UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FAKULTI KEJURUTERAAN ELEKTRIK

PROJEK SARJANA MUDA

(PSM 2)

BEKU 4983

DC Motor Servo Controller Using PC Parallel Port

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APRIL 2009

"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 (Control, Instrumentation and Automation)"

Signature : 

Supervisor's Name : Prof. Madya Dr. Ismadi Bugis

Date : 22 April 2009

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This Report Is Submitted In Partial Fulfillment Of Requirements For The Degree of Bachelor In Electrical Engineering

(Control, Instrumentation and Automation)

Fakulti Kejuruteraan Elektrik

Universiti Teknikal Malaysia Melaka

22 April 2009

"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 : TAN SHI CHIAN

Date : 22 April 2009

To my dearly loved father and mother

To all my teachers and friends

ACKNOWLEDGEMENTS

I wish to thank my project supervisor, Prof. Madya Dr. Ismadi Bugis for his guidance and teachings. And also would like to thank both the panels for their guidance.

I would also wish to extend my gratitude to my parents for their support and their understanding.

And of course to all my friends that help me in this project.

ABSTRAK

Penggunaan – pengunaan mesin untuk menganti kerja manusia pada zaman kini kian meningkat. Ini kerana peggunaan mesin automatik bukan saja dapat meningkatkan produktiviti, mesin juga dapat membuat kerja-kerja yang susah seperti mengangkat benda yang berat atau mengerakkan sesuatu benda ke tempat yang ditentukan dengan tepat. Dalam litar *" DC Motor Servo Controller using PC Parallel Port"* computer akan menghantar arahan ke PIC dan sebaliknya PIC akan menghantar arahan ke motor yang bergabung dengan *potential meter* untuk menjadikan motor itu boleh berfungsi macam *servo motor* yang boleh mengbalas arahan. Arahan balasan akan dihantar melalui *PI controller (analog to digital converter, PIC16F877A),* PIC (ADC module) akan menukarkan arahan *analog* kepada arahan *digital* dan hantar arahan itu balik ke computer. Dengan sistem ini, kami dapat mengawal motor arus terus ini mengekalkan tempat dia dan mangawal sudut pusingan dia. Sistem ini biasa digunakan dalam CCTV, tangan robot, *fabrication machine* dan lain lain. Satu kegunaan yang paling popular dalam sistem elektronik ialah "*motor servo controller*" iaitu boleh jadi kawalan dalam DC dan AC.

ABSTRAK

The usage of machine replacing the work done by human in this modern age is increasing rapidly. It is because automated machine can not only increase productivity, it can also do work that are hard to be done by human being such as lifting heavy object or move an object to position we set with high degree of rotation. In a DC Motor Servo Controller Using PC Parallel Port circuit, PC will send pulse to PIC and the PIC will send the signal to reverse and forward the dc motor. Furthermore, rotation of DC motor combined with a potential meter to make it function like feedback. Feedback signal (analog) will be transferred through PI controller (analog to digital converter, PIC16F877A), and then PIC (ADC module) will convert the analog signal to digital signal and send it back to PC. With this system one can easily make the dc motor hold their position and control the degree of rotation. This system normally use at CCTV, robot arms, fabrication machine and many other. To do such job, one can implement electrical or electronic system. One of the most popular function controls in electronic system is motor servo controller which can be DC or AC motor control.

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LISTS OF SYMBOLS & TERMS

A/D (ADC)	Analog to Digital Converter
DAC	Digital to Analog Converter
PC	Personal computer
PI controller	Proportional-integral controller
PID controller	Proportional-integral-derivative
DC Motor	Direct Current Motor
VB	Visual basic
CW	Clockwise
CCW	Counterclockwise
EMF	Electromotive Force
CEMF	Counter Electromotive Force
LED	Light-emitting diode
MOSFET	Metal–Oxide–Semiconductor field-effect transistor
PIC	Peripheral interface controller

CHAPTER 1

INTRODUCTION

1.1 Background

This Project Servo is to design and implement a digital PI controller for DC motor system. Both software and hardware are design and develop in this project.

