

ABSTRAK

Implementasi Perangkat IoT Kamera CCTV Berbasis YOLO dan Kalman Filter untuk Manajemen Ketersediaan Slot dan Jumlah Kendaraan (2026: xii + 75 Halaman + 20 Gambar + 9 Tabel + 28 Daftar Pustaka + Lampiran)

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Ketersediaan informasi parkir secara real-time menjadi faktor penting dalam meningkatkan kualitas layanan pada industri perhotelan. Pengelolaan parkir secara konvensional masih memiliki keterbatasan dalam menyediakan informasi jumlah kendaraan dan ketersediaan slot parkir secara cepat dan akurat. Penelitian ini bertujuan mengimplementasikan sistem monitoring parkir hotel berbasis Internet of Things (IoT) dan Computer Vision menggunakan ESP32-CAM, model YOLOv8-L, Kalman Filter melalui algoritma SORT, Firebase Realtime Database, dan website monitoring. ESP32-CAM digunakan untuk mengirimkan video streaming ke server, kemudian YOLOv8-L melakukan deteksi kendaraan secara real-time, sedangkan Kalman Filter digunakan untuk tracking dan counting kendaraan. Hasil pemrosesan dikirimkan ke Firebase Realtime Database dan ditampilkan melalui dashboard monitoring berbasis web. Hasil pengujian menunjukkan sistem berhasil mendeteksi 14 kendaraan dari total kapasitas 20 slot parkir sehingga tersedia 6 slot kosong. Sistem juga mampu melakukan tracking dan counting kendaraan secara real-time serta memperbarui informasi parkir secara otomatis pada dashboard monitoring. Hasil penelitian menunjukkan bahwa integrasi seluruh komponen sistem dapat mendukung pengelolaan area parkir hotel secara efektif, efisien, dan real-time.

Kata Kunci: Smart Parking, Internet of Things, YOLOv8-L, Kalman Filter, ESP32-CAM.

ABSTRACT

Implementing IoT CCTV Camera Devices Using YOLO and Kalman Filter for Managing Slot Availability and Vehicle Count
(2026: xii + 75 Pages + 20 Figures + 9 Tables + 28 References + Appendices)

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Real-time parking availability information is an important factor in improving service quality in the hospitality industry. Conventional parking management still has limitations in providing accurate and timely information regarding vehicle occupancy and parking slot availability. This study aims to implement an Internet of Things (IoT) and Computer Vision-based hotel parking monitoring system using ESP32-CAM, the YOLOv8-L deep learning model, Kalman Filter through the SORT algorithm, Firebase Realtime Database, and a web-based monitoring dashboard. ESP32-CAM transmits video streams to the server, where YOLOv8-L performs real-time vehicle detection, while Kalman Filter is used for vehicle tracking and counting. The processing results are synchronized with Firebase Realtime Database and displayed on the monitoring dashboard. Experimental results show that the system successfully detected 14 vehicles out of a total parking capacity of 20 slots, resulting in 6 available parking spaces. The system was also able to perform real-time vehicle tracking and counting while automatically updating parking information on the dashboard. The proposed system can support hotel parking management effectively, efficiently, and in real time.

Keywords: Smart Parking, Internet of Things, YOLOv8-L, Kalman Filter, ESP32-CAM.