

DESIGN OF ROBOTIC ARM CONTROLLER USING MATLAB

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This project and research work is dedicated to my beloved parents for their devoted caring throughout my life, my loving brother and sisters also my friends for their encouragement and love.

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ABSTRACT

This project is about designing a robot arm control using MATLAB. It is designed to be used in the movement either to the left and right and is also used to lift an object using a robot arm is controlled using MATLAB. This project also uses a PIC 16F877A microcontroller circuit as the basic circuit. 3 servo motors will be used as an application extension to make movements and lifting an object. In this project, the PIC microcontroller to be programmed instructions to control the servo motor. This project uses MATLAB as a graphical user interface (GUI) for controlling the movement of this robot. The microcontroller software will be standardized to achieve the simulation is not always limited to the convergence between the tools used by the circuit. The project is also designed in such electronics industry and the manufacturing industry.

ABSTRAK

Tugas projek ini adalah tentang rekabentuk kawalan lengan robot menggunakan Matlab. Ia adalah rekabentuk yang digunakan dalam melakukan gerakan sama ada ke kiri dan ke kanan dan juga digunakan untuk mengangkat sesuatu benda dengan menggunakan lengan robot yang dikawal dengan menggunakan MATLAB. Projek ini juga menggunakan litar mikropengawal PIC 16F877A sebagai litar asas. 3 motor servo akan digunakan sebagai aplikasi sambungan untuk membuat pergerakan dan juga mengangkat sesuatu benda. Di dalam projek ini, mikropengawal PIC akan diprogram kepada arahan untuk mengawal motor servo. Projek ini menggunakan perisian MATLAB sebagai „Antaramuka Pengguna Grafik“ untuk mengawal pergerakan robot ini. Perisian yang diseragamkan dengan pengawalmikro ini akan sentiasa mencapai simulasi yang tiada terhad daripada percantuman antara alat yang digunakan dengan litar. Projek ini juga direka dalam industri contohnya industri elektronik dan juga industri pembuatan.

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LIST OF ABBREVIATIONS

PWM	-	Pulse Width Modulation
RAM	-	Random Access Memory
ROM	-	Read-Only Memory
PROM	-	Programmable Read-Only Memory
IC	-	Integrated Circuit
I/O	-	Input / Output
PIC	-	Programmable Interface Controller
USART	-	Universal Synchronous Asynchronous Receiver Transmitter
USB	-	Universal Serial Bus
PBP	-	PICBASIC PRO

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CHAPTER I

INTRODUCTION

1.1 Robot

Robots are indispensable in many factoring industries. The reason is that the cost per hour to operate a robot is a fraction of the cost per hour to operate a human labor needed to perform the same function. More than this, once programmed, robots repeatedly perform function with a high accuracy that surpasses that of the most experienced human operator. Human operators are, however, for more versatile. Humans can switch job tasks easily. Robots are built and programmed to be job specific. You wouldn't be able to program a welding robot to start counting parts in a bin [5].

Today's most advanced industrial robot will soon become „dinosaurs“. Robots are in the infancy stage of their evolution. As robots evolve, they will become more versatile, emulating the human capacity and ability to switch job tasks easily. While the personal computer has made an indelible mark on society, the personal robot hasn't made an appearance. Obviously there's more to a personal robot than a personal computer robots require a combination of elements to be effective: sophistication of intelligence, movement, mobility, navigation and purpose [5].

1.2 Robot Arms

The simplest arm is the pick-and-place type. In this case the parts are moved from one location to another without caring how the part is picked up or down. However, these days robot arms are designed to manipulate objects having complicated shapes and fragile in nature. These may be used to assemble parts or fit them into clamps and fixture. This is possible due to high accuracy attainable in robot's arm [1].

1.3 Introduction of Project

This final project is about design robotic arm control using MATLAB. It is the robot that will make movement and grip something then put to another place. The project focuses on programming that use to move the robotic arm. The objective of this project is developing a program that can control robotic arm using MATLAB. To make the movement for robotic arm, 3 servo motor is used as a joints. In this particular project, PIC microcontroller is programmed into the instructions to control the servo motor. This project used the MATLAB software to create the program of robotic arm. This software emulator of the microcontroller will always suffer limited simulation from the combination device interaction with the circuit.

1.4 Objectives of Projects

PSM is a subject that require student to make their own project based on what they learn. The main core of this project is to develop a program that can control robotic arm using MATLAB. The system will be developing using MATLAB and PIC based circuit. Other than that, we also able to program the movement of servo motor.

