UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABB IRB 120 ROBOT WRITING PROGRAMMING AND DESIGN OF A PEN HOLDER TOOL MECHANISM TO WRITE ON A PAPER

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

by

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Dalam perkembangan terkini teknologi dan permintaan industri, penggunaan robot dan automasi dalam industri sangat digalakkan dan diperlukan untuk meningkatkan kecekapan dan mengurangkan pembaziran. Robot perindustrian kebanyakannya digunakan dalam perindustrian, tetapi mereka juga boleh digunakan dalam bidang senian yang lebih kreatif. Oleh itu, dalam projek ini, Robot Industri IRB 120 dari ABB digunakan untuk diprogramkan untuk menulis perkataan dengan menggunakan beberapa kaedah program termasuk pengekodan Rapid, target dan path, Add-in Machining Power Pac Machining tool dan Machining Power Pac CAM Converter tool. Objektif projek ini adalah untuk merekabentuk dan menilai parameter mekanisme pemegang pen, program IRB 120 untuk menulis, penilai kaedah optimum untuk program IRB 120 dan untuk menjalankan dan menguji program dalam IRB 120. Analisis kualitatif dan kuantitatif digunakan untuk menilai kaedah optimum untuk memprogram robot untuk menulis dan penentuan parameter terbaik untuk mekanisme pemegang pen. Machining Power Pac Machining tool merupakan kaedah terbaik untuk program manakala titik hubungan besar, kelajuan rendah, kedudukan pegangan 20% dan kecondongan pen 90 darjah adalah parameter terbaik untuk menulis.

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ABSTRACT

In the current advancement of technology and demand of the industrial, use of robots and automation in industry are highly encourage and needed to increase the efficiency and reduce waste. Industrial robot is mostly used in industrial, but they can also apply in more creative art works. Thus, in this project, Industrial Robot IRB 120 from ABB is used to be program to write words using few methods of program including Rapid coding, target and path teaching, use of add-in software Machining Power Pac machining tool and Machining Power Pac CAM Converter tool. The objective of this project is to design and evaluate parameter of pen holder mechanism, to program IRB 120 to write, to evaluate the optimum method to program IRB 120 and to run and test the program on actual IRB 120. Qualitative and quantitative analysis are used to evaluate optimum method to program robot to write and to determine the best parameter for a pen holder mechanism. Machining Power Pac Machining tool has is the best method to program while big contact point, low speed, 20% holding position and 90-degree tilt of pen is the best parameter to write.

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DEDICATION

To my beloved parents, to lecturer, helpful friends,

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I would like to thank my parent to give me chance to continue my study without the needs to worry about family situation far from home and giving their full spiritual support. I would like to thank my supervisor for giving me his attention and help when I am in need. Thank You.

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LIST OF ABBREVIATIONS

UAV	Unmanned Aerial Vehicle
ISO	International Organisation for Standardization
IRB	Industrial Robot
IoT	Internet of Things
MITI	Ministry of International Trade and Industry
MOSTI	Ministry of Science, Technology and Innovation
MOHO	Ministry of Higher Education
TCP	Tool Centre Point
USB	Universal Serial Bus
IRC	Industrial Robot Controller
I/O	Input / Output
CAD	Computer Aided Design
ABS	Acrylonitrile Butadiene Styrene
OCR	Optical Character Recognition
PCB	Printed Circuit Board

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CHAPTER 1

INTRODUCTION

1.0 Introduction

In this chapter, introduction of the project is being written and it include the background, problem statement, objective and work scope of the project.

1.1 Background

A robot is defined as an automatically operated machine that takes over human effort even it does not resemble a human and a robot is designed to be control by a controller. Controller can be a computer or other similar devices. In a robotics system, it does not just consist of robot, but it also includes other devices and systems that can be used together along with the robots to perform or to aid in certain task such as welding, painting and pick and place. We normally encounter robots in plant that are operating dangerous, boring and dirty work such as in manufacturing plant that is doing repetitive work or moulding work that will come with high temperature. Thus, robot is used to reduce the need of human to face this danger. Robot can be autonomous or semi-autonomous and it range from humanoids robot to industrial robot such, medical operating robots, patient assist robots and UAV drones. Figure 1.1 shows the type of robot and its example of robot.

