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OIL PALM AGE CLASSIFICATION BASED ON NDVI AND
AUTOMATIC CROWN DELINEATION EXTRACTION

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AND AUTOMATIC CROWN DELINEATION
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Under - Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The age of oil palm trees plays a crucial role in precision agriculture, yield estimates, carbon mapping, and sustainability analyzes. Traditional approaches rely on manual field data collection to monitor and record oil palm-related information. However, this method is time-consuming, labor-intensive, and inefficient for large-scale areas. This research aims to address this issue by proposing a method for classifying the age of oil palm trees using the Normalized Difference Vegetation Index (NDVI) and crown delineation area. By employing remote sensing techniques, specifically utilizing satellite imagery, this study analyzes the NDVI values obtained from multispectral data capturing near-infrared (NIR) and red-light reflectance. The NDVI values used for oil palm age classification are based on previous research. Additionally, the study employs high-resolution UAV orthophoto to extract the oil palm crown delineation area using object-based image analysis. The accuracy of object-based image segmentation was tested using over-segmentation, under-segmentation, and goodness of fit. The findings show that the overall accuracy of the segmentation is 93%, with a D index of 0.07. Furthermore, the comparison between the segmented crown delineation area and the manually digitized crown delineation area revealed a strong relationship, indicating that the segmented crown area closely approximated the manually digitized crown area ($R^2 = 0.97$). The study classified the age of oil palm trees by NDVI and crown delineation area into 6 and 5 age classes, respectively, and found discrepancies between the two approaches. This discrepancy shows that the age classifications derived from either approach may have constraints and uncertainty.

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