1.5 Problem Statements

In the industry at this time were used for the robot arm as a tool to facilitate the work. There are many problems that arise in the existing robot arm:

- i. Difficult to control and time consuming to control.
- ii. Getting securities using MATLAB is very rarely used in industry as such a system will be developed using MATLAB to control the robotic arm.

1.6 Scope of project

In order to achieve the objective of the project, there are several scope had been outlined. The scope of this project includes using PICBASIC PRO programming to program microcontroller PIC16F877A, build PIC microcontroller circuit and robotic arm for the system, and interface the microcontroller to computer by using RS232 serial port communication. Servo motors are also used for robotic arm and control by MATLAB. MATLAB is used to control PIC microcontroller which is connected to robotic arm. Robotic arm movement can be done by moving to the left or right to take and put things in different places.

1.7 Thesis Organization

This thesis consists of five chapters including this chapter. The contents of each chapter are outlined as follows, Chapter 2 contains a detailed description each part of project. It will explain about the robot arm, PIC Microcontroller, servo motor, RS232 serial port, servo motor, PICBASIC PRO Compiler and MATLAB GUIDE. Chapter 3 includes the project methodology. This will explain how the project is organized and the flow of the process in completing this project. Chapter 4 presents the expected result of simulation runs using MATLAB GUIDE and the analysis of the project. Finally the conclusions for this project are presented in Chapter 5.

1.8 Methodology

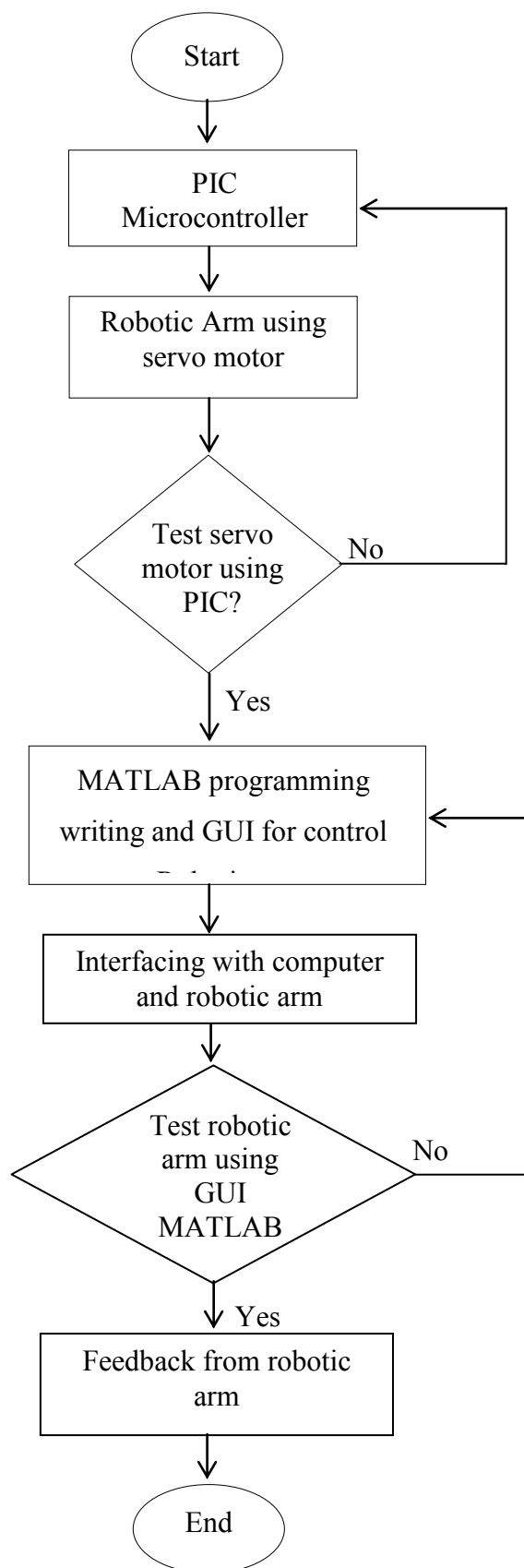


Figure 1.1: Flow chart for whole project

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter will describe about the knowledge of robotic arm or the literature review which is as a reference before develop this project, literature is one of the important part need to be consider before develop new project because it can be a good reference which is give a lot of information, theories, design and idea about the project develops. Literature review can be an article, journal, statement, research and the previous thesis done by others. Below show a few literature review referred before develop this project.

2.2 Robotic Arm

Reference is to build a robotic arm similar to this project. This robot quite simply, a robot to lift objects. More specifically, this is a robot arm with shoulder, elbow and wrist joints.