

ADAS (ADVANCED DRIVER ASSISTANCE SYSTEM): DESIGN AND DEVELOPMENT OF A VEHICLE SAFE DISTANCE DETECTION SYSTEM BASED ON YOLOv5 ALGORITHM USING BOUNDING BOX AREA ESTIMATION AND ALARM WARNING

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ABSTRACT

The advancement of transportation technology has driven numerous innovations aimed at enhancing driving safety. One common issue is minor traffic accidents caused by driver drowsiness, alcohol influence, or lack of focus in estimating safe vehicle distances. This research aims to design and implement a vehicle safe distance detection system based on Raspberry Pi camera input, utilizing the YOLOv5 object detection model. The system operates by identifying objects ahead of the vehicle and triggering an alarm if the safe distance threshold is breached. The development process involves system design, dataset collection and training, and comprehensive system testing. Test results indicate that the system achieves the highest object detection accuracy of 88% under morning light at moderate distances and a speed of 40 km/h, while the lowest accuracy of 26% occurs under bright midday light and close-range conditions. The resulting frame rate ranges from 2.31 to 3.79 FPS, highlighting the Raspberry Pi's limitations in real-time processing. Therefore, the use of higher-specification hardware is recommended for real-world traffic applications of this system.

Keywords: Object Detection, YOLOv5, Raspberry Pi, Safe Distance, Camera.

