DEVELOP PC BASED CONTROLLER USING PIC16F84A

FOR FLYING VEHICLE

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MAY 2008

"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronic and Drive)"

Signature : .....

Supervisor's Name : Mr. Hyreil Anuar Bin Kasdirin

Date : 7 / 5 / 2008

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This Report Is Submitted In Partial Fulfillment of Requirements for Degree of Bachelor in Electrical Engineering (Power Electronics and Drive)

Fakulti Kejuruteraan Elektrik
Universiti Teknikal Kebangsaan Malaysia

MAY 2008

"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

Signature : .....

Name : Mohd Hairi Bin Mohd Shafie

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For my beloved father and mother

Mohd Shafie Bin Sukaimi and Suhana Binti Sudin

In appreciation of supported and understanding.

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Alhamdulilah, praise be to Allah, the Cherisher and Sustainer of world, most Gracious, most Merciful Lord.

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Finally, I would like to honor my parent, for supporting me steadfastly and their appreciated advice through my project completion.

ABSTRACT

The aim of this project is to develop the new controller for flying vehicle. This project is about "Develop PC Based Controller Using PIC16F84A for Flying Vehicle". PC based controller describe as a controller that can be interface with PC to transmit or receive data for control automation system. The example of PC based controller in this project is to control flying vehicle by using PC. In this project, it focuses on developing software and hardware. The new controller that had been developed in this project will be used serial port as a communication interface. This PIC16F84A used as a control unit. It can be program and reprogram by using MPLab software. In this project, there are 3 main parts to be included that is controller circuit, PC and remote control for flying vehicle. Remote controls for flying vehicles are still being used and need to be modified. It has variable resistor that are used to control the speed of the flying vehicle. Remote control is one of the important parts as an application for this project. Variable resistor will be connected to DC motor. Beside that, the speed of flying vehicle depends on the variable resistor at remote control. The variable resistor can be adjusting through the DC motor that will be connected on controller circuit. DC motor actually function to drive the variable resistor after receives a signal from Visual Basic.

Beside that, a new controller is also should be interface with the PC for transmit or receive data. The controller will be interface with PC by using RS 232 cable. This project is also using PROTEUS software to design the controller circuit for flying vehicle. The controller will be designed and developed follow by the specification that suitable with the flying vehicle remote control and PC. It also can be connected and can be function smoothly for make the automation system operates. Another important part in this project, the new programming need to be designed to let the flying vehicle function and it's able to control by using interfacing with PC. Through it, knowledge in design and using programming language for interfacing

should be learns and improves. In this project, the flying vehicle such as helicopter has been used for this project and has minimum range of handling such as can moving up and down, forward and backward and left and right.

ABSTRAK

Tujuan utama dalam projek ini adalah membina sebuah litar pengawal baru bagi helicopter kawalan. Tajuk projek ini adalah membina sebuah litar pengawal yang boleh berhubung dengan computer dengan menggunakan PIC16F84A untuk mengawal helicopter kawalan. Projek ini akan tertumpu kepada dua perkara iaitu pembinaan perisian dan juga perkakasan. Litar kawalan baru yang telah siap dihasilkan dalam projek ini akan menggunakan serial port sebagai penghubung antara litar kawalan dengan komputer. PIC16F84A digunakan sebagai kawalan unit dalam litar pengawal. Projek ini terdiri daripada 3 bahagian utama iaitu litar kawalan, komputer dan alat kawalan untuk helikopter. Alat kawalan untuk helikopter masih lagi digunakan dan perlu di ubah suai. Selain itu juga, alat kawalan untuk helikopter mempunyai 3 perintang boleh laras dan berfungsi untuk mengawal pergerakan helikopter sama ada untuk terbang atau mendarat, kanan atau kiri dan juga kehadapan dan kebelakang. Ketiga-tiga perintang boleh laras ini akan disambungkan dengan gear motor. Perintang ini akan dilaraskan oleh gear motor apabila butang arahan ditekan dalam komputer. Projek ini menggunakan Visual Basic software, Proteus dan juga MPLab. Visual Basic software digunakan untuk membuat butang arahan bagi membolehkan gear motor di kawal menerusi komputer. Proteus software pula digunakan untuk melukis litar kawalan. MPLAb diperlukan untuk menulis arahan dan perlu di burn ke dalam PIC. Dalam menghasilkan projek ini, ilmu pengetahuan dapat dipelajari dan diaplikasikan.

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CHAPTER 1.0

INTRODUCTION

1.1 Background of Project

The aim of this project is to develop the new controller for flying vehicle. This project is about "Develop PC Based Controller Using PIC16F84A for Flying Vehicle". PC based controller describe as a controller that can be interface with PC to transmit or receive data for control automation system. The example of PC based controller in this project is to control flying vehicle by using PC. In this project, it focuses on developing software and hardware. The new controller that had been developed in this project will be used serial port as a communication interface. This PIC16F84A used as a control unit. It can be program and reprogram by using MPLab software. In this project, there are 3 main parts to be included that is controller, PC and remote control for flying vehicle. Remote controls for flying vehicles are still being used and need to be modified. It has variable resistor that are used to control the speed of the flying vehicle. Remote control is one of the important parts as an application for this project. Variable resistor will be connected to DC motor. Beside that, the speed of flying vehicle depends on the variable resistor at remote control. The variable resistor can be adjusting through the DC motor that will be connected on controller circuit. DC motor actually function to drive the variable resistor after receives a signal from Visual Basic.