In control engineering, a PI Controller (proportional-integral controller) is a feedback controller which drives the plant to be controlled with a weighted sum of the error (difference between the output and desired set-point) and the integral of that value. It is a special case of the common PID controller in which the derivation (D) of the error is not used so I am using PC as my programmer for PI controller.

An internal ADC module in PIC16F877A was used as my converter to convert the analog signal to digital signal. An analog to digital converter (abbreviated ADC, A/D or A to D) is an electronic integrated circuit, which converts operation is performed by a digital to analog converter (DAC).

Typically, an ADC is an electronic device that converts an input analog voltage (or current) to a digital number. The digital output may be using different

coding schemes, such as binary, Gray code or two's complement binary. However, some non-electronic or only partially electronic devices, such as rotary encoders, can also be considered ADCs.

In the real world the quantities we measure are mostly analog. Some examples of these quantities include volume, speed, temperature and heat. To measure these quantities the parameters need to be converted to electrical signals, namely voltage and/or current. To translate these values, a transducer or sensor is used.

After getting the analog voltage or current values, these values have to be converted to digital form to be processed by the Central Processing Unit or microprocessor or digital controller. This process is named Analog to Digital Conversion. This is because the digital controller can only handle data in discrete form.

The processor then analyzes the data and processes it in the way that the user wants, either to monitor the real time changes in value or to output to displays or buzzers or alarms.

In this case, 2 single quadrant chopper circuit was used in my circuit. A chopper circuit is used to numerous types of electronic switching devices and circuit. Essentially, a chopper is an electronic switch that is used to interrupt one signal under the control of another.

Besides that, servo motor also will be use as my output. It will receive the input signal and send the feedback analog signal to PIC and then PIC will convert the

analog input signal to digital output signal for transfer to PC. So this will make us can control the degree of rotation for servo motor.

1.2 Problem Statement

Four main problems in this project are; first problem is interfacing between Servo motor and PC using parallel port. In this case because of different voltage requirement between our component and Servo motor this makes us hard to get interfacing between Servo motor and PC.

Second problem is combine potentiometer and DC motor. Normally DC motor will run without giving any feedback, so we need to combine a potentiometer to get the analog feedback signal from motor. The way how to combine the motor and potentiometer is a big problem for me.

Third problem is the program write by MikroC can be properly fulfilling all the function. MikroC is use to write the program for controlling the DC motor. MikroC is a programming language I didn't learn before so this problem is one of the problem I facing now.

Fourth problem is the suitable gear will be used. Speed of DC motor is too fast for me so I need find some suitable gear for reducing the motor speed to make it easy to control.

1.3 Project Objective

Design and development of an embedded controller for DC motor to Servo motor applications.

1.4 Project Scope

- Design and development DC motor to servo motor.
- To study and understand the function for PIC16F877A
- Control the DC motor using PC through parallel port.
- To make a controller circuit board that is small and compact
- To study and familiarize with MicroC

