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Design and development of robot interface for controlling 6 DC motor using Visual Basic / Abu Ubaidah Abdul Aziz.

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF ROBOT INTERFACE FOR CONTROLLING 6 DC MOTOR USING VISUAL BASIC

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Robotic and Automation) with Honours.

by

ABU UBAIDAH BIN ABDUL AZIZ

FACULTY OF MANUFACTURING ENGINEERING

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ABSTRACT

The aim of this project is to design and develop appropriate robot interface using Visual Basic.NET to control six DC motors. The motors will be controlled via computer without direct interaction with a robot pendant. This project has been divided into two stages. The first stage consists of theory of the project such as research on the types of motors that can be used, software package in creating the interface and programming, the controller and the interface. The second stage involves on the design and development of the interface and controller. Programming stage involves two different softwares. Visual Basic.NET programming is used as an interface to control the motor movement while the MikroC is used to program the PIC microcontroller for the PIC to communicate with the Visual Basic.NET programming. Motor controller communicates with PC to control the motors in clockwise and counterclockwise direction through the Visual Basic.NET interface. In addition the controller is also able to control the speed of the motor. Testing is done to verify that the motor controller and the interface can communicate with each other. The interface can communicate with the PIC but not able to move the DC motors to go either forward or reverse. Two objectives had been achieved in this project that is designing and developing a robot interface for controlling 6 DC motor using Visual Basic.NET and constructing electrical circuit to control the DC motor. One objective is not achieved that is to interface the Visual Basic.NET program and motor and program the PIC to achieve controlling 6 DC motor using Visual Basic.NET.

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ABSTRAK

Projek ini bertujuan untuk mereka dan membina antara muka dalam mengawal enam motor yang berjenis arus terus. Projek ini dijangka akan membolehkan pengawalan motor menggunakan komputer tanpa manggunakan alat kawalan. Projek ini terbahagi kepada dua peringkat. Peringkat pertama mengandungi teori projek seperti kajian tentang jenis-jenis motor yang boleh digunakan, perisian yang digunakan untuk membina antara muka dan program, litar untuk mengawal motor dan antara muka. Peringkat kedua ialah mereka dan membina antara muka dan litar pengawal motor. Peringkat memprogram melibatkan dua jenis perisian yang berbeza. Pengaturcaraan Visual Basic.NET digunakan sebagai penghubungkait bagi mengawal pergerakan motor manakala MikroC akan diprogramkan ke dalam PIC untuk berkomunikasi dengan pengaturcaraan Visual Basic.NET. Litar untuk mengawal motor akan berkomunikasi dengan komputer untuk mengawal motor dalam beberapa arah pergerakan iaitu mengikut arah pergerakan jam dan lawan jam dengan meggunakan penghubungkait yang telah diprogramkan menggunakan Visual Basic.NET. Selain dari itu, pengawal juga akan mengawal kelajuan motor. Ujian ke atas pengawal motor dan penghubungkait dibuat supaya boleh berkomunikasi antara satu dengan yang lain. Antaramuka boleh berkomunikasi dengan PIC tetapi tidak dapat menggerakkan motor mengikut arah pergerakan jam dan lawan jam. Dua objektif Berjaya dicapai dalam projek ini iaitu mereka dan membina antaramuka untuk mengawal enam motor berarus terus menggunakan Visual Basic.NET dan membina litar untuk mengawal motor berarus terus. Satu objektif tidak tercapai iaitu untuk antaramuka antara program Visual Basic.NET dan motor dan memprogram PIC dalam mengawal enam motor berarus terus menggunakan Visual Basic.NET.

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DEDICATION

To my supervisors, Mr. Muhamad Arfauz bin A Rahman, Puan Syamimi binti Shamsuddin and lecturers. Not forgotten to my parents, Abdul Aziz bin Zahari and Nik Azizon binti Wan Kadir, and to all my friends.

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B An Inexpensive AVR Controlled 16-Channel Serial Servo Motor Controller Design for Robotic Application

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D Motor Controller Circuit Diagram

E Interface Programming (Visual Basic.NET)

F PIC Programming

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LIST OF ABBREVIATIONS

AC	-	Alternating Current
DC	-	Direct Current
GUI	-	Graphical User Interface
IC	-	Integrated Circuit
LED	-	Light Emitting Diode
PC	-	Personal Computer
PIC	-	Programmable Integrated Circuit
PLC	-	Programmable Logic Controller
PWM	-	Pulse Width Modulation
USART	-	Universal Serial Asynchronous Receiver Transmitter
USB	-	Universal Serial Bus
UTeM	-	Universiti Teknikal Malaysia Melaka
VB.NET	-	Visual Basic.NET

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CHAPTER 1
INTRODUCTION

1.1 Background

This project is aimed to design and develop appropriate robot interface for controlling six Direct Current (DC) motor using Visual Basic (VB) software. The outcome of this project can be used in controlling the motors via personal computer (PC) without direct interaction with robot pendant. Figure 1.1 show an example of connection between PC, motor controller and DC motor and the interface is expected to be user friendly and easy to connect with the current robot controller.