Beside that, a new controller is also should be interface with the PC for transmit or receive data. The controller will be interface with PC by using RS 232 cable. This project is also using Proteus software to design the controller circuit for

flying vehicle. The controller will be designed and developed follow by the specification that suitable with the flying vehicle remote control and PC. It also can be connected and can be function smoothly for make the automation system operates.

Another important part in this project, the new programming need to be designed to let the flying vehicle function and it's able to control by using interfacing with PC. Through it, knowledge in design and using programming language for interfacing should be learns and improves. In this project, the flying vehicle such as helicopter has been used for this project and has minimum range of handling such as can moving up and down, forward and backward and left and right.

1.2 Problem Statement

The project is emphasizing on delivering a complete system of develop PC Based Controller for flying vehicle. For the hardware part, only controller circuit is designed and fabricated. As the microcontroller is integrated into the circuit, the programming of PIC16F84A is required to enable the system to receive and retrieve the incoming signals from the PC through Visual Basic software. At the end, the highlight is given to the making of interfacing software for the system. The deliverables of the project are represented in the diagram of Figure 1.0.

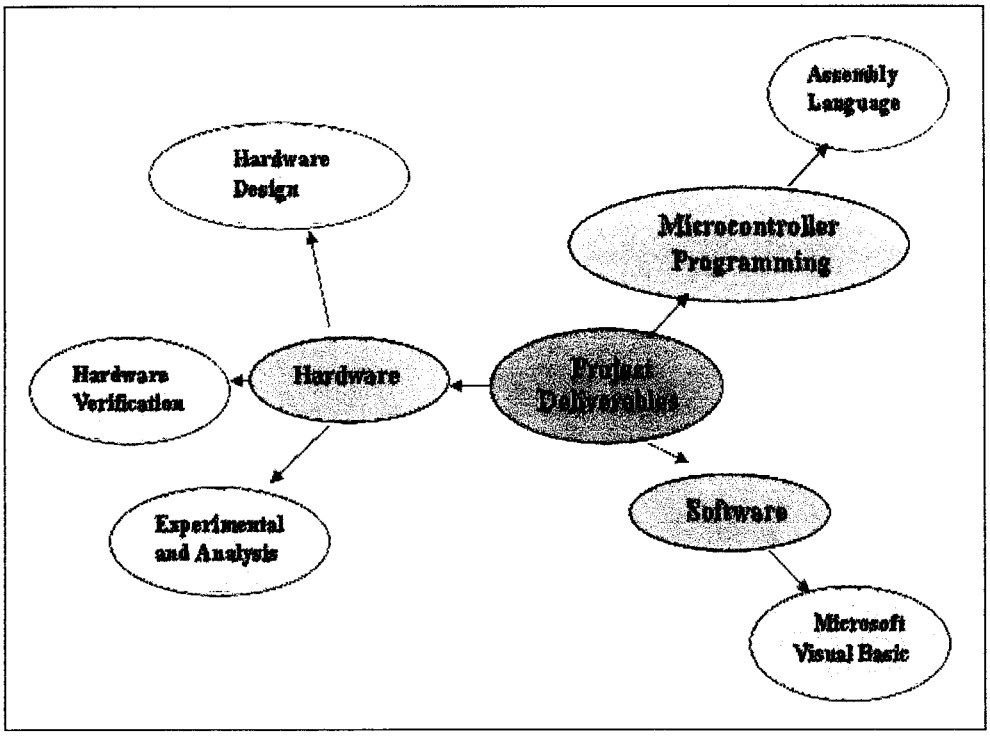

Figure 1.0: Deliverables of the project

1.2.1 Problem Identification

The PC Based Controller for Flying Vehicles system such as helicopter available in the market comprises of remote control, helicopter and software. Due to this reason, the price of the system is quite high. Furthermore, user might think it is not really worth the money to purchase the system but the utilizations are minimal. In this project, a new controller, which is capable to interface and receive signals that sent from PC, is designed. Beside, a new controller with low cost also will be developed.

The controller circuit is first modeled on the project board as to ensure there will be no faulty made in the design. Besides, if any additional components required to be embedded on the circuit, they can be identified and easily added before the finalized circuit is soldered on the etching board. In producing more than one unit of the controller circuit, etching board is fabricated once all regarding tasks have been accomplished.

Programming the microcontroller is the most critical part of the project. It is essential in enabling the system to read the signal that received through the serial communication of a PC. The thorough study and good understanding on assembly programming are necessary as to guarantee the smoothness while programming the microcontroller.

