

ABSTRACT

Violations of operational hours by large trucks are a major cause of traffic congestion, road infrastructure damage, and an increased risk of accidents. Manual monitoring by officers in the field is often inefficient and has limited coverage. This research aims to design and build an automatic detection system to identify operational hour violations by large trucks through video analysis.

This system is developed using a modern object detection algorithm, You Only Look Once version 8 (YOLOv8) with CRISP-DM methodology, which is trained to recognize three object classes: Large Trucks, Medium Trucks, and License Plates. The dataset used consists of 2,235 images that have undergone an augmentation process to increase condition variety. The model training process was conducted for 150 epochs with an image resolution of 960x960 pixels. The trained model is then integrated into a Streamlit-based web application that serves as the user interface. If the system detects a Large Truck violating the time and area (ROI) restrictions, it will automatically capture and read the vehicle's license plate using EasyOCR technology.

The evaluation results show excellent model performance, with a mean Average Precision (mAP@0.5) value of 84.0% for all classes. The per-class performance shows an Average Precision (AP) of 90.4% for License Plates, 84.1% for Large Trucks, and 77.6% for Medium Trucks, respectively. The overall system functionality successfully detects violations and records the results, including image evidence and license plate text, into a log file. This research proves that an automatic detection system based on YOLOv8 can be an effective, accurate, and practical solution to assist in more efficient traffic rule enforcement.

Keywords: Object Detection, Computer Vision, YOLOv8, OCR, Large Truck, Large Vehicle Violation, Web Application, CRISP-DM