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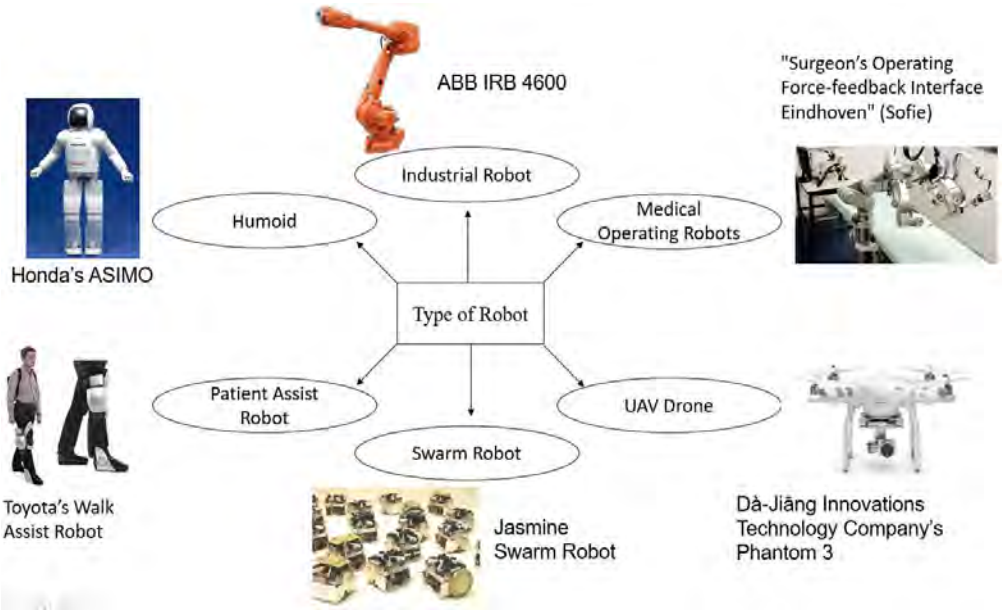

Figure 1.1: Type of Robot and Example of Robot

1.2 Introduction of Industrial Robot

Industrial robot as defined by ISO 8372:2012 is an automatically controlled, reprogrammable, multipurpose manipulator programmable in at least three or more axes, which can be either fixed in place or mobile for use in industrial automation application (ISO/IEC, 2012). Reprogrammable robots mean that the design of the robot can change the programmed motions or auxiliary functions without any physical alteration. The robot can adapt to a different application with physical alteration that's call multipurpose capability. Physical alteration of the robots means the alteration of the mechanical system of the robot.

ABB industrial robot manufacturer is the leading manufacturing company that has the industrial robot revenue in 6943.9 million euros in the year of 2016 followed by BM Group and Fanuc Corporation industrial robot manufacturing company which is the second and the third largest industrial robot manufacturing company by revenue

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respectively according to statista.com (Suisse, 2017). ABB IRB 120 is the smallest multipurpose industrial robot produce by ABB which just weights 25kg and have a payload of 3kg within 580mm. ABB IRB 120 is use because of cost that is effective and with high reliability. Figure 1.2 is an ABB IRB 120 manipulator, the smallest manipulator from ABB (*ROBOTICS Product specification IRB120*, 2017).

Figure 1.2: ABB IRB 120

1.3 Introduction of Industrial 4.0

Industrial 4.0 is referred to transformation of production and manufacturing based industries to a digitalized transform driven by connected technologies such as connecting a robotic control using a wireless connectivity that enable user to monitor real time physical progress of the system. There are 9 main pillars or drives of industry 4.0 which are autonomous robots, big data analytics, cloud computing, internet of things (IoT), additive manufacturing (3D printing), system integration, cybersecurity,

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augmented reality and simulation. Industry that are moving towards industry 4.0 will be able to have a higher flexibility, productivity, efficiency, quality and reduced time to market (Osman, 2018).

