UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND ANALYSIS OF MOBILE ROBOT FOR ROAD SIDE CURB PAINTING

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

By

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This report is submitted to the faculty of Manufacturing Engineering of UTeM as a partial fulfilment of the requirement for the Degree in Bachelor of Manufacturing Engineering (Robotic & Automation). The member of the supervisory committee is as follow:

……

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ABSTRAK

Robot pengecat bergerak adalah satu bidang baru dalam dunia robotik di Malaysia khususnya. Projek ini akan menerangkan tentang robot bergerak yang direkabentuk untuk melakukan proses mengecat bahagian pembahagi jalan di jalan-jalan raya. Robot bergerak berpotensi untuk diakplikasi di dalam persekitaran yang boleh membahayakan nyawa manusia seperti untuk tujuan dan proses mengecat pembahagi jalan. Proses merekebentuk robot ini melibatkan pemilihan alat-alat logam untuk robot, pemilihan atur cara dan hubungkait perisian yang sesuai serta melakukan analisis terhadap rekabentuk robot tersebut. Objektif utama projek ini adalah untuk melakukan rekabentuk dan analisis untuk robot yang digunakan untuk tujuan mengecat pembahagi jalan. Dalam projek ini, atur cara komputer dan peralatan untuk melakukan proses mengecat untuk robot ini dibincangkan secara teori dan analisis dibuat untuk mendapatkan keputusan dan kesimpulan secara eksperimen. Pada akhir projek ini, atur cara komputer dan peralatan yang digunakan untuk melakukan proses mengecat yang paling sesuai untuk robot ini akan dipilih.

ABSTRACT

Mobile painting robot is a new field in the world of robotics in Malaysia. This project will describe the design of mobile painting robot designed to make the process of painting the road side curb on the main roads. It has the potential to be applied in an environment that can endanger human life as to the purpose and process of painting the road side curb such as this mobile robot can replace place of human in working at the placed that need to be paint . The process involves selecting the designed robot tools for metal robot, the selection of programs and relationships as well as software to analyse the design of the robot. The main objective of this project is to design and analysed the robot that is used for painting the road side curb. In this project, a programming for the robot and also the painting mechanism for this mobile robot are discussed in theoretically and analytically is to obtain experimental results and conclusions. At the end of this project, a programming and the painting mechanism that works best for this robot are selected.

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CHAPTER 1

INTRODUCTION

1.1 Background

The research and development of mobile robots possess immense potential in terms of their applicability to a wide range of the task and also the usage of mobile robots is increasing in a service sector in the past decade. Like now, mobile robots mostly use in the service sector to make the continued course of going more easily and more smoothly and readily than before the exiting of mobile robots. Nowadays they had a night guard mobile robots and tourist guide mobile robots and mobile robots are also found in the industry, military, and security environment but unfortunately they does not have a mobile robot for road side curb painting. If now they had a mobile robot for road side painting, they can make the maintenance easier while doing the road painted and also they reduce the time to do work. To solve this problem, mobile robot for road side curb painting is designed to help make the jobs easier than before.

The main objectives of this project are to design and analyze mobile robot for road side curb painting to facilitate the painting of road by the curb side of the workers involved in this field.

This project covers only the design and analysis only. This project also does not involve the process of fabrication to complete this project. This project only design

and analyze mobile robot for road side curb painting. Overall activities include in Gantt chart at Table 1.1 and Table 1.2

1.2 Aim and Objective

This project aims to design and analyze mobile robot for road side curb painting. To fulfil the aims of this project, there are two objectives that must be achieved:

1. To design the structure and the painting mechanism of mobile robot for road side curbs painting.
2. To analyze the design of mobile robot for road side curbs painting and also analyze the design of the paint mechanism for in the mobile robot.

1.3 Project scope

This project addresses only the design of mobile robot, which can be used to paint the road side and analyze it, this project also analyze the mobile robot. This project is meanly more to see ways of designing and analysis for the mobile robot. By having this project, a person will know exactly what are needed in designing a mobile robot for road side curb painting. This mobile robot only paint standard curb side in Malaysia only and just design for curb in Malaysia only. Mobile robot is focusing on road side curb the use of black and white only and the same size as standrad only the size of the size specified by the authorities. Other than that, this project is to analyze the paint mechanism for mobile robot. To make it all posibble, the movement and the force of the mobile robot need to be calculated so it can be move and do the painting job. This project does not include other development such as fabricated or electrical component of this mobile robot.

