

**DESIGN AND DEVELOPMENT A LINE FOLLOWING MOBILE ROBOT FOR
MULTIPURPOSE APPLICATION**

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DEGREE OF BACHELOR OF MECHATRONIC

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“ I hereby declare that I have read through this report entitle “Design and Development a Line Following Mobile Robot for Multipurpose Application” and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Mechatronic)”

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Date :

I declare that this report entitle “*Design and Development a Line Following Mobile Robot for Multipurpose Application*” is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature :

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Date :.....

Special dedication to my beloved father and mom, my entire sibling and my kind hearted supervisor Mr. Mohd Shahrieel Bin Mohd Aras and my dearest friends.

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It is therefore difficult to name all the people who have directly or indirectly helped me in this effort, an idea here and there may have the appeared insignificant at the time but may have appeared insignificant at the time but may have a significant causal effect.

Last but not least, I take this opportunity to dedicate this report for all electrical engineering students. All suggestions for further improvement of this report are welcome and will be gratefully acknowledged. This work is reliant on those mentioned in the references and upon the people mentioned above. Without these giants, this work would be mere supposition and I thank them for the solidity their shoulders have granted me.

ABSTRACT

The project aim was to a built a robot, controlled by a PIC microcontroller to follow a line completely autonomously and able to bring the weight that be specified. The hardware was based on a block structure with infrared sensors at the front of the vehicle. Their analogue signals were transferred to digital logic with a comparator. This information used a PIC 16F877A microcontroller to control the movement and direction of the robot. Output from the controller will tell the motor to run or not. All parts from hardware to software were mounted on a chassis that build from angle iron. Batteries of 12V provided the necessary power supply. The electronic circuit was designed with the computer aided design tool Proteus and executed as a strip line board. The software development started with the flow chart and finally, the software was written in assembler language and implemented on the PIC.

ABSTRAK

Tujuan utama projek ini adalah membina sebuah robot yang di kawal oleh pengawal PIC yang akan mengikut garisan yang ditetapkan dengan sempurna dan mampu membawa berat yang telah ditetapkan. Perkakasan ini terdiri daripada stuktur blok dimana terdapat pengesan inframerah di hadapan kenderaan. Isyarat analog yang di hasilkan dari pengesan akan dihantar ke penukar isyarat dan menukar ke isyarat digital. Segala maklumat dari pengawal PIC16F877A akan digunakan untuk mengawal pergerakan dan arahan untuk robot bergerak ini. Output dari pengawal akan memberitahu motor untuk bergerak atau tidak. Semua bahagian perkakasan dan perisian akan di pasang di atas rangka badan yang diperbuat dari besi. Bateri 12 V akan dibekalkan untuk memberi bekalan kuasa kepada robot ini. Litar elektronik akan di reka menggunakan perisian computer protues dan ia akan dijadikan ke papan litar tercetak. Pembangunan perisian akan dimulakan dengan membina carta alir dan di aplikasikan ke dalam PIC dalam bentuk kod.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The word “robot” or “robota” in Czech language which means forced labor was invented in 1921 by the Czech play write Karel Capek’s. He writing about the futuristic robot calls R.U.R, which turns on their human makers and takes over the world. Nowadays, the world of the robotic grows up fast. Robotics are becoming more and more widely used in the automation, medical, manufacturing industries, also in many science fiction films and many others fields. Robot created by human to help doing works that we want to. . Building and programming a robot is a combination of mechanics, electronics, programming and also problem solving skills. All are based on the microcontroller technology that enables manufacturers to put an entire CPU on one chip. Nowadays, robots are constructed tended to be human-like.

Generally, robots have three main parts known as processor, sensor and motor control system. If robot is replaced by human, sensor is represented eye, controller is represented brain and actuator is represented leg.

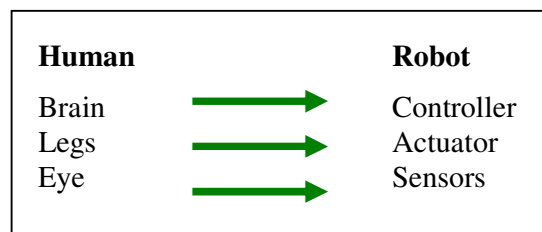


Figure 1.1 : Robot Compare to Human

This project is more about to design and development a line following mobile robot for multipurpose application. It included the mechanism, circuit and programming. After the base robot was built, the robot will undergo test run and than from the test we can collect data and identify the weakness and further improvement. The project goal is to design and build robots that work for multipurpose application that can use in offices and programmer. For example sensor to reach a common goal or target by carry paperwork, file, letter or other things to every desk in the office. For education propose it can be use to

get knowledge's or information's about the robot world. It also can help doing the task for assignment and made technology experiment to improve their understanding about robot technology in the future.

