PICK AND PLACE ROBOTIC ARM WITH TRAINING KIT

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Tarikh :.....10/5/07.....

I dedicate this book to my beloved father and mother, family members and last but not least, to all my UTeM lecturers and friends.

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ABSTRACT

The purpose of this project is to developed Pick and Place Robotic Arm with Training Kit. The function of this robot is to pick and place material and equipped with hardware and software. This robot can be controlled by using the remote controller and also using computer program. The main objective of this project is to develop a prototype pick and place robot that can be used as a teaching method to deliver a better understanding of basic function, operation and programming of a robot. The application of this project is also can be used in other related field such as industry, military, medical and so on. This project was successfully developed and tested and the hardware and the software could be integrated and working well without error.

ABSTRAK

Tujuan pembangunan projek ini adalah untuk mereka cipta dan membangunkan 'Angkat dan Letak Tangan Robot dengan Kit Latihan'. Tangan robot ini dilengkapi dengan sistem perkakasan dan juga perisian dan mempunyai kebolehan untuk mengangkat dan meletak barang. Secara umumnya, robot ini boleh di kawal dengan menggunakan 2 kaedah iaitu melalui alat kawalan jauh dan juga ianya boleh dikawal dengan menggunakan komputer. Program yg digunakan untuk perisian sistem ini adalah Visual Basic. Objektif utama pembangunan sistem ini adalah sebagai salah satu kaedah yang boleh digunakan dalam pembelajaran robotik dimana ianya secara tidak langsung dapat menyampaikan lebih pemahaman dan juga pengetahuan mengenai fungsi, operasi dan juga pembangunan perisian sesuatu robot. Aplikasi prototaip projek ini juga boleh digunakan di dalam bidang-bidang lain seperti industri, senjata, perubatan dan lain-lain lagi. Projek ini secara dasarnya berjaya dibangunkan dan diuji di mana sistem perkakasan dan perisian untuk projek ini berjaya berfungsi tanpa ralat dan masalah.

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LISTS OF ABBREVIATIONS

DOF	-	Degree of Freedom
PC	-	Personal Computer
IC	-	Integrated Circuit
VB	-	Visual Basic
Rx	-	Receiver
Tx	-	Transmitter
PCB	-	Printed Circuit Board

LISTS OF APPENDIX

CHAPTER 1

INTRODUCTION

1.1 Introduction to Robot Arm

Basically, the robotic arm can be control manually and automatically. The robot will initially provide a remote control and window controller to control the movement of robotic arm and also monitoring purposes. Next, the purposed of this project is to pick up or to remove object from one place to another and also as a training kit. The mechanical hardware that will be used is radio frequency remote control while the programming software that is going to be used is Visual Basic as the interface to control the robot movement. The hardware and software that had been developed is definitely a user-friendly programmed that will connect through robot arm. Motor will be used to move the robot arm and will be located at every join of the robot arm. The robot arm is divided to four parts which are base, elbow, wrist motion, and a functional gripper.

1.2 Objectives

For this project, the objectives are:

i. To design a Robot Arm that can be control manually and automatically by using remote control and computer software.
ii. To design a Robot Arm which can be function to pick and place things.
iii. To build and to develop both the robot hardware and software system that could be integrated to support the application system of the robotic pick and place arm.
iv. Doing the theories and practical research and proper analysis about the Pick and Place Robotic Arm.
v. To produce a set of lab sheet or manual as a guide for education purpose.

1.3 Scope of works

Basically, the scope of works had been divided to 3 levels. The levels are beginning level, intermediate level and finishing level:

1.3.1 Beginning Level

i. Doing Research and Development for this project (RND).
ii. Gathering informative source about the topic from multiple source such as books, journals, internet and also magazines.
iii. Doing the analysis about the project and at the same time search for solution for this project.
iv. Held meeting with lecturer/supervisor to get the guidelines so the project could be implemented according to the procedures.

1.3.2 Intermediate Level

i. Doing and finished the proposal according to the procedures.
ii. Held discussion with lecturer/supervisor about the material that had to purchase.
iii. Doing the quotation and submit it to the faculty to obtain the material that is needed.
iv. Doing the presentation about 'Projek Sarjana Muda 1' to elaborate and deliver understanding about the developed project.
v. Doing the research and understanding about the developed hardware.

