DC MOTOR CONTROLLER

MOHD IKHWAN BIN ABU BAKAR

This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Computer Engineering) With Honours

Faculty of Electronic and Computer Engineering
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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : DC motor controller

Sesi Pengajian : 2007/2008

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(TANDATANGAN PENULIS)

Alamat Tetap: 3679 Lahar Kepar
13200 Kepala Batas,P. Pinang

Tarikh: 1/5/08

Disahkan oleh:

(COP DAN TANDATANGAN PENYELIA)

AHMAD SADHIQIN BIN MOHD ISIRA
Pensyarah
Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200, Hang Tuah Jaya
Ayer Keroh, 75450 Melaka.

Tarikh: 12/5/08

"I hereby declare that this report is the result of my own work except for quotes as cited in the reference"

Signature : _____

Author : MOHD IKHWAN BIN ABU BAKAR

Date : 21/04/2008

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor of Electronic Engineering (Computer Engineering) With Honours."

Signature : _____

Supervisor's Name : Mr. Ahmad Sadhiqin Bin Mohd Isira

Date : 12/5/08

For my beloved Family, lecturers and my friends

APPRECIATION

Syukur to Allah S.W.T, with His bless, I had successfully finish my Projek Sarjana Muda. I also want to give my appreciation to all that involve and helping me along my progress in completing this project, and also a lot of thanks to my supervisor, Mr. Ahmad Sadhiqin Bin Mohd Isira, and also Mr. Fauzi bin johar. And others friends that help me, and not to forget the technician from PSM lab that help me to itching my circuit. Million of thanks to all and May Allah award and bless all of you.

ABSTRACT

The objective of this project is to design DC motor controller where it used to detect and control the motor speed follow its speed reference and also lit-up the LED to show the situation of the motor, whether it's too fast or to slow from speed reference. This project is including two main part which is the hardware and software part for PIC programming. The main objective of this project is to control the DC motor speed follow the reference speed. The motor speed is supply by the voltage input from the PWM, and its speed will be detect by the other motor, which mean in this project have two DC motor that being used, one for detect the other motor speed. And the output from the other DC motor will be change into digital signal by using ADC PIC features. Where the digital signal will be input for the LED and also used to compare whether the DC motor are in the right speed. From this choosing the right PIC and every changes in the parameter will show whether this controller is efficiency.

ABSTRAK

Projek ini bertujuan untuk membina pengawal motor DC dimana untuk mengesan kelajuan motor DC serta mengawal kelajuan motor bedasarkan kelajuan rujukan nya dan juga akan menyalakan LED untuk menunjukkan keadaan motor itu, samada lebih laju atau lebih perlahan daripada kelajuan rujukannya. Projek ini merangkumi dua bahagian iaitu bahagian hardware serta bahagian software untuk aturcara PIC. Objektif utama projek ini adalah untuk mengawal kelajuan DC motor bedasarkan kelajuan yang dikehendaki. Kelajuan motor adalah bedasarkan input masukan dalam bentuk PWM, dan kelajuan motor akan di ukur oleh motor yang lain,dimana output dari motor itu akan ditukarkan kepada output digital oleh ADC. input digital itu akan menjadi input untuk LED serta akan dibandingkan dengan input rujukan. Oleh itu pemilihan PIC yang betul serta kawalan setiap parameter menentukan kejituan serta kepersisan pengawal kelajuan motor DC ini.

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PIC	-	Peripheral Interface Controller
PWM	-	Pulse Width Modulation
ADC	-	Analog To Digital Converter
LED	-	Light Emitting Diode
DC	-	Direct Current
PCB	-	Printed Circuit Board
I/O	-	Input / Output
IC	-	Integrated Circuit
PSM1	-	Projek Sarjana Muda 1
PSM2	-	Projek Sarjana Muda 2
CCP	-	COMPARE AND CAPTURE PWM
PCB	-	PRINTED CIRCUIT BOARD
CISC	-	COMPLEX INSTRUCTION SET COMPUTER
RISC	-	REDUCE INSTRUCTION SET COMPUTER
BLDC	-	BRUSHLESS DC

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CHAPTER I

INTRODUCTION

DC motor controller is the project that can control the speed of DC motor by controlled the voltage. This project will use PIC as its controller.

