MOBILE ROBOT IN OFFICE

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This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Industrial Electronics) With Honours

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

May 2008

UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : .....MOBILE ROBOT IN OFFICE.....

Sesi Pengajian : .....2007/2008.....

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Special dedication to my beloved father and mom, my entire sibling and my kind hearted supervisor Mr. Zulhairi bin Othman, and my dearest friends.

ACKNOWLEDGEMENTS

I would like to extend my sincere gratitude to my supervisor, Mr. Zulhairi b Othman, for her assistance and guidance toward the progress of this thesis project. Through the year, Mr. Zulhairi b Othman has been patiently monitoring my progress and guided me in the right direction and offering encouragement. Obviously the progress I had now will be uncertain without her assistance. Likewise, I would like to En. Muhammad Faizal b Mahmod for his assistance in PIC programming and make this project possible. Thank you for giving an advice to finish my project. My special appreciation and thank to my friend Noremy and Azzad for their invaluable assistances towards this thesis project. I also would like to thank to my family especially to my parents and my girlfriend, without their support and understanding this would not have been possible.

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 16F84A 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 PIC16F84A 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 elektonik akan di reka mengunakan 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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LIST OF ABBREVIATIONS

PCB	Printed Circuit Board
UV	Ultra Violet
PIC	Programmable Interrupt Controller
DC	Direct Current
IR	Infra Red
LCD	Liquid Crystal Displays
LED	Light Emitting Diode
MIG	Metal inert gas
ASM	Assembly
HEX	Hexadecimal
I/O	Input and Output
ADC	Analog Digital Converter

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CHAPTER I

INTRODUCTION

1.1 PROJECT BACKGROUND

Robotics are becoming more and more widely used in the automation, medical, manufacturing industries, also in many science fiction films and many others fields. Building and programming a robot is a combination of mechanics, electronics, programming and also problem solving skills. Nowadays, robots are constructed tended to be human-like.

This project targeted to complete in 6 months timeline. The ultimate goal is to ensure the mobile robot capable to navigate along the following line and successfully stop besides the table that been set for awhile. Beside this, this mobile robot is also programmed that to go around a constant square path, delivering item from one location to another. A reset button is installed to perform this mobile robot going after an item has been putted on to the tray.

The micro controller chosen for this project is PIC micro controller from Microchip, Inc Company. There are total two sensors installed to sense the dark line and ensure the mobile robot always moving in centre axis and always in forward direction. These sensors also manufactured by Ramco, Inc Company. The motor chosen is power window from second hand part dealer, and total of these two motors was constructed to materialize the motion the mechanism.

1.2 SCOPES OF WORK

This project is divided into four parts:

- Designed the hardware for this mobile robot that will support maximum weight 3Kg.
- Find the microcontroller type which market available and technical supports that mean it (well supported).
- Using the best locomotive for this mobile robot to move smoothly and stable
- Find the best navigator that will give accurate signal for locomotive to following the line.

1.3 PROBLEM STATEMENTS

The problem statement in this project is to build a mobile robot that can overdo the human work like transfer file in the office. The mobile robot will only used photoelectric sensors to detect the following line as a sensing media before giving a response to microcontroller (PIC) and ON the dc motor to move.

1.4 PROJECT OBJECTIVES

Due to the problem statement stated above, it's cleared that the objectives of the project is:

- To completed the project within the required timeline.
- The mobile robot must be built with the capability to self navigate from a starting point to an end point.
- To travel along a dark line using sensors and at smoothly right and left turning.
- To applied power window motor to this mobile robot as navigator so it has power to carry the load with maximum 3 kg.

1.5 PROJECT METHODOLOGY

Phase1:-

Every week, meet and discuss with supervisor Mr zulhairi bin othman and show the project progress. Get the more information about mobile robot from supervisor, internet, books, journal, thesis, and so on. Firstly, try to understand the concept & desired result for this mobile robot. After that, get the datasheet of component involved (motor, sensor, & controller).

Phase2:-

For this phase, do surveys to the entire previous mobile robot project for find the best method and rapprochement to this mobile robot. Do literature survey from journal and internet.

Phase3:-

For this phase, find the primary component involved in the mobile robot and design the interface circuit for software part between hardware parts using Multisim 2004 software. Do 3D mechanical drawing for this mobile robot using AutoCAD software.

