DESIGN A MULTI-DETECT SURFACE ALGORITHM FOR HOME VACUUM APPLICATION

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"I hereby declared that I have read through this report and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Electronic & Drive)"

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Date : 7/5/08

"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

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Date : 7 / 05 / 2008

For my beloved father and mother
Kamilan Bin Supian and Norlia Binti Mahzan
For all supported and understanding.

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بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

In the name of Allah, The Beneficent, The Merciful.

Alhamdulillah, all praise is to Allah that I have been able to complete my report for my "Projek Sarjana Muda 2" that is design of multi-detect surface algorithm for home vacuum application.

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Finally, I would like to honor my lovely parent, for supporting me steadfastly and their appreciated advice through my project completion.

Thank you to all of you.

ABSTRACT

The main objective of this project is to design and develop a multi-detect surface algorithm for home vacuum application. In this paper, vacuum controller, (advance controller for multi detect surface) will be explained and studied. Advance controller describes the discipline where control method are developed that attempt to emulate important characteristics of human intelligence. These characteristics include adaptation and learning, planning under large uncertainty and copying with large amount of data. This project concerned about the vacuum controller motor speed that installed an advance controller. The sensor will detect the surface of the variety floor and give the signal to the controller for determine the speed of the motor. The key point of this project is that this controller can function and could interface with sensor, and finally its own actuator that is rotation of the motor. For this project used PIC 16F873A, sensor and other components. This project is focusing on the automatics function system and control system that bases on a PIC 16F873A microcontroller. The usage of the vacuum controller motor speed is to present such items as the user's real environment. It can make our job easier and simple to use.

ABSTRAK

Tujuan utama projek ini adalah untuk mencipta dan memajukan satu alat yang boleh mengesan atau membezakan pelbagai jenis permukaan dan seterusnya diaplikasikan pengunaannya dalam vakum di rumah. Oleh itu, dalam laporan ini pengawal vakum "vacuum controller for-multi detect surface" akan diterangkan. "Advance controller" merupakan satu displin dimana satu kawalan dimajukan dan ianya diadaptasikan atau dicontohi dari kepintaran manusia. Ciri- ciri ini ternasuklah adaptasi dan pembelajaran, merancang sesuatu yang tidak ditentukan dan menyalin serta membaca pelbagai data. Justeru itu, projek ini adalah mencipta sejenis vakum yang boleh mengawal kelajuan motor untuk menyedut sampah mengikut jenis permukaan yang dikesan oleh "sensor" dan ianya diadaptasikan dari "advance controller" teori. Kunci utama untuk menghasilkan alat ini adalah, alat pengawal yang boleh membaca dan menghantar isyarat dari "sensor"dan seterusnya motor pada vakum berputar mengikut arahan yang diberi oleh alat pengawal. Sebagai contoh, untuk permukaan permaidani, vakum memerlukan kelajuan yang tinggi pada motor untuk menyedut sampah dan sebaliknya untuk permukaan lantai licin. Untuk projek ini, PIC 16F873A dan IR sensor digunakan berserta komponen elektronik lain. Keseluruhan dari projek ini boleh diringkaskan ialah aplikasi dari sistem fungsi automatik. Hal ini kerana, kelajuan motor berubah dengan sendiri dan bersesuaian mengikut jenis permukaan yang dikesan. Akhir sekali, penghasilan vakum ini amatlah praktikal dan sesuai digunakan dalam kehidupan sebenar kerana ia adalah satu alat yang mudah digunakan dan menyenangkan kerja.

TABLE OF CONTENTS

LIST OF FIGURE

LIST OF TABLE

CHAPTER 1.0

INTRODUCTION

Advance controller describes where control method are developed that attempt to emulate of human intelligence. Advances in sensors, actuators, computation technology and communication networks help provide the necessary for implementation this control hardware.

Advance control methodologies are being applied to robotics and automation, communications, manufacturing, traffic control, to mention but a few application areas. Neural networks, fuzzy control, genetic algorithms, planning systems, expert systems, and hybrid systems are all areas where related work is taking place.

