BALANCE QUAD ROTOR FLYING MACHINE USING ATMEGA8535

This thesis is presented as a partial fulfillment for the award of the Bachelor in Electrical Engineering (Hons.)

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In the most name of ALLAH S.W.T

Most Gracious and Most Merciful

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ABSTRACT

This paper presents the design of quad rotor flying machine using Atmel AVR microcontroller. The scope of this project involves both hardware design and software implementations. This project design is divided into three parts i.e. input from user, control system and output device. Potentiometer is used as an input device to produce analog signal. The analog signal is converted to digital form using analog to digital converter (ADC) in Atmel AVR microcontroller. The digital value is used by the microcontroller to generate pulse width modulation (PWM) for the electronic speed control (ESC). ESC is a device that use with brushless DC motor to control its speed. By varying PWM frequency, the speed of the motor is controlled. Four brushless DC motor is used in this project as the output device. This quad rotor can perform vertical takeoff and landing (VTOL) with user as the input controller. The project start with literature review where all the information for designing the control system of the quad rotor was gathered. All design requirements was obtained from the literature review. The requirements of the control system of four motor in quad rotor are microcontroller, electronic speed control (ESC), brushless dc motors, propellers and the potentiometer as the throttle. During system design, the implementation of quad rotor design involves two major steps, the system and hardware design and the construction of the quad rotor. System and hardware design involved the PCB fabrication using tonner transfer method and the developments of the quad rotor hardware parts. Aluminum was chosen as the material for the body parts of the quad rotor. The design operation take count the weight of the design. Aluminum is light and rigid material which suitable for this application. The other part of design operation is the software implementation. Atmel AVR microcontroller was programmed using BASCOM compiler with the basic language as its platform. Programming is much easier using flow chart. It consists of the simplified flow of the program execution. PWM frequency changing was decided as the result of this project. This indicates the condition of the motor whether it's at ideal, minimum or maximum speed. This design use potentiometer as a manual controller to varies PWM frequency to control the speed of four BLDC motor simultaneously.

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CHAPTER 1

1.0   INTRODUCTION

1.1   BACKGROUND

As its name, quad rotor or also known as quad copter applied almost same principle with conventional helicopter. Conventional helicopter only has one propeller and some helicopter needs a yaw stabilizing rotor at the back of the helicopter. The main propeller not fix to its position since the helicopter need to move forward, backward and turn left or right. It used some mechanism to force the propeller to have an angle of attack on the shaft and spin then the wings start to develop lift force to the helicopter. The mechanism required periodically maintenance in order to make sure the helicopter can perform it desired functions.

The reason why helicopter preferable in some applications is it can perform vertical takeoff and landing (VTOL), move forward, backward and also helicopter can hover in the air. Since almost all the direction of helicopter controlled by one propeller, the maintenance due to that is higher.

Quad rotor is designed to minimize this maintenance cost by introducing an aircraft with fix-pitch propeller. It also can perform all the ability that conventional helicopter has [1]. But quad rotor does not need much on it maintenance due to the fix position of the propellers to each of the motor.