VOICE RECOGNITION MOTOR CONTROL SYSTEM

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Dedicated to my beloved family especially my mother and father

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ABSTRACT

Voice recognition motor control system is a system where the operation of an electrical motor such as a dc motor is controlled and monitored by using voice command. This system is used in a motorized wheelchair movement control system. The user is able to move the wheelchair by using this voice recognition motor control system. This voice recognition system is capable of receiving voice input signal and converting it into data which control the dc motor movements which is the direction of rotation. Voice Recognition Motor Control System is developed to help the people with disabilities especially those having difficulties using their hands. PIC is used in this system not only because it is cheap but also is easy to program using C programming language. Besides that, this program will control the DC motor movements by using voice command from voice recognition kit SR-06. By using this product, disabled person are able to move around independently and able to enjoy better life significantly. It will make our daily life easier and very useful for unhealthy person to control the motor directions.

ABSTRAK

Sistem kawalan motor menggunakan pengecaman suara adalah satu sistem yang mengawal operasi motor elektrik menggunakan arahan suara. Contoh motor yang digunakan adalah DC motor. Pengguna boleh menggerakkan kerusi roda menggunakan kawalan sistem ini. Sistem pengecaman suara ini, berupaya menerima isyarat masukan suara dan menukarkannya dalam bentuk data yang boleh mengawal pergerakan DC motor iaitu arah haluan motor. Sistem ini, dibangunkan untuk membantu orang kurang upaya yang manggunakan kerusi roda untuk bergerak atau melakukan kerja harian. Keutamaan sistem ini adalah untuk pengguna yang tidak dapat menggunakan tangan. Penggunaan perisian PIC adalah lebih baik untuk sistem ini kerana bahasa untuk perisian ini adalah terhad dan mudah difahami. Oleh sebab itu, pengguna akan lebih mudah untuk memahami arahan yang perlu diberikan. Selain itu, sistem ini menggunakan 'kit SR-06' untuk litar pengakuan suara. Litar ini beroperasi secara sendiri, dimana ia tidak memerlukan komputer untuk bersambung dengan alat lain bagi melaksanakan arahan yang diberi. Sistem ini adalah berkaitan dengan teknologi terkini. Tambahan pula aplikasi untuk sistem ini digunakan secara meluas. Dengan adanya projek ini, diharap urusan harian akan menjadi lebih mudah terutama kepada orang kurang upaya.

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CHAPTER 1

INTRODUCTION OF PROJECT

1.1   Introduction

Nowadays, there are many kinds of motorized wheelchair available in the market, for instance wheelchair that utilizes the analogue joysticks, touch activated switches and LCD, sip and puff switches, chin-controlled switches, head-controlled switches, tongue-touch pad switches, eye gazed switches, predetermined lines and routes, and two points autonomous navigation that uses LRF technology. Voice or speech recognition is the ability of a machine or program to receive and interpret dictation, or to understand and carry out spoken commands. Voice Recognition Motor Control System is a system where the operations of an electrical motor such as a dc motor is controlled and monitored by using a voice command. This system is useful to control the system of motorized wheelchair movement. The system is designed to run on a DC electric motor. Furthermore, these systems uses PIC programming to program the voice command. The system has the ability to control the directions of motor. PIC refers to 'Programmable Interface Controller'. Voice recognition is the ability of the program to receive and interpret dictation or to understand and carry out spoken command into motor control. This voice recognition system is capable to move the wheelchair according to preset voice instructions.

1.2   Objectives

The objectives of this project:

- To combine PIC Programming (software) with DC motor (hardware). The type of PIC used in this circuit is PIC16F84A. This microcontroller has 18 pin, two input /output port that is port A and port B, oscillator and 68bytes memory.

- To convert receiving voice input signal into data which control the dc motor movements by using PIC programming.

- To control the DC motor movements by using voice command using voice recognition kit SR-06. This circuit will operate in the stand-alone manual mode. The voice recognition circuit doesn't require a host computer and may be integrated into other devices to add voice control.

- To simplify the operations of the motorized wheelchair as to make it easier and simpler for the disabled person to operate. With this simplified operation, many disabled people have a chance to use the system with out too much effort.

- Finally, to fulfill the objectives, it is necessary to learn and understand how to use Programming Language. The coding and command of such software need to be learned and familiarized. The programming involves is PIC 16F84A microcontroller.