In this chapter brief explanation about flow of this project will be discussed specially. There are the problem statements, objectives, scope of the project and methodology of the project.

1.2 Problem Statement

Robot is device or machine that very important in the world today. Human sometimes cannot do some of works by their own. The created of the robot help human to do these of the work. For example work that will harm the human like at the radiation environment, out of space, underground work and many more. Robot very sensitive and everything in the robot must be perfect to do the task that we want. The problem statement in this project is to build a mobile robot that can overdo the human work like transfer file in the office. Nowadays most of the delivery jobs such as deliver books, documents, letters or other thing such drink are done by human being. This daily routine job actually tedious and can be substitute by mobile robot for multipurpose application especially in the office. At the same time it will reduce employee payment cost, time, and human power. It also will increase the efficiency of delivery job because human normally affected by pressure and problems. So this mobile robot will be the alternative way to solve this problem. The two main components inside the robot are hardware and software.

1.3 Objective Project

The main objectives of this project are to make the design and development a line following mobile robot for multipurpose application with a suitable body and wheel robot. In order to make this project successful, the objectives have been declared these objectives must be achieved in completing this project.

There are another four objectives of this project which are :-

First, to implement programmable software to be cooperating with the PIC. This project using PIC16F877A microcontroller as the controller. This is very commonly controller that use for beginners. It low-cost and easy to understand market available and technical support.

Second is to achieve smooth motion using the sensor and motor combination. To move the robot, dc motor is used so it has power to carry the load. Here, two dc motor used to move left and right, that meant the motor must have good braking, stability and not too much power (*uncontrollable*). The mobile robot must be built with the capability to self navigate from a starting point to an end point and to travel along a dark line using sensors and at smoothly right and left turning.

Third, the good sensor is very important here because it will send signal or data to microcontroller to move the motor accurately. If the sensor cannot send the data on the perfect timing, motor will be lose control and going out of track (*sensitivity*). Besides, the good sensitivity of sensors are need to detect any obstacle in front of mobile robot during run and also the drawer system sensors.

Forth, to build mechanical structure that suitable and can perform efficiently.

1.4 Scope of the Project.

The scope of this project is to build a robot structure that will function properly referring to the objective where the need of the design must be build in good shape to make sure it suitable with the motor and other stuff.

Next, to create a computer program that will process the whole data from input to the output. The program must be declared as the mechanical part is done to make sure the robot will function properly.

Lastly, perform an experiment that is including testing and commissioning the product to make sure the product well function as stated in the objective.

There are many kinds of methods that can be implemented to develop this project. For this project, the scopes can be described as follows:

- i) Design and develop a mobile robot that transfer offices supply like paperwork, file , letter, document or other things such drink that will support maximum weight 30Kg which applied power window motor to this mobile robot as navigator.
- ii) Design and develop the program using the 16F877A microcontroller(PIC).
- iii) Design and develop a mobile robot that t must be built with the capability to self navigate from a starting point to an end point.
- iv) Design and develop a mobile robot to travel along a dark line using sensors and at smoothly right and left turning.

1.5 Layout of Project

Chapter 1: Introduction

This chapter will simply introduce about the project. This chapter contains introduction, objectives, scope of project and problem statement.

Chapter 2: Literature Reviews

This chapter shows about the studies and research that relevant to the project.

Chapter 3: Theory and Background

The theory of the device that has been used will be state out in this chapter

Chapter 4: Research Methodology

This part will show the canvass about the research methodology used in this project.

Chapter 5: Result, Discussion and Analysis

This part will state out the result that be obtained, discussion and analysis of the result.

Chapter 6: Conclusion and Recommendation

This chapter will talk about conclusion and recommendation of the project.

