

ABSTRACT

Increasing traffic volumes pose serious problems related to speed limit violations and non-compliance of safe distances between vehicles. These problems require effective and automated monitoring solutions to reduce the risk of traffic accidents. This research aims to develop a speed detection system and safe distance between vehicles based on YOLOv11 and DeepSORT with a visual approach from CCTV videos. The system is designed as an alternative to overcome the limitations of conventional traffic monitoring which still relies on manual supervision. The research methodology uses Design Science Research approach (Hevner) with OSEMN (Obtain, Scrub, Explore, Model, iNterpret) framework for systematic problem solving. The system implementation uses a combination of YOLOv11 algorithm for vehicle object detection and DeepSORT for vehicle tracking consistently every frame. The system was developed with the ability to calculate speed, evaluate safe distance, and present results through the dashboard analytics. The results show for the task object detection the system achieved high performance with mAP 87.3%, precision 83%, recall 80.1%, and F1-score 81.5%. The normalized confusion matrix evaluation showed 81% accuracy, while the vehicle classification modeling results achieved 92% accuracy. The web dashboard provides comprehensive features including video preview, graph visualization, traffic records, and data export. The system successfully integrates visual speed and safe distance analysis, providing a novelty compared to previous research. Although tested non-real-time with limited resources, the system performed well and produced informative data for traffic management in the form of a web dashboard. This research proves that the YOLOv11 and DeepSORT-based approach is effective in solving traffic violation detection problems, with great potential to be further developed into a real-time system and integrated with existing traffic management systems.

Keywords— YOLOv11, DeepSORT, Speed Detection, Vehicle Safe Distance, Computer Vision, Traffic Management