INTISARI

IMPLEMENTASI YOLOv8n UNTUK DETEKSI ALAT PELINDUNG DIRI PADA SISTEM AKSES PINTU OTOMATIS

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Keselamatan dan kesehatan kerja (K3) merupakan aspek krusial dalam lingkungan industri, terutama dalam penggunaan Alat Pelindung Diri (APD) secara lengkap. Namun, tingkat kepatuhan pekerja terhadap standar APD masih rendah yang meningkatkan risiko kecelakaan kerja. Penelitian ini bertujuan untuk mengembangkan sistem deteksi kelengkapan APD berbasis *computer vision* menggunakan algoritma YOLOv8n yang diintegrasikan dengan sistem akses pintu otomatis ke area khusus. Sistem dirancang untuk mendeteksi minimal tiga dari tujuh jenis APD yang umum digunakan yaitu helm, rompi keselamatan, *wearpack,* kacamata pelindung, penutup telinga, sarung tangan dan sepatu pelindung, secara *real time* melalui citra kamera beresolusi rendah.

Model YOLOv8n dilatih menggunakan 2005 data, dengan pembagian 1404 data pelatihan, 400 data validasi, dan 201 data pengujian. Proses pelatihan dilakukan selama 200 *epoch* dengan konfigurasi *batch size* 8, ukuran citra 320×320 piksel, *learning rate* sebesar 0.01, dan *optimizer* secara otomatis. Hasil evaluasi menunjukkan bahwa sistem memiliki performa deteksi yang cukup baik, dengan mAP@0.5 sebesar 0.5855, mAP@0.5:0.95 sebesar 0.3069, dan mAP@0.75 sebesar 0.2794. Sistem juga menunjukkan nilai *precision* sebesar 0.5890 dan *recall* sebesar 0.4804. Performa terbaik ditunjukkan oleh deteksi *helmet* (mAP@0.5 = 0.900), disusul oleh *vest* (0.838), *glasses* (0.621), *wearpack* (0.503), *ear noise* (0.513), *glove* (0.370), dan *shoe* (0.353). Sistem ini menunjukkan potensi untuk meningkatkan efektivitas pengawasan K3 secara otomatis, terutama dalam pengendalian akses ke area kerja berisiko tinggi.

Kata kunci: Alat Pelindung Diri (APD), Deteksi Objek, Keselamatan dan Kesehatan Kerja (K3), YOLOv8n.

Commented [HI1]: Masukkan kata Alat Pelindung Diri (APD)

ABSTRACT

IMPLEMENTATION OF YOLOv8n FOR PERSONAL PROTECTIVE EQUIPMENT DETECTION IN AUTOMATIC DOOR ACCESS SYSTEM

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Occupational safety and health (K3) is a crucial aspect in the industrial environment, especially in the use of complete Personal Protective Equipment (PPE). However, the level of worker compliance with PPE standards is still low, which increases the risk of work accidents. This study aims to develop a computer vision-based PPE completeness detection system using the YOLOv8n algorithm integrated with an automatic door access system to a special area. The system is designed to detect at least three of the seven types of PPE commonly used, namely helmets, safety vests, wearpacks, protective glasses, earmuffs, gloves and protective shoes, in real time through low-resolution camera images.

The YOLOv8n model was trained using 2005 data, divided into 1404 training data, 400 validation data, and 201 test data. The training process was carried out for 200 epochs with a batch size configuration of 8, an image size of 320 × 320 pixels, a learning rate of 0.01, and an automatic optimizer. The evaluation results show that the system has quite good detection performance, with mAP@0.5 of 0.5855, mAP@0.5:0.95 of 0.3069, and mAP@0.75 of 0.2794. The system also shows a precision value of 0.5890 and a recall of 0.4804. The best performance is shown by helmet detection (mAP@0.5 = 0.900), followed by vest (0.838), glasses (0.621), wearpack (0.503), ear noise (0.513), glove (0.370), and shoe (0.353). This system shows the potential to improve the effectiveness of automatic OHS supervision, especially in controlling access to high-risk work areas.

Keywords: Personal Protective Equipment (PPE), Object Detection, Ocupational Safety and Health (OSH), YOLOv8n.