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STUDY THE STABILITY OF THE QUADCOPTER USING MISSION PLANNER

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ABSTRACT

These projects reports the analysis of stability of the quad copter during a specific faulty condition. By analyzing the stability of the quadcopter during fault condition, the behavior of the copter can be determined. In order to analyze the stability in certain faulty condition test bed system was developed which represent the real quadcopter. In this project the faulty condition that was specify is the motor fault which is the motor is mulfunction. This project also focus only on the Roll angle because of the limitation of the trainer test bed system. From that, the characteristic of the angle of quad copter during fault condition is considered from the reaction of the four motor that control the thrust to keep it stable. After that the percentage of the error can detected during the fault injected. The drone is equipped with an attitude central for system positioning made of gyroscopes, accelerometer and magnetometer. In order to access the data, the mission planner was used in this experiment and the data are collected wirelessly using a telemetry hardware. The fault was analyzed using two techniques, the residual detection and polynomial error analysis. The residual detection that can determined the obviously fault is occur and the polynomial can determined the direction of the error. With the rotor error, it will give the bad impact of the stability of the quadcopter and can cause crash and gives major damage. In order to stabilize the quadrotor it needs good functionality of the rotor. The result that was get from the analysis in this project is that the minimum value that can be considered as in undercontrol is 237.5 by refering from the residual analysis. For the polynomial analysis the direction of fault can be determined by refering the value of polynomial which is the result can be either positive or negative value. In this analysis using polynomial the direction of fault for motor 1 and 4 is same which is at starboard side. Besides that the direction of fault for motor 2 and 3 is same which is at port side of the quadcopter. From all the development, experiment and analysis the aim of the project was achieved.

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INTRODUCTION

1.1 BACKGROUND OF PROJECT

A drone that calls as a quad-copter is a multirotor that is fly by four rotors. Quadcopters usually use two set of identical fixed pitch propellers, which is two clockwise (CW) and two counter-clockwise (CCW). The quad copter can fly by used the variation of RPM to control lift and torque. Control of quadcopter motion is achieved by altering the rotation rate of one or more rotor [1]. For getting a quadcopter stable in the air during flight is not trivial. The stability of a quadcopter depend on the harmonious working of all it's parts. The three of the major factors that contribute to a quadcopter's stability is the vibration, propeller choice and PID settings [2].

The most common multirotor technical issues is the ESC problems that might be burn-out, or even catching fire[3]. From this issue it can be related that can cause the motor mulfunctions. The motors for quadcopter are generally quite robust and don't break easily. But since the motor are very exposed to crash damages, ripped wires, sent shaft or loose magnets can happen[3]. The quad-copter is created in different fields and for multiple purposes. They can be intended for academic, industrial worlds and military purposes [2].

Fault analysis is important obligation to demonstrate compliance with airworthiness requirement for safety system. To build a quad-copter does not ensure its access into domestic airspace, it must be safe in the sense of stability, despite different types of fault may occur. The mission can continue or aborted safety without causing injuries or damages to people. The undesirable effects from the actuators, controller, or sensors, the UAV control system must be responsive and adapt to such failure. The necessary action must be made to adjust the control laws to recover. It is required to analyze the stability behavior and fault diagnosis. From understanding the