

ABSTRACT

Modern railway systems in Indonesia, such as MRT Jakarta and LRT Jabodebek, face significant challenges in keeping track areas free from obstacles such as bags, suitcases, umbrellas, and small animals that can disrupt operations and pose safety risks. This study develops an automated obstacle monitoring system for platform track areas using a computer vision approach with the YOLOv11n algorithm. The choice of this method considers the cost limitations of implementing 3D sensors such as LiDAR, which, although capable of detecting object size and distance more accurately, require significantly higher hardware investment and data processing resources.

By utilizing affordable high-resolution cameras, YOLO enables real-time detection of critical obstacles with high accuracy while maintaining the feasibility of monitoring sterile track areas. The system consists of a camera, a processing unit, and a visual-audio alerting mechanism. The prototype was tested in a simulated real-world environment to evaluate detection accuracy across five obstacle classes using both random and controlled testing methods.

The results indicate that the system can detect obstacles in real-time with high accuracy, particularly under optimal lighting conditions and with objects that have been trained in the model. The system also provides effective alerts to station personnel, thereby increasing situational awareness of potential hazards on the tracks. Thus, this solution is considered a viable, cost-efficient alternative to 3D sensors while still supporting a more responsive and reliable railway safety system.

Keywords: automation system, computer vision, cost limitation, obstacle detection, railway safety, YOLO