For this project, the design of multi- detect surface algorithm for home vacuum application will be build to implement the advance controller. This project are bases on used PIC 16F873A, LM358 and infrared sensor as a main component for hardware development.

The success of vacuum controller for multi detect surface operation will be used or implement for home vacuum application. This vacuum controller with automatic function is mainly to make human job more easily and convenient.

1.1 Problem Statement

Nowadays, there are many type of vacuum, but not many vacuums that have an advance or intelligent function. So, vacuum controller for multi detect surface is build. This vacuum controller is easy to use with an automatic function to make our work more convenient in a life day.

Otherwise, this vacuum is also low cost designing with low power uses. So, this vacuum construction is highly practical to develop for human uses.

For this vacuum controller motor speed, it is difficult to design and upgrade from the type of vacuum that have a basic function. Besides, the controller is hard to design and have difficult construction.

1.2 Project Objectives

The following objective will be based on PIC 16F873A programming:

1. To design and develop an intelligent controller of the basic type of vacuum.

2. To make the controller can function and could interface with sensor.

3. To develop a system that can control the speed of the rotation motor.

4. To develop a system that has an automatic mode and function controlling.

5. To build and upgrade the function of the basic vacuum that already has.

1.3 Scope of project

The project final results;

The vacuum controller will be able to control the speed of motor follow suit the surface of the floor. Based on the PIC 16F873A microcontroller as the heart of the system.

Approach used in this project;

- To control the speed of motor in vacuum, firstly, the sensor will detect the variety of surface on floor. The sensors that will be used are transmitter and receiver IR sensor. This sensor emits infrared radiation or signal. Then send or transmit the signal to the controller that is PIC 16F873A.

- The controller will function and the systems will immediately response to determine the applicable speed of motor.

- Finally, the speed of rotation motor follow suits the type of surface floor to suck the rubbish.

The project involved;

#Hardware;

The hardware development consists of the design, redesigns, testing and troubleshoots all the circuit involved. It contains of infrared sensor and PIC controller as a control element. Proteus Professional 6 has been used for all design of the circuit.

#Software;

The software part will base on the simulations for all the system parts and the program development used MikroC program. This program is important because it give the instruction all the journey of the hardware.

#Firmware;

This project consists of hardware development & software application and improvement for the existing system. The complete design and development hardware and software will combine to make vacuum controller for multi-detect surface. This combination as the final test for the firmware and to ensure this project is successful follow the planning.

CHAPTER 2.0

LITERATURE REVIEW

2.1 Introduction

This chapter includes the study of hardware and software development. There are two aspects in process to be proceeding while doing this project that are software part and electrical part. For the electrical part, contain part on programmer for microcontroller PIC16F873A, LM358, IRF 530N control circuit and sensor. For software part, the MikroC programming C and the Proteus Professional will be used to simulate the circuit.

2.2 Microcontroller

All microcomputer systems, irrespective of their complexity, are based on similar building blocks. A microcontroller (or MCU) is a computer-on-a-chip used to control electronic devices.

These are shown in Figure 1 and consist of the following:

- CPU - the part that does all logic and arithmetic functions
- RAM - storage for programs and/or program variables
- ROM - read-only parts of programs
- I/O - connection to external devices

