MOBILE ROBOTIC ARM WITH EMBEDDED PID SYSTEM

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This report is submitted in partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Bachelor of Electronic Engineering with Honours.

Signature	:	……
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DEDICATION

Special thanks to Allah, to my family, project supervisor, friends, and other staff in UTeM

ABSTRACT

In this century, Robot has been widely used especially in Industrial Area. Robot is used in repetitive tasks where errors take account. Robot can be either controlled by user or to perform autonomously. In this project, the mobile robot has a 5-DOF robotic arm to perform the pick and place task. Besides that, the mobile robot has 4 wheels for mobility. The mobile robot is powered up by 2200mAH Li-PO Battery which can last for an hour. Furthermore, it is built with an Arduino UNO and controlled by Android Smartphone with an app called "JoyStick Controller". Bluetooth is used as a connection between the Arduino and Android Smartphone. The User Interface of the application is designed in a way to allow the user to handle the mobile robot easier. PID controller is used in this project to make the arm movements smooth without barrier and lagging.

ABSTRAK

Pada abad ini, Robot telah digunakan secara meluas terutamanya di kawasan perindustrian. Robot digunakan dalam tugas-tugas yang berulang-ulang di mana setiap kesilapan diambil kira. Robot boleh digunakan sama ada dikawal oleh pengguna atau digunakan secara automatik. Dalam projek ini, robot mudah alih mempunyai 5-DOF lengan robot untuk melaksanakan tugas mengambil dan meletak. Selain itu, robot mudah alih ini mempunyai 4 roda untuk bergerak. Robot mudah alih ini dikuasakan oleh 2200mAh Bateri Li-PO yang boleh bertahan selama satu jam. Tambahan pula, ia dibina dengan Arduino Uno sebagai mikropengawal dan dikawal oleh telefon pintar Android dengan aplikasi yang dipanggil "JoyStick Controller". Bluetooth digunakan sebagai jaringan antara Arduino dan telefon pintar Android. Aplikasi mesra pengguna telah direka sebagai satu cara bagi membolehkan pengguna untuk mengendalikan robot mudah alih lebih mudah. Pengawal PID digunakan dalam projek ini untuk menjadikan lengan bergerak lancar tanpa halangan dan ketinggalan.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays, Robots are significantly increase as robots being immersed into our daily tasks, machines are replacing human especially in industrial sector whereas the automation of process has increase the efficiency while decreasing time consume and human energy. As the technologies getting move advance, the improvement of technologies has inspired whole generation of engineer to push the barriers of technology. The main challenge such as to develop a robotic arm to work the way human arm does.

Human are restricted by physical and mentally limitation whereas robot are inversible. They can work repetitively and way more effectively and efficiency compare to human. They replace human to outperform a duty which human unable

to do. Robot do not have soul, they are lifeless. They perform what they are programmed to be and they can work 24/7. They can lift heavy weight and can accurately perform the job with less errors. Robots are widely used in many fields of application including office, industrial automation, military task, hospital operations, security system, dangerous environment, and agriculture.

Generally, industrial robotic arm widely used for pick and place task where it is programmed to execute the task to be fast and accurate. From SMT machine to automation, it can work independently or cooperate with human force especially in large scale or heavy weight which human unable to handle. This can greatly reduce the risk factor as well as increase the efficiency of work done.

Furthermore, robots are deployed especially in hazardous situation as terrorist bomb threat, land mine patrol and nuclear disaster. They often used to deal with hazardous materials to enhance the human safety especially in hazardous environment such as extremely hot or cold temperature, polluted air, and radioactivity. Human is unable to endure these hazardous environments for a long period.

1.2 Objectives

- To design a mobile robot with robotic arm
- To apply the embedded PID controller to mobile robot
- To do analysis to the control performance with and without PID controller

1.3 Problem Statement

In the chemical manufacturing company, the sample must be occasionally checked to secure it meets the standard requirement. These checking will be done by the laboratory technician. Although human body can give off the chemicals from human body by the help of the liver. However, when human is exposed to these harmful substances for a periodical time, it will bad to health effects. This means the laboratory technician will in risk of having cancerous cell when testing the sample periodically.

1.4 Scope of work

- To determine the complexity and DOF level of the robotic arm
- To design a mobile robotic arm with 5 DOF
- To design a robotic arm using Embedded PID controlled system

1.5 Limitation of work

- Using Embedded PID controlled system
- Control the movement of the mobile robot by controller build using Android Studio
- Can lift an object up to 100g only