ABSTRACT

Aquatic environments are increasingly contaminated by diverse types of waste, which poses a significant risk to surrounding ecosystems. Existing inspection methods for monitoring water pollution are manual monitoring, which is inefficient, and sometimes using GPS tracking systems, which is lack of real-time accuracy. Based on these issues, an automatic and efficient waste monitoring system in waterways that utilizes a surveillance camera is necessary. This research aims at developing a computer vision model to detect the presence of floating trashes in the waterways. Our focus in this paper is to discuss on how to improve the detection capabilities by fine-tuning the pre-trained model using self-collected images captured from local waterways. This study employed the YOLOv11 architecture that was trained on various publicly available trash datasets and resulted in the YOLOv11-x model that achieved mAP50 scores of 0.933 on the WaterTrash dataset and 0.856 on the FloW-Img dataset. Nevertheless, the YOLOv11-s variant proves to be the ideal choice considering the trade-off between detection precision and inference speed. The trained YOLOv11-s model was further fine-tuned using a dataset from local waterway; We introduce it as BojongTrash. As a result, the fine-tuning scenario proved to be able to achieve a significant mAP50 improvement of 0.461 compared to the original model with around 500 new images data in only 2 to 3 training epochs. This finding highlights the importance of domain adaptation approach for improving the performance of a trash detection model in specific aquatic scenarios.

Keywords: *trash detection, waterways, YOLOv11, performance improvement, fine-tuning.*