ABSTRACT

The vehicle windshields is an essential component in ensuring driver safety and visibility, however its detection and segmentation processes in digital images face challenges due to variations in lighting, reflections, and visual disturbances. This study applies a deep learning based segmentation approach using the DeepLabv3+ model to accurately detect and segment vehicle windshields. This research employs three training scenarios, namely without augmentation, partial augmentation, and full augmentation, aimed at improving the model's generalization capability. Evaluation is conducted using normal test images with segmentation metrics, including Intersection over Union (IoU) and Dice Score, as well as detection metrics, including Precision, Recall, and mean Average Precision (mAP). In addition, testing is also performed on augmented test images to analyze the model's robustness against variations in image conditions. The results show that in the scenario without augmentation, the model achieves an IoU of 84,07% and a Dice Score of 91,35%. After applying full augmentation, the model performance improves, achieving an IoU of 85,65% and a Dice Score of 92,27%. In terms of detection, the model with full augmentation also demonstrates superior performance with Precision of 87,68%, Recall of 95,55%, and mAP of 88,69% on normal test images, while maintaining stable performance on augmented test images. These results indicate that the application of comprehensive data augmentation is able to improve the performance of the DeepLabv3+ model, while also enhancing its robustness and consistency against variations in visual conditions, making it more reliable for real-world applications.

Keywords : Deep Learning, DeepLabv3+, Image Augmentation, Robustness, Semantic Segmentation, Windshield Segmentation