1.4 Problem Statement

In the service sector, the use of mobile robot can be called as a big present for the community and the environment it self. Although the technology of the mobile robot is still new in the service sector but the result has been very good. But in the road side painted service, they do not use the mobile robot yet. Now in the real world, road side painting service still use the man power to do the road side painting. Without the use of the man power the mobile robot can accelerate the process of painting the curb side of the road. Apart from that it can save time and reduce labour from abroad. This project is more into designing and analyzing the mobile robot for the road side curb painting. To make it all possible, the movement and the force of the mobile robot need to be calculated so it can be move and do the painting job. This project is all about to design a new way of painting the road side curb in Malaysia.

Figure 1.1: Road side curb before painting (Majlis Perbandaran hang Tuah Jaya)

Figure 1.2: Road side curb after painting

1.5 Expected Outcome

The expected outcome for this project is the design and analysis of mobile robot for road side curb painting. This mobile robot can help people that are involved in this work to more quickly and efficiently. Besides that, it also can reduce the time and energy that is used to paint the side road curbs.

Table 1.1: Gantt chart (PSM 1)

Item	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19
Find the project title																			
Observe problem																			
Introduction (Chapter 1)																			
Problem Statement																			
Objective																			
Scope																			
Expected Outcomes																			
Literature Review (Chapter 2)																			
Searching the past journal																			
Finding																			
Methodology (Chapter 3)																			
Introduction																			
Flowchart																			
Preparing Report																			
Submit the report to supervisor																			
Preparation the presentation																			
Presentation																			
Preparing the complete report																			
Submit the full report																			

Table 1.2: Gantt chart (PSM 1 and PSM 2)

Project Activities	2010						2011				
	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May
Research and Study on mobile robot											
Research and study on road side curb painting											
Research and Design the mobile robot for road side curb painting											
Research and Design the painting mechanism of mobile robot											
Design the mobile robot											
Design the mobile robot system											
Design the programming for mobile robot											
Design the application for selected painting mechanism											
Analyze the mobile robot design											
Analyze the mobile robot system and programming											
Final analyze of the mobile robot for road side curb painting											
Progress Report											
Project Presentation											
Project Documentation											

CHAPTER 2

LITERATURE REVIEW

2.1 Robotics

Robot is a virtual or mechanical artificial agent. In practice, it is usually an electro-mechanical machine which is guided by computer or electronic programming, and robot also capable to do tasks on its own. Another common characteristic is that by its appearance or movements, a robot often conveys a sense that it has intent or agency of its own. Robot, computer-controlled machine that is programmed to move, manipulates objects, and accomplishes work while interacting with its environment. Robots are able to perform repetitive tasks more quickly, cheaply, and accurately than humans in some cases the men had reached a state of limitation to the some situation. But robotics is the engineering science and technologies of the robot, and their design. Robotics are related to the electronic, mechanism and software.

The term „robot" originates from the Czech word *robota*, meaning "compulsory labor". It was first introduced in January 1921 play R.U.R (Rossum's Universal Robots) in Prague by the Czech novelist and playwright Karel Capek. The word robot has been used since to refer to a machine that performs work to assist people or work that humans find difficult or undesirable.

The term 'robotics' refers to the study and use of robots. The term was coined and first used by the Russian-born American scientist and writer Isaac Asimov. One definition of robotics by Brady (1985) is:

"Robotics is the intelligent connection of perception to action".

From a different perspective, robotics is the discipline, which involves:

a) The design, manufacturing, control, and programming of robots;
b) The use of robots to solve problems;
c) The study of the control processes, sensors, and algorithms used in humans, Animal, and machines; and
d) The application of these control processes and algorithms to the design of robots

A clear distinction must be made between robotics engineering and the science of robotics. Robotics engineering is concerned with the design, construction, and application of robots. While robots are built during the course of scientific research, the goal of robotics science is not the development of machines, but to understand the physical and information processes underlying perception and action. Once basic principles are established, they can be used in the designed of robots.

2.2 Types of Robot

There are several types of robots in the robotics world. Such as mobile robot, service robot, industrial robot, and also telerobot.

