UNIVERSITI TEKNOLOGI MARA

IMAGE-BASED ANANAS COMOSUS DETECTION AND COUNTING USING ARTIFICIAL NEURAL NETWORK

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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 Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Ananas Comosus or pineapple is currently one of the most popular fruits with high demand from the global market. This tropical fruit is widely planted, especially in Johor, Malaysia and is increasingly growing in other countries. However, the method of fruit counting and yield estimate continues to follow the conventional approach by manually counting pineapple fruit, resulting in inaccurate yield after harvesting. Therefore, to automate the process of fruit detection, counting, and yield estimation, a two-step process, namely image processing and artificial neural network (ANN), was proposed. First, the 360 images were extracted from recorded video using an unmanned aerial vehicle (UAV) DJI Phantom 3 Advanced collected at a pineapple plantation in Simpang Renggam, Johor. Then, the top view of the pineapple's crown images was pre-processed, segmented and performed via feature extraction process by shape, colour and texture features before classifying it as fruit or non-fruit using the ANN counting algorithm. The proposed fruit counting algorithm was quantitatively analysed and validated using performance metrics of accuracy, precision, specificity and sensitivity. Results demonstrated that the pineapple's crown images with the best lowest MAPE are 8%, which is at the 3-meter height from the ground to the UAV. Colour thresholding of HSV colour space resulted in the lowest average error of 12%, contrast enhancement with CLAHE technique at 0.008% of MAPE. Gradient Descent Backpropagation (GDX) with feature selection for classification and counting showed accuracy, precision, specificity and sensitivity, respectively, at 94.4%, 92.6%,96.5%, and 96.7%. This has shown that the detection of pineapple crown images is reliable for counting and finally estimating the yield of Ananas Comosus

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TABLE OF CONTENTS