

ABSTRACT

The use of head covering attributes such as helmets and hats by ATM machine visitors is often exploited by criminals to disguise their identities, making it difficult to monitor using conventional CCTV cameras. Manual monitoring has limitations, such as delayed detection and less than optimal video quality. To overcome these problems, this study developed an automatic helmet and hat detection system based on Deep learning with the You Only Look Once version 5 (YOLOV5) method. The dataset used consists of 2,000 images divided into two object classes, namely helmets and hats, and has gone through a manual and automatic augmentation process using Roboflow. The data is labeled and divided into training data (75%), validation (15%), and test (10%), with the image size adjusted to 480×480 pixels. The training process was carried out for 150 epochs with the YOLOV5n variant, producing the best model. The evaluation was conducted using Confusion Matrix for Real-Time testing and val.py script for static data testing, which produced mAP50 values of 0.994 and mAP50–95 of 0.803, indicating high detection accuracy at the IoU threshold of 0.50 and varIoUs other IoU thresholds. In addition, Recall reached 1,000, indicating that the model was able to detect all objects in the test data without missing any. In Real-Time testing using an RTSP camera integrated with a Flask-based web application, the system produced an accuracy of 82.1% for both classes, with a helmet Precision of 98.0%, a hat Precision of 95.0%, a helmet Recall of 72.6%, and a hat Recall of 97.0%. This study aims to develop an automatic detection system that can improve surveillance and prevention of crime around ATM machines, with the results showing that the YOLOV5 model can detect helmets and hats with very good accuracy, both in static and Real-Time testing.

Keywords: accuracy, ATM, deep learning, helmet, Precision, recall, hat, YOLOV5