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A Case Study on Detecting and Mapping Individual Coconut Trees Using YOLOV3 in Conjunction with UAV Remote Sensing for Smart Plantation Management

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Location and number data of individual coconut trees are important for surveying of planting areas, predicting coconut yield, and managing and planning coconut plantations. This data is usuallyobtained through manual investigation and statistics, which is time-consuming and tedious. Deep learning object recognition models, widely used in computer vision, can provide an opportunity to accurately identify individual coconut trees, which is essential for rapid data acquisition and the reduction of human error. This study proposes an approach to identify individual coconut trees and map their spatial distribution by combining deep learning with unmanned aerial vehicle (UAV) remote sensing. High-resolution true-colour images of coconut trees at the Mahayaya Coconut Model Plantation in Sri Lanka were collected through UAV remote sensing, and an image dataset of deep learning models of individual coconut trees (ICTs) was constructed by visual description and field surveys based on coconut tree images captured by UAV remote sensing. YOLOv3 was selected to train, validate and test the image dataset of coconut trees. The results show that the average accuracy of the YOLOv3 model for validation reaches 91.7%. The number of ICTs in the study area was calculated using YOLOv3, and their spatial distribution map was created using the non-maximum suppression method and ArcGIS software. This study will provide basic data and technical support for smart coconut plantation management in Mahayaya coconut model plantation and other coconut-producing areas.

Keywords: *Individual Coconut Tree (ICT) detection, deep learning, YOLOv3, remote aensing, Unmanned Aerial Vehicle (UAV), spatial distribution*