Phase4:-

For this phase, the software part with hardware part will combine to get the final result. After that, test the functional, ability & weakness of this mobile robot. If have some error at the hardware and software part, troubleshoot will be done to the circuit & redesign the circuit if needed to get better result. Finally, submit the thesis of this mobile robot.

1.6 REPORT STRUCTURE

This thesis is organized in 7 chapters. The first chapter gives the brief introduction of self-directed mobile robot. The objectives and project scope of the project is also explained in this chapter.

Chapter 2 : Covers the introduction review

Chapter 3 : Covers the literature review

Chapter 4 : Covers design methodology

Chapter 5 : Cover the result for the project that consists of maze specification and expected result

Chapter 6 : Discussion

Chapter 7 : Conclusion and Recommendation

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Literature Review is important in each project as a base for gathering information necessary to complete the project. All information is gathered from various sources such as:-

1. Journal
2. Books
3. Conference Transcript
4. Thesis
5. Patent
6. Website

After searching through all this various material, all information will be filtered to be related to mobile robot. All this information will be compiled to be included in the report.

2.2 Classifications for mobile robot

A robot can be seen as a machine with three characteristic such as input consist of navigator or sensor, the intelligence or brain of the robot which normally is

a central processing unit or control unit and locomotion mechanisms to enable it to move through its environment. A mobile robot may be classified by the environment in which they travel such as land, home, industry, air, and underwater. It usually used wheel and they also include legged with two or more or resembling animals or insect.[3]

2.3 Mobile Robot Navigation

There are many types of mobile robot navigation. The navigation here is the process of directing the mobile robot to a destination. It can be defined as *"The process of determining and maintaining a course or trajectory to a goal location" (Franz, Mallot, 2000).* [2] From the previous project that similar to my project they have using several methods to move the mobile robot. Roland Y.Siegwart in her/his press [3] states the several methods such as below.

2.3.1 Manual Remote

A manually remote robot is totally under control of a driver with a joystick or other control device. Figure 2.1 shows the Rob Pet that has in internet. The device may be plugged directly into the robot, may be a wireless joystick, or may be an accessory to a wireless computer or other controller. This type is typically used to keep the operator out of danger. This method used radio frequency (RF) to control the mobile robot

Figure 2.1:- Manually remote robot

2.3.2 Line-following Robot

Some of the earliest Automated Guided Vehicles (AGVs) were line following mobile robots. They might follow a visual line painted or embedded in the floor or ceiling or an electrical wire in the floor. Most of these robots operated a simple "keep the line in the center sensor" algorithm. Figure 2.2 show the sample of line following robot. They could not circumnavigate obstacles. They just go through when something blocked their path.

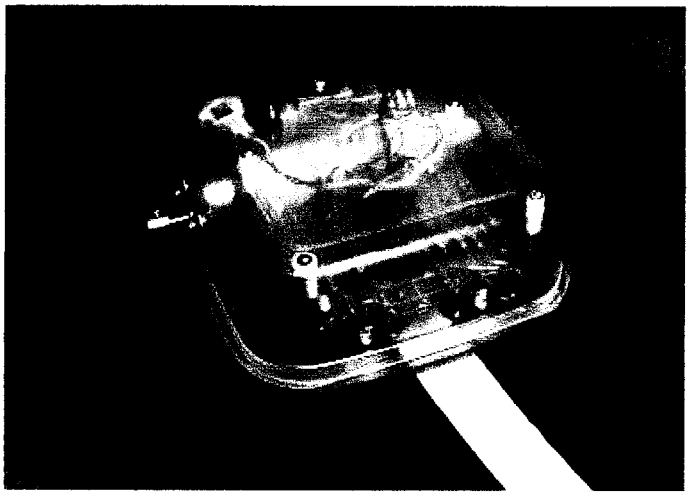

Figure 2.2:- sample line following robot

Sensing a line and maneuvering the robot to stay on course, while constantly correcting wrong moves using feedback mechanism forms a simple yet effective closed loop system. As a programmer I get an opportunity to 'teach' the robot how to follow the line thus giving it a human-like property of responding to stimuli.

2.3.3 Autonomously Randomized Robot

Autonomous robots with random motion basically bounce off walls, whether those walls are sensed with physical bumpers like the Roomba(vacuum cleaners)like figure 2.3 or with electronic sensors like the Friendly Robotics lawn mower(grass