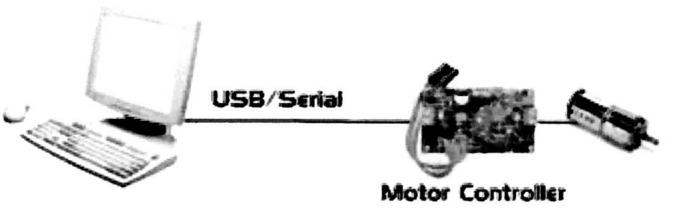

Figure 1.1: Connection between PC, motor controller and DC motor

Generally, the DC motor had been widely used in industry as in the robot arm and robot slider applications. The advantages of using the DC motor is the speed can be controlled and they have the ability to develop very high torque at low speed. The rotation of the motor also can be controlled clockwise ad counterclockwise. There are four basic types of DC motor as follows:

a) Series motor
b) Shunt motor

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c) Compound motor

d) Permanent-magnet motor

Visual Basic.NET is the software package use for this project to develop a program for controlling the DC motor. VB.NET is the most popular language for develop programming because it is easy to use. The language not only allows programmers to create simple graphical user interface (GUI) applications, but can also develop complex applications as well.

Figure 1.2 explains about a simplified model for computer control for controlling the 6 DC motor. It starts with the user interface where users give instructions and read information from the control target through the user interface. The software in the computer will process the instructions and send it to the control/interface board through a communication port (serial/USB port). The control/interface board will interpret and execute the instructions according to a pre-written protocol. The instruction will be sent to the DC motor through the drive board/relay and other electronic components on the control/interface board.

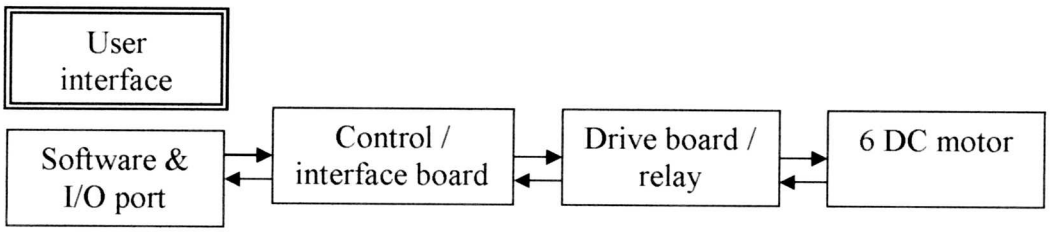

Figure 1.2: Simplified model for computer control (PromoChorm Technologies Ltd.)

1.2 Aim and Objectives

This aim is achieved through these objectives:

a) To design and develop an interface for controlling 6 DC motor using Visual Basic.NET.

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b) To construct electrical circuit to control the DC motor.

c) To interface the Visual Basic.NET program and motor and program the PIC (Programmable Integrated Circuit) to achieve controlling 6 DC motor using Visual Basic.NET.

1.3 Scope

This project is to design and develop appropriate robot interface for controlling 6 DC motor using Visual Basic.NET software. The robot interface will be a user friendly interface. The motor controller that been developed can control the angle and speed of the DC motor. This project is to understand the functionality and capability of the DC motor. It is also to understand the application of Visual Basic as the interface.

1.4 Problem Statement

In industry, the robot or motors is inclined controlled and programmed using the control pendant. Using the control pendant, the motors had to be controlled in a close range. In this project, the DC motor can be controlled via PC without direct interaction with control pendant. The advantage is the speed of each motors can be controlled and the program can be changed easily.

1.5 Benefits

The potential benefit of this project is the DC motor can be controlled via PC without direct interaction with control pendant.

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1.6 Project Outline

GANTT CHART FOR PROJECT SARJANA MUDA 1 AND 2

PSM 1		WEEK													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
SELECTION OF CHAPTER															
OBJECTIVE, SCOPE, BACKGROUND															
LITERATURE REVIEW															
REPORT WRITING															
SEMINAR							S1				S2				S3
DESIGN, DEVELOP, TROUBLESHOOT CIRCUIT															
MAKING PROGRAMMING															
REPORT SUBMISSION															
PRESENTATION															
PSM 2															
DEVELOP VISUAL BASIC.NET	ACTUAL														
	PLAN														
PROGRAM THE MICROCONTROLLER	ACTUAL														
	PLAN														
DESIGN CIRCUIT	ACTUAL														
	PLAN														
CONSTRUCT CIRCUIT	ACTUAL														
	PLAN														
TROUBLESHOOT CIRCUIT	ACTUAL														
	PLAN														
CONNECTING THE INTERFACE WITH MOTOR	ACTUAL														
	PLAN														
REPORT WRITING	ACTUAL														
	PLAN														
REPORT SUBMISSION	ACTUAL														
	PLAN														

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