ASSESMENT OF ROBUST TREE DETECTION TECHNIQUE FOR INTER ROW TREES TRACKING UAV BASED ON SIMULTANEOUS LOCALIZATION METHOD

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4. Enhanced Research Title and Objectives

Original Title as Proposed:

ASSESSMENT OF ROBUST INTER-ROW TREES TRACKING TECHNIQUE FOR UAV NAVIGATION BASED ON SIMULTANEOUS LOCALIZATION METHOD

Improved/Enhanced Title:

ASSESMENT OF ROBUST TREE DETECTION TECHNIQUE FOR UAV INTER ROW TREES TRACKING BASED ON SIMULTANEOUS LOCALIZATION METHOD

Original Objectives as Proposed:

1. To design inter-row trees tracking UAV using SLAM-based technique with appropriate sensors for row trees environment.

2. To design an embedded filter in SLAM-based technique for interference rejection from adjacent row by means of landmark extraction algorithm.

Improved/Enhanced Objectives:

1. To design tree detection technique with appropriate sensors for UAV implementation based on SLAM method.

2. To design an embedded filter in SLAM-based technique for interference rejection from tree recognition by means of landmark extraction algorithm.

5. Report

5.1 Proposed Executive Summary

In previous work, there had been extensive research on row tracking by academicians. Most of row tracking techniques were implemented on mobile robot and the method varies in terms of sensors and algorithm used for detection for example Global Positioning System (GPS), vision based, laser, mechanical sensors and sensor fusion. Inter-row tracking technique of a mobile robot can be upgraded to Unmanned Aerial Vehicle (UAV).

UAV has not been specifically designed to function on row tracking but has been used as platform for tree detection from aerial platform view, however such technique, inherit problems in identifying individual trees from different row with narrow inter-row spaces or recognizing row that is completely covered by multi-layered tree crowns.

A new approach with Simultaneous Localization and Mapping (SLAM) is proposed to guide inter-row trees tracking of UAV with the ability to generate a map of environmental feature, moving the UAV and estimate its pose in unknown environment. Study of inter-row trees tracking using SLAM for UAV includes finding appropriate representation of the observation model, row trees applied a triangular planting pattern, data from on-board sensors will include reading from adjacent row. In obtaining precise observation model of row trees, landmark extraction algorithm need modification since most extraction algorithm was developed based on condition of indoor environment, solid line features and aligned point features.

To sum up specific contributions of inter-row trees tracking UAV compared to aerial view observation of trees to be the base of row tracking include reducing complexity on image analysis particularly on row trees with heavy canopies, minimizing effort in dealing with visible shadows and lessening the uncertainty due to colour blending between tree's crown and ground surface.