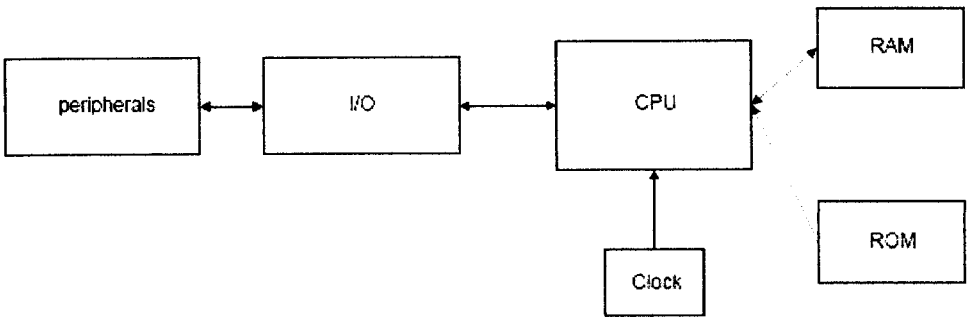

Figure 2.1: Basic Building Blocks of a Computer

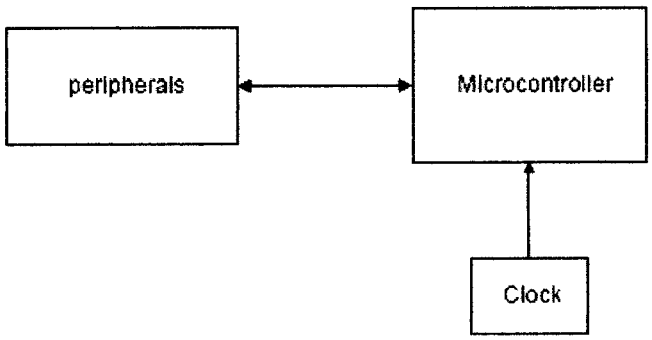

Figure 2.2: A Microcontroller Based System

Most microcontrollers contain circuitry to generate the system clock. This square wave is the heart beat of the microcontroller and all operations are synchronized to it. Obviously, it controls the speed at which the microcontroller functions. All that needed to complete the clock circuit would be the crystal or RC components. We can, therefore precisely select the operating speed critical to many applications.

To summarize, a microcontroller contains (in one chip) two or more of the following elements in order of importance:

i. Instruction set
ii. RAM
iii. ROM, PROM or EPROM
iv. I/O ports
v. Clock generator
vi. Reset function
vii. Watchdog timer
viii. Serial port
ix. Interrupts
x. Timers
xi. Analog-to-digital converters
xii. Digital-to-analog converters

The CPU or microprocessor is the core component of any microcomputer and it requires the external components such as the ROM, RAM, I/O to accomplish its purpose. The difference between the microprocessor and the microcontroller arises because of their different end-usage. The microcontroller that will be investigated is the PIC16F873A.

2.3 PIC 16F873A

Basically, we are using programmable IC (PIC) microcontroller to design of such circuit easier since it allows the programming of specific behaviors in software. PIC microcontrollers are among the cheapest possible microcontrollers, they are considered relatively low-level microcontrollers and low power consumption which need some external parts to function.

The PIC 16F873A (Programmable Interface Controller) devices are available only in 28-pin packages. The PIC 16F873A have one-half of the total on-chip memory of the PIC 16F876A and PIC 16F877A. This 28 pin devices have three I/O ports, five channels of A/D converter input channels, fourteen interrupts, PWM

output, capture and compare registers, power on reset, watchdog timer, power saving sleep mode, brown-out detection circuitry, in-circuit programming support, USART, and timers.

