UNIVERSITI TEKNOLOGI MARA

AGARWOOD CLASSIFICATION BASED ON ODOR PROFILE USING INTELLIGENT SIGNAL PROCESSING TECHNIQUE

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Thesis submitted in fulfillment of the requirements for the degreee of **Doctor of Philosophy**

Faculty of Electrical Engineering

June 2014

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 24th October 2013 to conduct the final examination of Muhammad Sharfi bin Najib on his Doctor of Philosophy thesis entitled "Agarwood Classification Based on Odor Profile Using Intelligent Signal Processing Technique". The Panel of Examiners recommends that the student be awarded the relevant degree. The panel of Examiners was as follows:

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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 acknowledge as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualication.

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

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ABSTRACT

This thesis presents the classification of Agarwood from Malaysia and Indonesia regions based on signal processing technique. Signal processing for the Agarwood classification is a new area and has yet been actively implemented. In this thesis, the Agarwood has been pre-identified by experts using 32 sensor arrays to measure the Agarwood odor profile. General Agarwood pattern has been plot in 2D diagram. The odor profile from different samples have been normalized and pre-processed and visualized in 3D and 2D plot to find unique patterns. The variation of patterns that has been visualized has been marked as different group samples. From 32 data sensor arrays, several significant data sensor array have been pre-processed using principal component analysis (PCA) as data reduction process. The selected data from PCA are applied as input to compute sensor centroid for k-NN and ANN model design. To test the robustness of the classification techniques, the data sets are randomized for both k-NN classifier and ANN model. The classification results of the k-NN classifier and the ANN model utilizing significant sensor centroid new features for Agarwood grades and regions. It was found that the k-NN classifier and the ANN model is able to classify 100% of Agarwood grade and region.

ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful. Praise be to Allah, who gave me an opportunity to gain his boundless knowledge.

I would like to thank to my supervisor Prof Dr. Mohd Nasir Taib for his supervision in this research. Thanks also to Dr Nor Azah Mohd Ali, my co-supervisor who helped me completing this research and offered the best laboratory access and sufficient sample at Forest Research Institute Malaysia (FRIM). Also thanks to Mr. Abdul Majid and Mr Nasir who gave technical assistance and their cooperation throughout this research.

Thanks also to my beloved parents who consistently pray for me in solving this challenging task and support in various aspects. I also would like to acknowledge my appreciation to my wife and children for their prayers and generous supports and also my beloved brothers and sisters.

I would also like to thank the Ministry of Higher Education Malaysia and the Faculty of Electrical Engineering, Universiti Malaysia Pahang for scholarships for this research. I would also like to thank all ASP members for their sincere cooperation. May Allah bless them for their sincere assistance in helping me completing this research work.