

PENGEMBANGAN SISTEM PENGHITUNG OTOMATIS POKOK TANAMAN KELAPA SAWIT BERBASIS PENGINDERAAN JAUH DENGAN METODE DEEP LEARNING

INTISARI

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Data jumlah tanaman kelapa sawit pada lahan budidaya sangat penting dalam kegiatan budidaya di perkebunan. Sampai saat ini, keterbatasan pendataan jumlah tanaman kelapa sawit dengan metode *terrestrial* antara lain efektivitas waktu, biaya, dan cakupan wilayah. Pemanfaatan penginderaan jauh dengan citra udara dan metode *deep learning* dapat mempresentasikan hasil secara lebih efisien. Penelitian ini bertujuan untuk mengembangkan sistem deteksi dan penghitung otomatis pokok tanaman kelapa sawit berdasarkan model deteksi objek *You Only Look Once* (YOLO) *version 3* pada data foto udara, serta memvalidasi hasil deteksi dengan *Quantum Geographic Information System* (Q-GIS). Terdapat dua data test dengan luasan 5,7 ha dan 10,9 ha dengan empat parameter validasi serta tiga jenis *dataset*. Pada luas area 5,7 ha diperoleh nilai *Accuracy* sebesar 96,13 – 98,32%; *Precision* 100%; *Recall* 96,13 – 98,32% dan *F1-Score* 98,02 – 99,15%. Sedangkan pada luas area 10,9 ha diperoleh nilai *Accuracy* sebesar 98,21 – 98,36%; *Precision* 99,49 – 99,85%; *Recall* 98,35 – 98,71% dan *F1-Score* 99,097 – 99,17%. Ke depannya, evaluasi dan optimasi model dapat dilakukan dengan menambah jumlah data pelatihan, variasi luasan data test, mengganti atau memodifikasi arsitektur model.

Kata kunci: Kelapa Sawit, *Deep Learning*, *You Only Look Once* (YOLO), *Quantum Geographic Information System* (Q-GIS)

DEVELOPMENT OF AUTOMATIC COUNTING SYSTEM FOR PALM OIL TREE BASED ON REMOTE SENSING IMAGERY USING DEEP LEARNING METHOD

ABSTRACT

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Data on the number of palm oil trees on cultivated land is essential in plantation cultivation activities. Until now, the limitations of collecting data on the number of palm oil plantations using the terrestrial method include the effectiveness of time, cost, and area coverage. Utilization of remote sensing with aerial imagery and deep learning methods can present results more efficiently. This study aims to develop a system for detecting and automatically counting palm oil trees based on the You Only Look Once (YOLO) version 3 object detection model on aerial imagery data and validate the detection results with the Quantum Geographic Information System (Q-GIS). There are two test data with an area of 5.7 Ha and 10.9 Ha with four validation parameters and three types of datasets. In an area of 5.7 Ha, an Accuracy value is 96.13 – 98.32%, Precision is 100%, Recall is 96.13 – 98.32%, and F1-Score is 98.02 – 99.15%. Meanwhile, in an area of 10.9 Ha, an Accuracy value is 98.21 – 98.36%, Precision is 99.49 – 99.85%, Recall is 98.35 – 98.71%, and F1-Score 99.097 – 99.17%. Model evaluation and optimization are suggested by increasing the training data, adding variations detection areas, and replacing or modifying the architectural model.

Keywords: *Palm Oil, Deep Learning, You Only Look Once (YOLO), Quantum Geographic Information System (Q-GIS)*