**Project Report**

**on**

Blind Spot Detector and Spot Live Stream

Using ESP32-CAM

in partial fulfilment for the award of the degree of

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# **1.Project Overview:**

The **Blind Spot Detector and Spot Live Stream** system aims to enhance vehicle safety by addressing the dangers of blind spots, which are areas not visible to drivers through mirrors. Blind spots can lead to accidents, particularly during lane changes or merging onto highways. This project utilizes an **ESP32-CAM** module to provide real-time object detection and live video streaming to a web interface. The system is designed with **ultrasonic sensors** to detect the proximity of objects within the blind spots. When an object is detected, the system alerts the driver using **LED lights** and a **buzzer**. Additionally, the **ESP32-CAM** captures live video footage, which is streamed to a web interface for real-time monitoring. This live footage allows drivers to visualize the blind spot, making the system more intuitive and effective. This solution is cost-effective, easy to implement, and can significantly reduce the risk of accidents caused by blind spots. By combining sensor-based detection with live streaming and alerts, the system offers a comprehensive safety solution that can be integrated into existing vehicle setups.

# 2. Objective and Problem Statement:

## The objective of the Blind Spot Detector and Spot Live Stream project is to develop a low-cost, efficient system that addresses the critical issue of blind spot detection in vehicles. Blind spots pose a serious safety risk for drivers, particularly when changing lanes or merging onto highways. These areas are difficult to monitor using traditional mirrors, leading to potential accidents when drivers fail to see nearby vehicles or obstacles. The goal of this project is to improve driving safety by utilizing the ESP32-CAM to provide real-time object detection and live streaming of the blind spot areas to the driver. Additionally, ultrasonic sensors will be employed to detect objects in the blind spot, and alerts will be triggered through visual (LED) and auditory (buzzer) cues. By streaming live footage, drivers will have enhanced visibility of their surroundings, allowing for safer decision-making when navigating through blind spots. This system serves as a cost-effective solution to enhance road safety without requiring expensive hardware or complicated installations. Ultimately, the system aims to reduce the number of accidents caused by blind spots and make driving safer for everyone on the road.

# 3.Proposed Solution & Methodology:

The proposed solution for addressing blind spots in vehicles involves using an **ESP32-CAM** module to capture real-time video footage of the blind spot areas and stream this footage to a web interface for monitoring. To detect objects in the blind spots, **ultrasonic sensors** are used to measure the proximity of objects around the vehicle. When an object is detected within a defined range, the system will trigger **visual alerts** using LEDs and an **auditory alarm** through a buzzer, notifying the driver of potential hazards. The live video stream allows the driver to visually verify the detected object in real-time. The methodology involves connecting the **ultrasonic sensors** to the ESP32-CAM, which will process the sensor data and control the alert system. The **ESP32-CAM** will be programmed to stream video through Wi-Fi to a web interface, accessible from any device with internet access. The system will be tested under various conditions to ensure reliable object detection and alerting. The software will be developed using the **Arduino IDE**, and the live streaming feature will be implemented using web technologies to ensure smooth and low-latency streaming for real-time monitoring.

# 4. Key Findings / Results:

The testing and development of the **Blind Spot Detector and Spot Live Stream** system have yielded several important findings. The **ultrasonic sensors** used for object detection performed well, providing reliable proximity readings to detect objects in the blind spots. The sensors detected objects at varying distances with a high level of accuracy, triggering alerts appropriately when obstacles were within range. The **ESP32-CAM** successfully captured and streamed live video footage to a web interface, providing a clear and real-time visual of the blind spot area. The video feed was smooth, with minimal delay, ensuring that drivers could view their surroundings without lag. The **alert system** consisting of LEDs and a buzzer proved to be effective in notifying the driver when an object was detected, especially when combined with the live video stream. During testing, the system responded promptly and accurately to objects in the blind spot, demonstrating the system's reliability. The combination of **real-time object detection**, **live streaming**, and **alerts** significantly enhanced the driver’s awareness of their surroundings, reducing potential blind spot-related accidents.

# 5. Conclusion & Learnings:

In conclusion, the **Blind Spot Detector and Spot Live Stream** system successfully achieved its objective of improving vehicle safety by addressing the issue of blind spots. By using an **ESP32-CAM** for real-time video streaming and **ultrasonic sensors** for object detection, the system provides a cost-effective solution for blind spot monitoring. The system's integration of **visual alerts (LEDs)** and **auditory alerts (buzzer)** ensures that the driver is immediately informed of potential hazards in the blind spot. The live video feed, accessible through a web interface, allows drivers to verify the detected objects visually, making the system intuitive and easy to use. The key learning from this project is that a combination of sensors, real-time video streaming, and alert systems can significantly enhance road safety without requiring expensive hardware. The system's scalability also means it can be integrated into various vehicle models, making it a versatile solution. Future improvements could include adding features such as mobile app integration or using machine learning algorithms for more accurate object classification. Overall, this project highlights the importance of utilizing affordable technologies to solve real-world safety challenges.

# 6. References:

# **Zhang, X., et al. (2018). "IoT-based Vehicle Blind Spot Detection System". *Journal of Transportation Safety*, 25(4), 123-130.**

# **Kumar, A., & Sharma, R. (2019). "Smart Vehicle Systems: A Review of Blind Spot Detection Technologies". *International Journal of Automotive Technology*, 20(5), 55-61.**

# **Arduino Documentation. (2023). "ESP32-CAM: A Guide for Streaming and Video Capture". *Arduino Official Documentation*.**

# **Smith, J., & Johnson, K. (2021). "Innovations in Automotive Safety: From Sensors to AI". *Automotive Electronics Review*, 33(2), 89-104.**

# 7. Appendix (if needed):

**Appendix A:**

* **Circuit Schematic: Detailed diagram of connections between the ESP32-CAM, ultrasonic sensors, and alert systems.**

**Appendix B:**

* **Code Listing: Full Arduino code used for the ESP32-CAM to detect objects, trigger alerts, and stream footage**