1.3   Problem Statement

A clinical survey indicates that 9-10% of severely disabled patients having difficulties or impossible in using powered wheelchair in spite of having some training in handling and operating it [11]. This indicates that they are lacked of motor skill and strength and difficult to operate a sophisticated wheelchair functions. With the presence of simple and easy motorized wheelchair control system, they are able to operate the wheelchair without having to go through hard time learning how to use a wheelchair. This has a big significant impact in their life.

1.4   Scope

The first scope for this project is to control the motor movement using the voice command. This system is capable of receiving voice input signal and converting it into data which control the dc motor movements such as the directions of the rotations.

The basic voice activated functions of the wheelchair control system includes forward and backward directions movements, left and right turns, wheelchair stop function, as well as collision avoidance function. The functions and the corresponding digital command words are pre-stored in the voice recognition memory locations.

This project used PIC microcontroller to program the voice command. PIC is an apparatus that can be reprogrammed if the mistake is happen or to improve the system.

In any electric motor, operation is based on simple electromagnetism. The internal configuration of a DC motor is designed to control the magnetic interaction between a current carrying conductor and an external magnetic field to generate rotational motion.
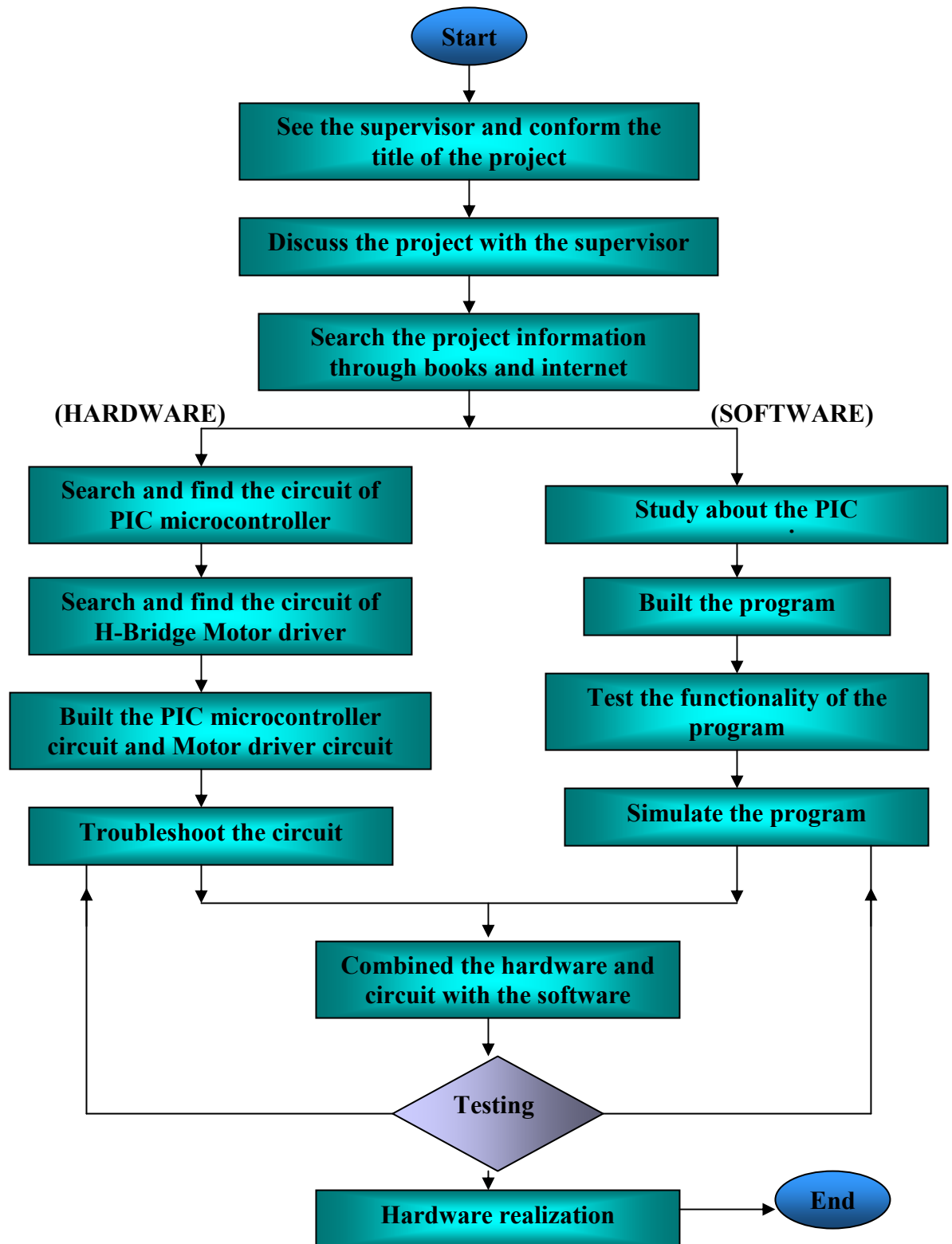
1.5   Methodology

Figure 1.1: Project Methodology

1.6   Report Structure

The first chapter of this report is about the introduction of the report. It includes explanation about objectives, problem statement, scope and the methodology of the project.

