

ABSTRAK

PENGEMBANGAN SISTEM PENDETEKSI *AUTHORIZED OCCUPANT* *REAL-TIME* BERBASIS YOLOV8 DAN RASPBERRY PI MENGGUNAKAN *WEBCAM* PADA *SMART ROOM*

(2026: xx + 70 halaman + 33 gambar + 20 tabel + Daftar Pustaka + Lampiran)

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Perkembangan teknologi *Artificial Intelligence* (AI), dan *Internet of Things* (IoT) telah mendorong pengembangan sistem *smart room* yang lebih cerdas dan aman. Namun, sebagian besar sistem otomasi ruangan masih menggunakan sensor konvensional seperti *Passive Infrared* (PIR) yang hanya mampu mendeteksi keberadaan manusia tanpa membedakan identitas penghuni. Kondisi ini berpotensi menimbulkan risiko keamanan pada ruangan dengan akses terbatas.

Penelitian ini bertujuan mengembangkan sistem pendeteksi *authorized occupant* secara *real-time* menggunakan algoritma *You Only Look Once* versi 8 (YOLOv8) yang diimplementasikan pada Raspberry Pi dengan *webcam* sebagai sensor utama. Sistem dirancang untuk mendeteksi dan mengklasifikasikan penghuni menjadi *authorized occupant* dan *unauthorized occupant*. Hasil deteksi digunakan untuk mengendalikan perangkat elektronik secara otomatis pada *smart room* serta mengirimkan notifikasi melalui Telegram Bot sebagai sistem monitoring.

Hasil pengujian menunjukkan bahwa model YOLOv8 mampu mendeteksi *authorized occupant* dan *unauthorized occupant* secara *real-time* dengan performa yang baik. Berdasarkan hasil pelatihan diperoleh nilai *precision* sebesar 98,9%, *recall* sebesar 98,5%, *mAP@0.5* sebesar 99,3%, dan *mAP@0.5:0.95* sebesar 79,0%. Sistem juga berhasil mengendalikan perangkat elektronik sesuai status penghuni yang terdeteksi dan mengirimkan informasi monitoring melalui Telegram Bot. Dengan demikian, sistem yang dikembangkan mampu meningkatkan efisiensi dan keamanan *smart room*.

Kata kunci: *Smart room, Authorized Occupant, Unauthorized Occupant, YOLOv8, Raspberry Pi.*

ABSTRACT

DEVELOPMENT OF A REAL-TIME AUTHORIZED OCCUPANT DETECTION SYSTEM BASED ON YOLOv8 AND RASPBERRY PI USING A WEBCAM IN A SMART ROOM

(2026: xx + 70 pages + 33 figures + 20 tables + References + Appendices)

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The advancement of Artificial Intelligence (AI), and Internet of Things (IoT) technologies has encouraged the development of smarter and more secure smart room systems. However, most room automation systems still rely on conventional sensors such as Passive Infrared (PIR), which are only capable of detecting human presence without distinguishing occupant identity. This limitation may lead to security risks, particularly in rooms with restricted access.

This study aims to develop a real-time authorized occupant detection system using the You Only Look Once version 8 (YOLOv8) algorithm implemented on a Raspberry Pi with a webcam as the primary sensing device. The system is designed to detect and classify occupants into authorized occupants and unauthorized occupants. The detection results are utilized to automatically control electronic devices within a smart room and send notifications through a Telegram Bot as a monitoring system.

The testing results indicate that the YOLOv8 model is capable of detecting authorized and unauthorized occupants in real time with satisfactory performance. Based on the training results, the model achieved a precision of 98.9%, a recall of 98.5%, an mAP@0.5 of 99.3%, and an mAP@0.5:0.95 of 79.0%. The system successfully controlled electronic devices according to the detected occupant status and transmitted monitoring information via Telegram Bot. Therefore, the developed system can improve both the security and operational efficiency of smart room.

Keywords: Smart Room, Authorized Occupant, Unauthorized Occupant, YOLOv8, Raspberry Pi.