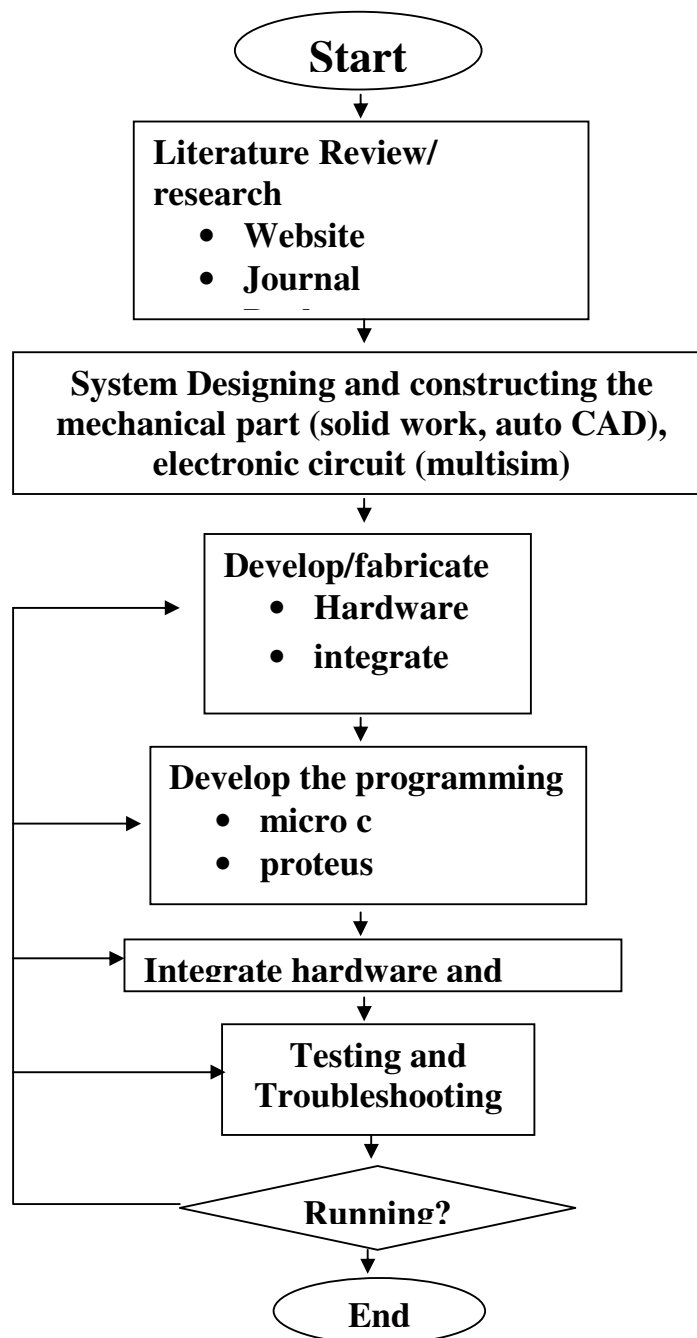


Figure 1.2: Flow chart of methodology

1.6 Summary

In this chapter, the main purpose that needs to be perceived is the general understanding on the objective, problem statement and scope of project that would help the reader to have a better understanding the general idea about the project. Anything related about the project will be explained in the in upcoming chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This section will discuss about the fundamentals, theories and concepts of this project in detail. Beside that, it also explains about the perspective, components and method that will be used in this project. The concept of the robot that will be discussed is more about hardware and software. It also include about the components that will be used to develop this mobile robot. Using the advantages of Personal Computer, the software is developing to give something new or preference idea for this project.

2.2 Study and research of the project

First of all, some research about the robot available today and how it work is been study. All this information is important for the next step that will be taken to proceed this project. Three methods are used in doing a research about this project. It is :-

i. Gain information for related book

Books are the first source to refer to do some research. Books can give an accurate output and the right information when looking at the title. It is not difficult to find a correct title needed. Some of books are equipped with features, graphs and tables that help collaborates about the topic. But books also have it weakness. First, it is difficult to understand some of it sentence or word from book because book is written by someone with a different level of knowledge and background education. The terminology is always advance and sophisticated. It is difficult to fully understand what the authors try to explains, plus with static feature, its hard to understand everything.

Second is difficulty to read with the numbers and long equations, everything in books seems hard to understand. So to depend on books alone is not enough. Other sources should be used.

ii. Search from internet

Now day, world without boundary is very synonym with millennium era. Internet made everything in this world seem very small. Information and data can be transfer so fast. Just a click, any information can be obtained. Anything can be found in internet as long as it knows how to find it. Just to do is searching. Information about robotics technology also can be found easily in internet. In internet, there some of websites are come out with a video or animation to help explaining the related topic. With this features, its help to understand more compare to books. But internet also has it fuzzy side. Some of information in internet is untrue information. It is cannot be used as reference. So, it must be carefully when getting the information to ensure that information is true.

iii. Discuss with expertise

Discussion with expertise about the topic is the best way to gain information about the robot. It can be done early before we refer to other source but it always the best ways if we meet to expertise after we refer to other source. With this step we know that expertise would explain what topic we need more understand and which topics are not related with the project. Expertise also can help to overcome the problem of understanding books and compromise any information from internet. In university, expertise is a lecturer, teaching engineer, tutor and technician that expert related with the project field for examples to understand of robotic system.

2.3 Fundamental of Line Following Mobile Robot For Multipurpose Application

Mobile robots have the capability to move around in their environment and are not fixed to one physical location. Mobile robots are the focus of a great deal of current