1.3.3 Finishing Level

i. Start to develop and installing material for hardware.
ii. Integrate the developing hardware and software.
iii. Doing the *'performance testing'* to the developed system.
iv. Locate, analyze and repair if there is any troubleshooting and problem occurred during the *'performance testing.'*
v. Finally, the Robotic Arm which functions to pick and place things with a training kit is completely able to run.

1.4 Problem Statement

Robots have become important over a wide range of applications from manufacturing, surgery until to the handling of hazardous materials. Consequently, it's important to understand how they work, and what problems exist in designing effective robots. In designing the robot especially robotic arm, we must understand it requires a lot of knowledge and basic information about the robot. From the research and studies, there are several problem statements that is clarify and noticed.

1.4.1 Cost

Initially, the cost for purchasing the material for robotic arm is very expensive. A quality and suitable material for the robot will cost a lot of budget and it's clearly not affordable. This will cause a difficulty for educational purposes and many students and lecturer will find lots of difficulties in doing their studies and research. Thus this project will help them to deliver a better understanding about the basic operation and function of the robot.

1.4.2 Hardware System

To constructed a circuit, there are few procedure to be consider which are process etching, installation component, soldering process, testing and troubleshoot. If the constructed circuit is not function, troubleshoot must be done and it need a lot of focus and the knowledge about circuit process. It is a complicate process to find the error because we must go through one by one to find the error.

1.4.3 System Integration

Technically, it is always difficult to integrate the hardware and software. There is many way to integrate the system to function according to instruction given. Loads of research and studies must be done in order to achieve the expected result for this project.

1.5 Thesis Structure

The content of this thesis is all about the project that had been done. This thesis will be divided into five chapters to provide reader to understand the whole project. Entire chapter is:

i. Chapter I – It is covering the overview of the project.

ii. Chapter II – It will cover up all the project theory, perspective, method that was use to solve the problem and any hypothesis that related with the research of methodology.

iii. Chapter III – It is covers the research methodology in this project.

iv. Chapter IV – It is covers the contrivance and the result of the data analysis or the project result.

v. Chapter V – It is about the whole contents of this thesis and project. By the end of this chapter, there are some discussion and conclusion for this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will explain about theory and concept of this project. The objectives of this discussion is to explain the perspective and the method that had been used in the past research and to find how those research and theory can be relate with it. Others than that, this chapter will also show about the theory and concept that had been used in solve solution. Understanding of the theory is very important as a guide in doing any research. Result cannot be obtained if there is no comparison between theory and result because the result just can be obtained by referring to theory.

2.2 Robot Overview

In this project, robot arm is one of the main parts because the objective of this project is to pick and place things using a robotic arm. To obtain the objective, robot arm must be installing in this project. Another objective is to implement as a training kit for education purpose.

2.2.1 Definition of Robot

A robot can be defined as a reprogrammable and multifunctional manipulator designed to move materials, parts, tools, or specialized devices through various programmed motions for the performance of a variety of tasks.

2.2.2 History of robot

One of the first robots was the clepsydra or water clock, which was made in 250 B.C. It was created by Ctesibius of Alexandria, a Greek physicist and inventor. The earliest remote control vehicles were built by Nikola Tesla in the 1890's. Tesla is best known as the inventor of AC electric power, radio (before Marconi), induction motors, Tesla coils, and other electrical devices. Other early robots (1940's - 50's) were Grey Walter's "Elsie the tortoise" ("Machina speculatrix") and the Johns Hopkins "beast."

2.2.3 Functions of Robots

Nowadays, robots have been used in a lot of aspects such as:

2.2.3.1 Exploration

People are interested in places that are sometimes full of danger, like outer space, or the deep ocean but when they can not go there themselves, they make robots that can go there. The robots are able to carry cameras and other instruments so that they can collect information and send it back to their human operators.

2.2.3.2 Industry

When doing a job, robots can do many things faster than humans. Robots do not need to be paid, eat, drink, or go to the bathroom like people. They can do repetitive