Currently in Malaysia, the Cabinet has tasked 3 important ministry department to lead the initiative to move towards industry 4.0 which are Ministry of International Trade and Industry (MITI), Ministry of Science, Technology and Innovation (MOSTI) and Ministry of Higher Education (MOHE). The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Figure 1.3 is the main pillar of industrial 4.0.

Figure 1.3: Main Pillar of Industrial 4.0 (McCabe, 2016)

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1.4 Problem Statement

Robot are usually use in 3D works that is dirty, dull and dangerous work. Dirty works are like sewer scraper that are always in contact with tons of pollutants, infectious diseases and drug use in the community. Dull works are works that are highly repetitive that might danger human from repetitive strain injuries. Dangerous work is likely to link with high temperature and high load work such as high temperature molding industry work. Industrial Robot could also be expanding into the use of detail art work to imitate the work of art of a human hand such as calligraphy writing and art drawing. Therefore, this project is initiated to use the current industrial robot of ABB IRB 120 to first write out programed words.

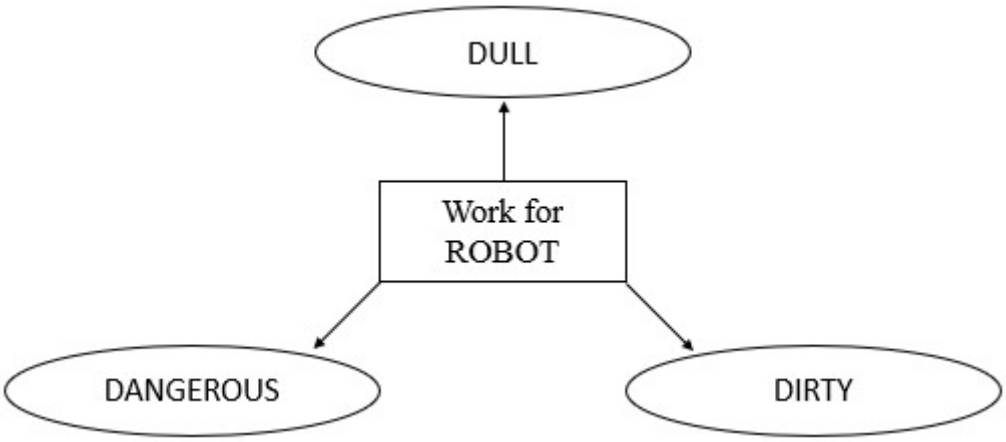

Figure 1.4: Work for Robot

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1.5 Objective of Research

The use of industrial robot, ABB IRB 120 to follow and write accurately as what is being programmed to the ABB robot. written by the user in real time is an interesting way of producing more original artistic imitation of human touch art works. The objective of this project is as follow:

1) To design and evaluate parameter of pen holder mechanism for ABB IRB 120 as a tool to attach in end effector of ABB IRB 120 to be use as writing tool.

2) To program an industrial robot using RobotStudio software and run simulation before running test in the actual industrial robot.

3) To evaluate the optimum method to program IRB 120 to write programmed text or word.

4) To run and test the program on actual ABB IRB 120 industrial robot to write out words that can read on a white board.

1.6 Scope of Project

Guideline are proposed to ensure the project will meet the objectives by narrowing the scope of this project. The scopes of this project are as follows:

1. This project is only using ABB IRB 120 industrial robot.

2. This project is only using IRC 5 that are produced by ABB as a controller for the IRB 120.

3. This project is using Robotstudio to simulate before testing out in an actual ABB IRB 120

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1.7 Report Outline

The structure and layout of the report are as follow:

Chapter 1 – Introduction: This chapter will briefly explain about the introduction which cover the problem statement, objectives and scopes of the project.

Chapter 2 – Literature Review: This chapter will discuss about a general step used by other research to carry tasks to complete projects.

Chapter 3 – Methodology: This chapter will explain about the methodology of this project, which will describe the details of the method used for developing this project and approach taken to complete the project.

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