

THE IMPLEMENTATION OF ADAS (Advanced Driver Assistance System) BASED ON YOLOv5 FOR LANE DETECTION AND EARLY VEHICLE WARNING

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ABSTRACT

Traffic accidents remain one of the leading causes of death, particularly due to vehicles veering off their lanes. To enhance driving safety, an automated system capable of providing early warnings of potential hazards is essential. The challenge lies in the absence of an efficient, accurate, and real-time edge detection system that functions effectively across diverse environmental conditions. This study aims to design and develop an ADAS (Advanced Driver Assistance System) capable of detecting road edges using the YOLOv5 algorithm and Raspberry Pi as the microcontroller. The system is designed to provide early warnings to drivers via a buzzer when a vehicle is detected to be deviating from its lane. The dataset was obtained from Roboflow, and model training was conducted using Google Colab before implementation on the Raspberry Pi. Test results show that the system can detect lane lines effectively, particularly under daylight and low-speed conditions. However, system performance declines under low-light conditions and at high speeds. Additionally, the Raspberry Pi could only run the system at an average of 0.67 FPS due to limited computing power. The proposed solution is to use a YOLOv5-based detection algorithm trained on a dedicated lane-edge dataset, deployed on higher-spec devices such as the NVIDIA Jetson or the latest version of Raspberry Pi, along with model optimization to ensure lightweight and accurate detection across various environmental conditions.

Keywords: Lane Detection, YOLOv5, Raspberry Pi, ADAS, Edge Detection, Early Warning System.