28-Pin PDIP, SOIC, SSOP

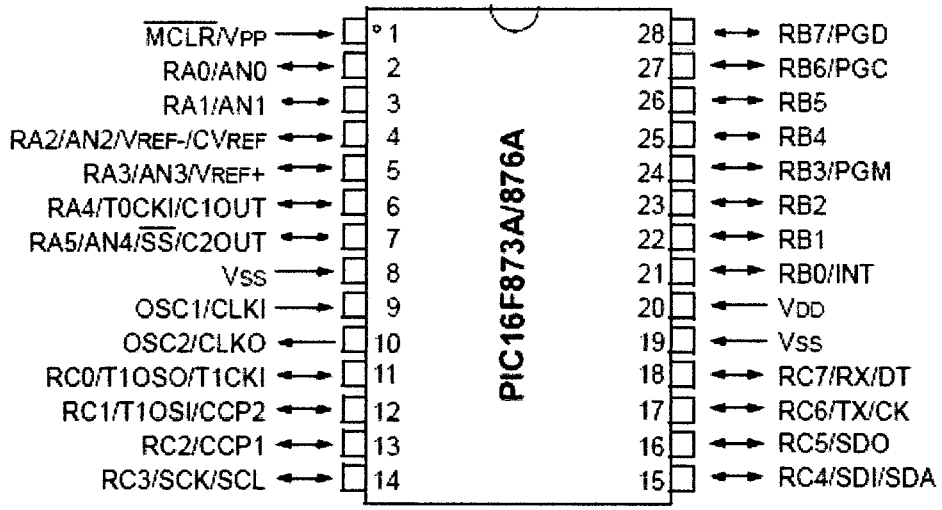

Figure 2.3: PIC 16F873A. [8]

The microcontroller acts like the brain of the control system. Microcontroller chip that has been selected for the purpose of controlling the speed of DC motor is PIC 16F873A manufactured by Microchip. A typical microcontroller contains all the memory and interfaces needed for a simple application, whereas a general purpose microprocessor requires additional chips to provide these functions.

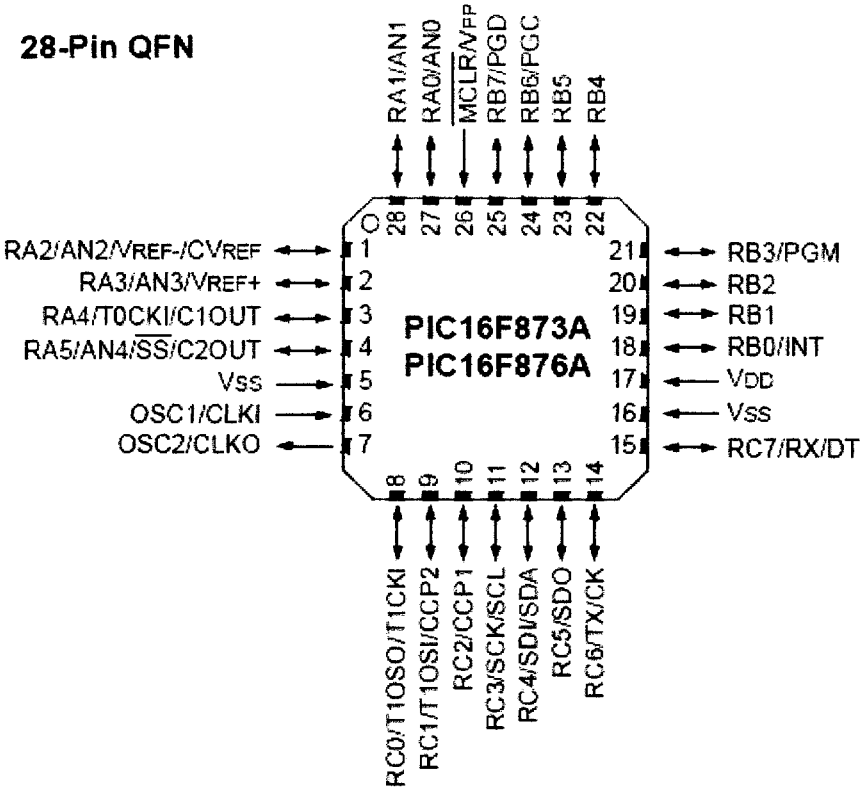

Figure 2.4: The Pin Diagram of PIC 16F873A. [8]

This chip is selected based on several reasons:

- Its size is small and equipped with sufficient output ports without having to use a decoder or multiplexer.
- Its portability and low current consumption.
- It has PWM inside the chip itself which allow us to vary the duty cycle of DC motor drive.
- It is a very simple but powerful microcontroller. Users would only need to learn 35 single word instructions in order to program the chip.
- It can be programmed and reprogrammed easily (up to 10,000,000 cycles) using the universal programmer in robotics lab.