ABSTRAK

RAJA ARYANSAH PUTRA. Analisis Performa *YOLO26* untuk Deteksi Objek *Real-Time* pada Perangkat Komputasi Berdaya Rendah Robot AGV. Dibimbing oleh TEKAD MATULATAN dan NOVRIZAL FATTAH FAHMITRA.

Penggunaan *Automated Guided Vehicle* (AGV) dalam industri membutuhkan sistem navigasi cerdas yang seringkali terhambat oleh keterbatasan perangkat komputasi berdaya rendah seperti prosesor CPU murni. Penelitian ini bertujuan menganalisis performa deteksi objek menggunakan arsitektur *YOLO26* dan mengevaluasi efektivitas optimasi *OpenVINO Toolkit* pada Mini PC *Intel N100*. Metode penelitian mencakup pelatihan model, konversi ke format *Intermediate Representation* (FP32, FP16, INT8), serta pengujian kecepatan inferensi selama 30 menit menggunakan metrik *System* FPS dan latensi inferensi. Hasil pengujian menunjukkan bahwa seluruh model *PyTorch Baseline* gagal mencapai batas kelayakan navigasi 30 FPS, dengan varian terbaik *YOLO26*-N hanya meraih rata-rata 22,29 FPS. Optimasi *OpenVINO* INT8 pada varian *YOLO26*-N berhasil memberikan akselerasi kecepatan inferensi sebesar 108,5%, sehingga mencapai rata-rata 46,48 FPS dengan latensi inferensi rata-rata 11,80 ms. Selain itu, sistem estimasi jarak monokuler berbasis *Inverse Perspective Mapping* (IPM) yang diintegrasikan mencatat Mean Absolute Error sebesar 22,3 cm. Penelitian ini menyimpulkan bahwa model *YOLO26*-N berformat INT8 paling optimal diimplementasikan sebagai sistem persepsi visual *real-time* untuk menunjang keamanan navigasi AGV pada perangkat keras yang terbatas.

Kata kunci: AGV, deteksi objek, *OpenVINO*, *real-time*, *YOLO26*.

ABSTRACT

RAJA ARYANSAH PUTRA. Performance Analysis of *YOLO26* for Real-Time Object Detection on Low-Power Computing Devices for AGV Robots. Supervised by TEKAD MATULATAN and NOVRIZAL FATTAH FAHMITRA.

The use of Automated Guided Vehicles (AGVs) in industry requires intelligent navigation systems, which are often hindered by the limitations of low-power computing devices such as pure CPU processors. This study aims to analyze object detection performance using the *YOLO26* architecture and evaluate the effectiveness of *OpenVINO* Toolkit optimization on an *Intel N100* Mini PC. The research method included model training, conversion to Intermediate Representation formats (FP32, FP16, INT8), and 30-minute inference speed testing using System FPS and inference latency metrics. The test results showed that all PyTorch Baseline models failed to reach the 30 FPS navigation feasibility threshold, with the best-performing *YOLO26*-N variant achieving only an average of 22.29 FPS. *OpenVINO* INT8 optimization on the *YOLO26*-N variant successfully accelerated inference speed by 108.5%, reaching an average of 46.48 FPS with an average inference latency of 11.80 ms. In addition, the integrated Inverse Perspective Mapping (IPM) based monocular distance estimation system recorded a Mean Absolute Error of 22.3 cm. This study concludes that the *YOLO26*-N model in INT8 format is the most optimal for implementation as a real-time visual perception system to support AGV navigation safety on constrained hardware.

Keywords: AGV, object detection, *OpenVINO*, real-time, *YOLO26*.