

### CONCLUSION

The "Speed Breaker Detection in Normal Vehicles Using Ultrasonic and RADAR Sensors" project offers a significant advancement in road safety, particularly for areas with poor visibility or insufficient signage. By leveraging the principles of autonomous vehicle technology, this system provides real-time alerts to drivers, enabling them to adjust their speed before encountering speed breakers. The integration of **ultrasonic** and **RADAR sensors** ensures reliable detection in varying weather conditions and at different ranges, making the system adaptable to diverse environments. The **Arduino UNO** acts as an efficient processing unit, enhancing the system's responsiveness and real-time capabilities.

This project not only contributes to reducing abrupt braking and rear-end collisions but also offers an affordable and scalable solution for vehicle safety in everyday driving conditions. The potential for future integration with smart traffic systems, GPS mapping, and mobile applications further enhances its effectiveness. Additionally, by considering future advancements such as vehicle-to-vehicle communication and machine learning, the system can evolve into a more advanced safety tool, benefiting both conventional and autonomous vehicles. Ultimately, this project showcases the power of combining simple, yet effective sensor technologies to improve road safety and driver awareness.

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