The second chapter is about literature review of the project. This project discusses the concept of the research and how it related with the theory.

Chapter three is explained the methodology and process that taken to complete the project. It consist the detail development of this project.

Chapter four is about the result that we obtained based on the methodology. The result will be analyzed and compared to the objectives and problem statement.

Chapter five is about the discussion and summary of project achievement. It also includes the conclusion and recommendation that can be taken for future improvement of the project.

CHAPTER II

LITERATURE REVIEW

This chapter is discusses about previous research in wheelchair development related on the project. There are five projects which included wheelchair controlled using a tongue, wheelchair controlled using Automatic Vehicle Guided (AVG), Smart Wheelchair Component System (SWCS), navChair Assistive Wheelchair Navigation System and designed a DC Motor Speed Controller by using PIC Microcontroller.

2.1   Wheelchair controlled using a tongue

Researches in the area of wheelchair control system are still going on. For example, wheelchair controlled by tongue. It is especially design for the tetraplegics and this is meant to be used by disabled person who only could move the parts of body above the neck. It utilizes the in-mouth position sensor to control the movements. Another example are, a Semi-Autonomous Wheelchair Mobility System (SAWMS) which uses visual tracking technology that utilizes color camera, sonar, infra-red sensors, contact sensors and a PDA based interface which uses for wireless communication.

2.2   Wheelchair using Automatic Vehicle Guided (AVG)

Mohamed Fezari *et. al.* [11] used and implemented a direct voice command wheelchair control system in their design for disabled person. They used a speech recognition kit which previously had been implemented in the control of Automatic Vehicle Guided (AVG) and they used a voice recognition kit 'Voice Direct 364' (VD364) manufactured by Sensory Incorporated, USA. In their design microphone is directly connected by using wires to the input of the voice processor module.

2.3   Smart Wheelchair Component System (SWCS)

Richard Simpson, *et. al.* developed prototype of Smart Wheelchair Component System (SWCS) to a added to be commercial wheelchair with minimal modifications. They adopted technology from mobile robots to create "smart wheelchair'. Their prototype can provide navigation assistance on wheelchair using two different input methods which are analog joystick and switch joystick. The Smart Wheelchair Component System is used as a component to be added to variety of commercial power wheelchairs with minimal modifications. It is compatible with multiple brands of wheelchair.

2.4   NavChair Assistive Wheelchair Navigation System

They also developed a NavChair Assistive Wheelchair Navigation System to reduce the cognitive and physical requirements of operating a powered wheelchair. It is developed to provide mobility to those individuals who would otherwise find it difficult or impossible to use a power wheelchair due to cognitive. It is an adaptive shared control system, in which divided between the wheelchair and the wheelchair operator and adaptive in how control is divided between the wheelchair and the wheelchair operator varies based on current task requirements. They used voice control to steer the NavChair through a navigation task requiring several transitions between operating modes. It could reduce the motor and cognitive effort of operating a power wheelchair by sharing vehicle control decisions regarding obstacle avoidance, safe object approach, maintenance of a straight path, and much more. The system consists of (1) IBM-compatible 33MHz 80486-based computer, (2) array of 12 sonar sensors mounted on the front of a standard wheelchair lap tray, and (3) interface module which provide the necessary interface circuits for the system.

2.5   DC Motor Speed Controller by using PIC Microcontroller

Hazli Rafis Bin Abdul Rahim designed a DC motor speed controller to control the rotational speed of the motor which is varied when the load is changed. The rotational speed of the motor will not change even when the load is changed. By using the PIC, a computer program is developed to control the motor's speed. Based on the project analysis, rotational speed of the motor can be controlled by using pulse width modulation (PWM) through duty cycle of the wave.

Most of the system apparently has various functions which assumed to be difficult to operate by the disable people. So, to make the simpler system and easier to operate by the disabled persons, this project develops and simplifies the wheelchair control system by using a voice command system which uses short commands to move the wheelchair.