2.2.1 Mobile Robot

Mobile robot have a capabilities to move around in their environment and mobile robot are not fixed to one direction location only it also can move in any given environment. Mobile robots are also found in industry, military and security environments. Mobile robot also appears as consumer products, for entertainment or to perform certain tasks like vacuum cleaning. Mobile robot also known as Automated Guided Vehicles or AGV, these are used for transporting material over large sized places like hospitals, container ports, and warehouses, using wires or

markers placed in the floor or lasers or vision to sense the environment that they operate in. An advanced form of the AGV is the SGV or the Self Guided Vehicle, like PatrolBot Gofer, Tug, and Speci-Minder, which can be taught like the autonomously navigate within a space, or do it by being given a map of the area. (Lewis 2006)

Figure 2.1: Khepera mobile robot (robotics.youngester.com/2009/10/...ots.html)

2.2.2 Service Robot

The Japanese people today are at the forefront in the use of robots in their everyday activities. In essence, this category includes only robot that used the facilities outside the industry, although they can be divided into two main types of robots which are a robot which is used for professional jobs and the second is the robot used for personal use. Among the types of robots used for military, then there is a robot used for underwater work, or robots used for cleaning up hazardous waste. Another area where personal use robots are being introduced is in the care for the elderly. In countries where there are increasing numbers of the aged with comparatively fewer numbers of young people to provide them with care, due to low birth rate and increased longevity, such as is the case in Japan and a growing number of Western countries, robots are increasingly thought to be the answer. These robots are being designed to provide physical services such as carrying bedridden elderly people (or

even the handicapped), or washing for them, and doing various other day-to-day tasks.

And then there are robots being designed to provide mental services, such as offering the therapeutic effect of interacting with the often lonely elderly people. (Shuzhi 2009)

Figure 2.2: Service robot (www.getrobo.com/getrobo/toyota_2009)

2.2.3 Industrial Robot

Robots today are being utilized in a wide variety of industrial applications. Any job that involves repetitiveness, accuracy, endurance, speed, and reliability can be done much better by robots, which is why many industrial jobs that used to be done by humans are increasingly being done by robots. Typical applications of robots include welding, painting, assembly, pick and place, packaging and palletizing, product inspection, and testing, all accomplished with high endurance, speed, and precision. For example, for the past 30 years or thereabout robots have progressively taken over the fully automated production lines of the automobile industry, where in a chassis of a vehicle is transported along a conveyor belt and is welded, patch, painted, and assembled by a succession of robot stations. Some of the other industrial jobs robots

are performing are palletizing and packaging goods, dispensing jobs, laboratory applications, and robots that pick miniscule electronic components from trays or strips and accurately place them on printed circuit boards in the electronics industry.

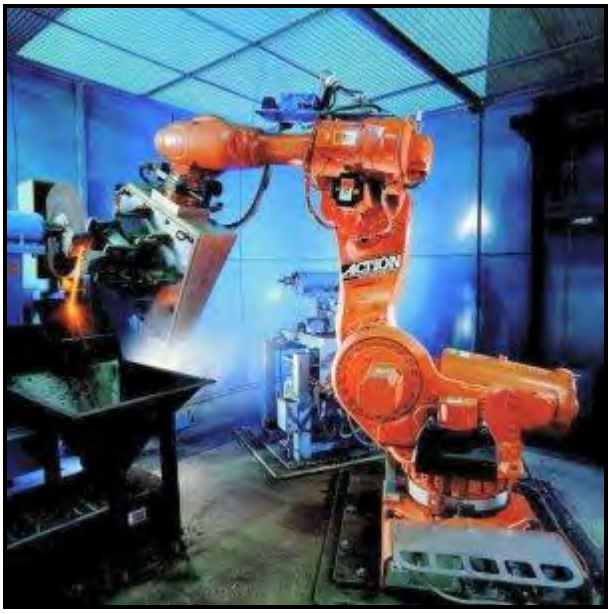

Figure 2.3: Industrial robot (www.teach-ict.com 2007)

2.2.4 Telerobot

Telerobot is used in places that are harmful to humans, which can not be achieved by human beings or far away from humans. A human operator is located at distance providers from telerobot a control action, which is the arm of the spacecraft. One example is the use of these robots is in the medical field, where the robots are used in the field laparoscopic operation. In this laparoscopic is performed with the help of telerobot, or remotely located doctors use robots to communicate with their patients, allowing them to treat patients around the world. This has the potential of patients in remote places of the world, without adequate medical facilities, being able to consult doctors across the world or even in the next town and the doctors also in turn having the ability to monitor them although the doctor was not close to the patient.