1.1 Overview

The main purpose of the project is to detect and control the motor speed, when motor speed is lower than the specification, the controller increase the electric current, otherwise, when motor speed higher than specification, the controller reduce the current, the control parameters included are speed detection period, the adjustment of reference value and control rate value. The speed can be detected by LEDs are lit up to confirm the control situation of the motor. This project uses PIC as the controller.

The main advantage of this project is it can automate control the DC motor speed and also easy to implement with other project. It also can be used for study purpose which is for ADC (analog to digital converter) and CCP (capture and compare PWM) function in PIC.

1.2 Objectives

Objectives of the project are:-

I. To detect and control the motor speed follow it's specification

II. To study and analyze the problem identified during implementation

1.3 Problem statement

This project has two parts, which is the hardware part and the coding part for PIC, for hardware part, in DC motor controller, the efficiency of the motor speed is needed and how to controlled it by using the PIC are important, we need the correct algorithm is needed doing coding process, and motor speed efficiency are depends on the pulse width modulation. And for hardware part, the motor cannot switch the current flow, so the control circuit and software must control the current flow correctly to keep the motor turning smoothly. And from that we need sensor to monitor the motor position

1.4 Project scope

The scope of this project is to design motor DC controller by using PIC controller. The aim is to detect and control the motor speed, when motor speed lower than the specification, the controller increase the electric current, otherwise, when motor speed higher than specification, the controller reduce the current, the control parameters are include such as speed detection period, adjustment reference value and control rate value, the speed can be detected by LEDs are lit up to confirm the control situation of the motor. This project uses PIC.

1.5 Methodology

The flowchart in figure 1.1 below shows the process of the development of the DC motor controller. First starts with the software part, this part come first because when to make DC motor move, we need give instruction to PIC, and then we have to simulate the hardware to make sure the circuit can run before we applied it to hardware. After testing, some improvement will be making because not all project is perfect, and some touch up or reworks need to be done to make it almost can run smoothly.

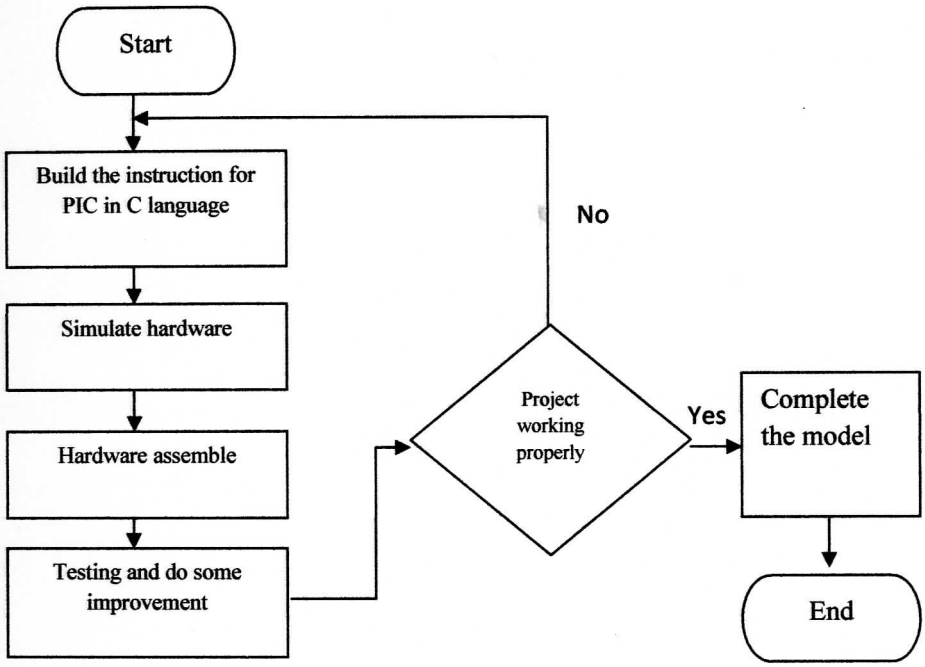

Figure 1.1: Progress Flowchart

1.6 Report Structure

This report starts with the literature review about DC motor, PIC and with basic PWM and ADC. Next chapter will cover about the design process to develop the model of DC motor controller. Then, all the result will be discusses in the next chapter. Project hypothesis will be done to decide either the project has achieved the objective or not. Lastly, the conclusion and also the suggestion on this overall project will be included in this report.