1.5 Methodology

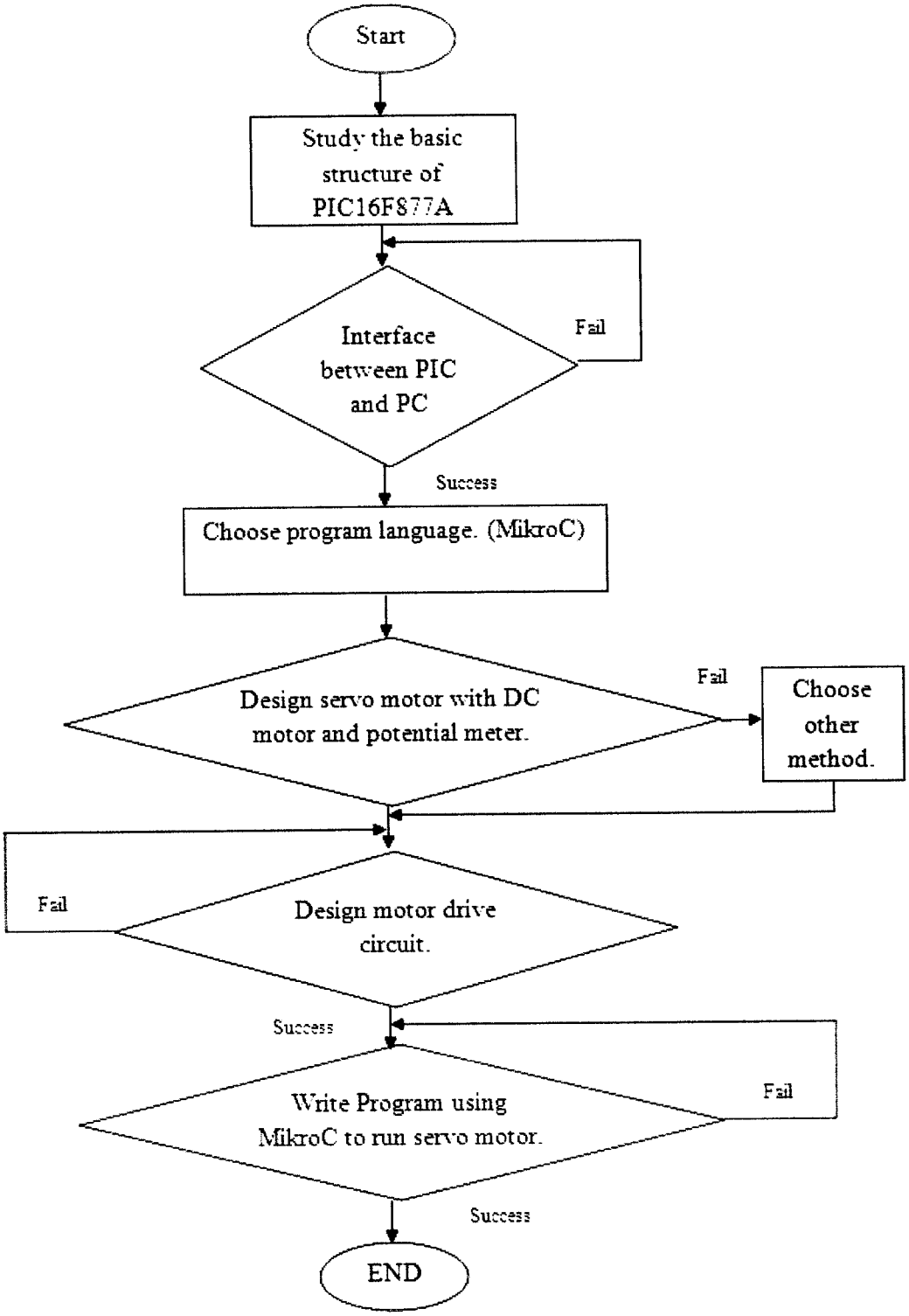

Figure 1.0: Methodology Flow Chart

1.6 Project Planning

Table 1.0: Project Planning

Project Planning													
List major activities involved in the proposed project. Indicate duration of each activity to the related month(s).													
	2008							2009					
Project Activities	**June**	**July**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**	**Mac.**	**Apr.**	**May**	**June**
1. Title Selection and Literature Review	*	*											
2. Research For PIC16F877A and Preparing Proposal	*	*	*										
3. Write Programming MikroC			*	*	*								
4. PSM 1 Report			*	*	*								
5. Research and Design Servo motor						*	*	*					
6. Acquiring Hardware Components						*	*	*					
7. Troubleshooting								*	*	*			
8. PSM 2 Report									*	*	*		