Designing the interfacing software is another important stage of the project. Familiarization with the Microsoft Visual Basic software is necessary as to ensure that the software designed meets the users' requirements and can be utilized as desired.

1.2.2 Significance of the Project

As described previously, only a new controller circuit is designed for the project. User can use the available flying vehicle remote control and connect to a new controller that can interface with PC in order to control the system using PC. Figure 1.1 below shows the block diagram to represent the basic operation of the PC based controller for flying vehicle system, from the PC as an input signal to the controller circuit.

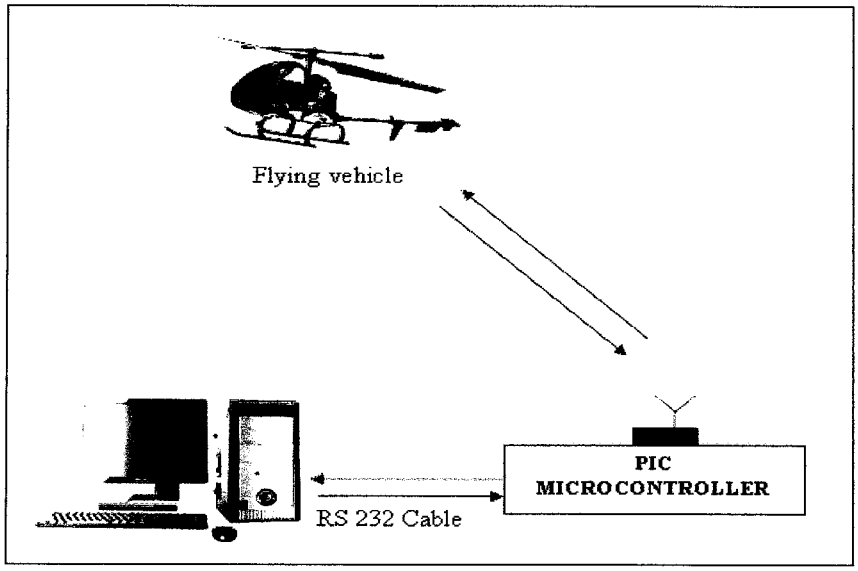

Figure 1.1: Basic Block diagram for flying vehicle control system

1.3 Objectives and Scope of Project

The foremost objective of the project is to develop a new controller for flying vehicle by using PIC16F84A that can be utilized interactively by users in controlling the flying vehicle system. The system should be cost-effective as to allow user interface to the control system.

Another objective is to enhance the design and performance of the existing design. The project is differentiated with the existing flying vehicle remote control system. From that, the new controller has been designed and it should have able to control flying vehicle from the PC.

The project coverage also includes the programming knowledge of the microcontroller. With this, the knowledge enhancement on assembly language to program the microcontroller is considered as another main objective of the project.

The project final results;

At the end of this project, the flying vehicle that use PIC16F84A microcontroller had been designed. For this purpose, the flying vehicle is able to interface with its controller and also able to control by using PC. As for the circuit controller, it needs to be function and follow the criteria that have been planned.

The scopes of this project are:

- For this project, a new controller for helicopter control will be designed.
- It uses Visual Basic 6 to control the flying vehicle.
- The controller will be interface with the PC by using RS 232 cable.
- The data will be transmitting to the controller using RS 232 cable.

- The new programs will be designed using MPLab software.

- This project will be use Proteus software for design control circuit.

The project involved;

- Hardware;

  The hardware development consists of the design, redesigns, testing and troubleshoots all the circuit involved.

- Software;

  The software part will base on the simulations for all the system parts.

- Firmware;

  This part consists of programming the entire system using MPLab Software stage by stage toward the end. Another part is design and develops the complete automated systems that will control the flying vehicle.

1.3.1 The Relevancy of the Project

The relevancy of the project is viewed from three different perspectives, by which include hardware design, PC and remote control applications.

1.3.1.1 Hardware Design

In this project, the new controller circuit has been designed and develops. The controller circuit and remote control circuit will connect together. Flying vehicle will operates when its get the output signal from control circuit. Actually, the speed of

flying vehicle could be adjust depends on the variable resistor. There are 3 DC motor that used to varied variable resistor.

1.3.1.2 PC Application

PC application is used as a medium to interface main controller and PC. It is also important to control flying vehicle by using Visual Basic. From Visual Basic, a new program had been designed for control flying vehicle system. When the controller circuit receives a signal from PC via serial port communication, DC motor will operates and varied variable resistor. So that mean, flying vehicle operates synchronize with DC motor.

1.3.1.3 Remote Control Application

Remote control is used to send a signal to flying vehicle. In this project, remote control needs to be modified and connect to a new controller. It is also operates depend on the controller circuit.

1.3.2 Feasibility of the Project within the Scope and Time Frame

In general, all scopes covered to complete the project are feasible for a final year student. The allocated time frame of approximately one year is sufficient to carry out the entire task required in the project. Appendix A summarized the allocated time frames for all tasks performed throughout the two semesters in a Gantt chart. There are three fundamental parts contributing to the major accomplishment of the project; hardware design, microcontroller programming and software design.