CHAPTER II

DESIGN PROCESS

2.1 Overview

For the design process, it contains the background research and former paperwork about the overall project. It is including:

a) DC motor
b) PIC

This following paperwork and research can be look at the next chapter, Chapter 3: Literature Review.

2.2 Analyze and Study the Characteristic

Before go to the hardware model development, the characteristic of the PIC and DC motor must be analyzed and studied first., the important thing of the characteristic that must know is:

a) Control parameter
b) System configuration
c) System variables and parameter
d) System operation

2.2.1 Control parameter flowchart

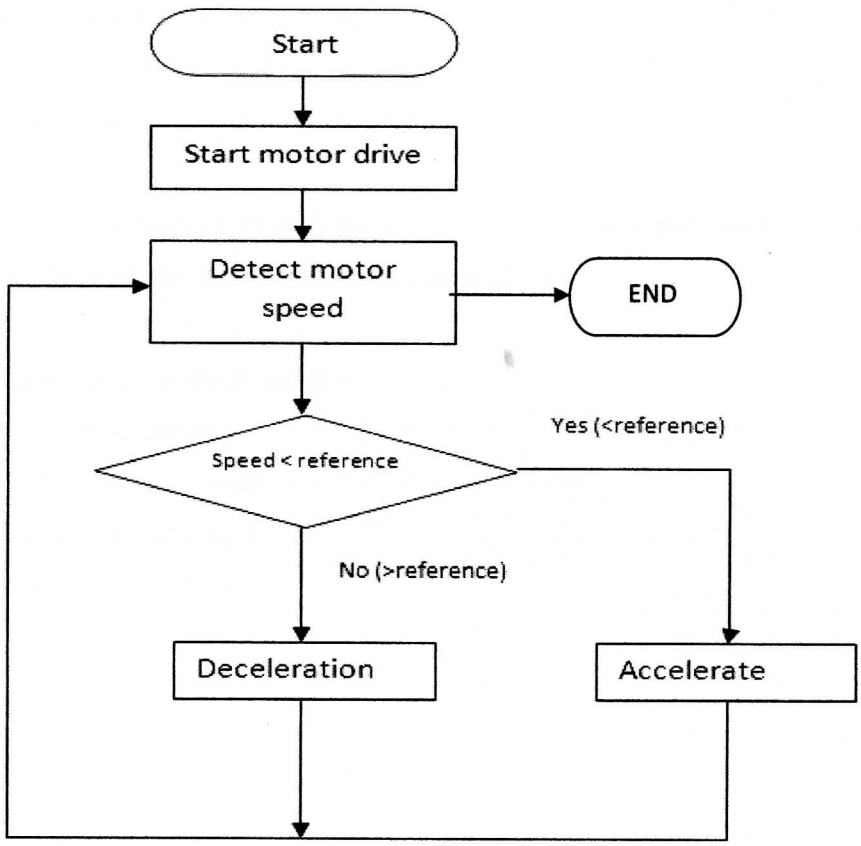

Figure 2: control parameter flow chart

Control parameter is where the motor speed being control, where whether the motor will accelerate or decelerate are depends on the detect speed minus the reference speed. The reference speed will are fix, which we can set it in the software.

2.3 Hardware model development

These projects develop the model of DC motor controller, so the hardware and software part is done in this project. There is an important thing on the model or hardware development.

a) Identify the component that will used
b) Design the controller circuit, amplifier circuit.
c) Run the model circuit simulation.
d) Assembly and build the hardware model.
e) Troubleshoot the hardware model.

For the component identifying process, there is the main part of circuit or component that includes for the hardware model design:

a) Control voltage input circuit
b) Motor drive circuit
c) Clock generator circuit
d) LED displaying circuit
e) Power supply circuit

Table 1: Gantt chart

PERANCANGAN PROJEK

Senaraikan aktiviti-aktiviti utama bagi projek yang dicadangkan. Nyatakan jangka masa yang diperlukan bagi setiap aktiviti

Aktiviti Projek	2007																								2008							
	Julai				Ogos				September				Oktober				November				Disember				Januari				Februari				March			
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Log book PSM																																				
Study/refresh:																																				
i. PIC																																				
ii. Characteristic of DC motor																																				
iii. C languages																																				
Preparing for Seminar PSM 1																																				
Working on PSM 1 Report																																				
Design model for DC motor																																				
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