VOICE RECOGNITION HOME APPLIANCES CONTROL SYSTEM

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Saya SHATINI BINTI MD SAID

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DEDICATION

Dedicated to my beloved friends and family
And everything is possible with you by my side my love

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ABSTRACT

In the era of information technology, human tend to develop better and more convenient lifestyle. Most of the controlling mechanisms of daily appliances are at our fingertips. This project innovates the controlling of home appliance by using voice command that controls the overall operations and functions. The system's function includes turning off and on through a simple voice command. This system is hands-free products which allow users to speak then turn their voice command into digital form using voice recognition technology. The most important part is that the system will not interfere other appliances and still work properly depending on their own recognition commands. The PIC microcontroller is used to manage and control the needed operation based on the output digital signal of the voice recognition module. Through this system, the project is capable to control the home appliance operation by using voice command. Moreover, this project enhance the capability of the existing remote control and help the users to lead a more comfortable and easy life especially to the handicapped person.

ABSTRAK

Dalam era teknologi maklumat masa kini, manusia lebih cenderung untuk membentuk cara hidup yang lebih mudah dan teratur. Kebanyakan peralatan yang digunakan dalam kehidupan seharian dikawal menggunakan hujung jari. Projek ini memperkenalkan sistem kawalan peralatan rumah dengan menggunakan arahan suara untuk mengawal keseluruhan operasi dan fungsi peralatan. Sistem ini termasuk memati dan menghidupkan peralatan melalui arahan mudah suara. Sistem ini tidak menggunakan tangan tetapi hanya membenarkan pengguna bercakap dan menukarkan bahasa yang digunakan (analog) kepada digital dengan menggunakan teknologi pengecaman suara. Sistem ini tidak akan mempengaruhi operasi peralatan lain dan berfungsi dengan lancar bergantung kepada arahan suara yang ditetapkan. Pengawal mikro *PIC* digunakan untuk mengawal operasi yang dikehendaki merujuk kepada signal keluaran digital pada modul pengecaman suara. Melalui sistem ini, projek ini berupaya mengawal operasi peralatan rumah menggunakan arahan suara. Lebih dari itu, projek ini dapat meningkatkan keupayaan sistem kawalan jauhyang sedia ada bagi membolehkan pengguna terutama golongan kurang upaya dalam menjalani kehidupan yang lebih mudah dan selesa.

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PIC	-	Programmable Integrated Circuit
PCB	-	Printed Circuit Board
UV	-	Ultraviolet
ALS	-	Amyotrophic Lateral Sclerosis
ASIC	-	Application Specific Integrated Circuit
PAL	-	Programmable Array Logic
BASIC	-	Beginner's All-purpose Symbolic Instruction Code
RAM	-	Random Access Memory
CMOS	-	Complementary Metal–Oxide–Semiconductor
ADC	-	Analog to Digital Converter
BJT	-	Bipolar Junction Transistor
LCD	-	Liquid Crystal Display
IDE	-	Integrated Development Environment
LED	-	Light-Emitting Diode
NO	-	Normally Open
NC	-	Normally Close

LIST OF APPENDIX

CHAPTER I

PROJECT OVERVIEW

1.1 Project Overview

Voice recognition system is widely used to improve operation of appliances. However this system is rarely applied to home appliances. Normally, the home appliances use remote control unit to control the overall operations. This project shows one of the control systems using voice command to operate the appliances.

Voice Recognition Home Appliances Control System is a system that provides voice command applications that control the overall operations and functions of the home appliances such as radio, television, fan and others. The system function includes turning off and on through the simple voice command. This system is a hands-free product which allows the user to speak and transform their word into digital form using voice recognition technology.

Voice Recognition Home Appliances Control System is a simple system to use and is easy to operate. It is very convenient to use voice command to operate the home appliances compared to the conventional system. That means the system will also help the disable to use and operate appliance easily.

In this project the PIC microcontroller used to manage and control the system operation based on the digital signal data from of the voice recognition module. The most important part is that the system will not interfere other appliances and work properly depending on their own recognition commands. In this project, a fan is used as a model of home appliance. C programming language has been chosen as the programming language.

1.2 Project Objective

In order for the project to be successfully implemented, the following objectives have to be achieved:-

- To learn and practice technical skills to overcome problems occurred in implementing the project.
- To design the program code using C language as a program interface between speech recognition module and home appliances.
- To build home appliances control module and interface it with the speech recognition board and a microphone unit.
- To simplify the operations of the home appliances to make it easier and simpler for the disabled to operate. With this simplified operation, the disabled may conveniently have a chance to use the system.

1.3 Problem Statement

Nowadays, voice recognition system is widely used to improve the operation of appliances. However this system is rarely applied to home appliances. Normally, the home appliances use remote control unit to control the overall operations. There is no problem using the current system. But the problem is faced by the handicapped user in order to operate the home appliances. In this project, the appliances will be operated by

using voice command. Through this system, it is possible for the disabled to use and operate an appliance easily.

1.4 Scope Of Work

To achieve the project objectives there are certain scope that must be done. The scope can be divided into several parts. The scopes are:-

1) To design and develop a home appliances control system by using a voice command.
2) The hardware of the project will be designed and fabricated.
3) The software used in this project is the C programming language for PIC to interface between voice recognition circuits and the appliance.
4) The fan is used for the testing purpose until the system reaches the right operation.
5) Finally to complete the project, circuit layout will be fabricated on PCB and printed using proteus software.

1.5 Methodology

There are several steps used to complete this project. These steps are divided into 9 phases. Each phase is explained in the point form below:

Phase 1:-

The first stage is the starting activity before proceeding with the project chosen. The project that is to be implemented for semester 1 and 2 is discusses and decided with the supervisor was chooses. The project has been chosen is 'Voice Recognition Home Appliances Control System'.

Phase 2:-

After choosing the project, some research that relate to this project scope is done. This research includes the software and hardware development of the system. It also limited to the home appliances control system only.

Phase 3:-

The third phase includes circuit finding and designing. To complete this phase, more research from books and internet is made. After completing the third phase, it is possible to proceed to phase 4.

Phase 4:-

Phase 4 is the software development of the project. PIC-C compiler is used to build the source code. In this phase, the PIC-C compiler is studied before continuing any writing. After that, the coding writing was proceeds depending on the circuit operation and compiling the coding until no error is present.

Phase 5:-

Phase 5 combine the hardware and software design. In this part, simulation is done. The software that used to perform the simulation part is the Proteus Professional. The simulation uses switch as input which represents the speech recognition input.

Phase 6:-

After the simulation, the hardware on the protoboard is built. In this phase the program must be downloaded into the microcontroller. Then the circuit operation had been tested. The circuit needed troubleshooting to make sure the sequence is in order.

Phase 7:-

Next, the circuit needs to be designed. In this phase, Proteus Professional software is used. Then the circuit is printed so that the circuit can be allowed to the etching process on the UV board.

Phase 8:-

After completing the etching process, component and the microcontroller that was burned with programming code was inserted. Then, the circuit was also tested to make sure all components functioned and are not damage.

Phase 9:-

Finally, the circuit was connected to the fan which is an example of the home appliance that was chosen. Then the circuit functionality was tested. After achieving the desired result, the circuit was implemented into casing.

1.6 Thesis Outline

This thesis will be divided into 5 chapters to provide the understanding of the whole project.

Chapter 1 is introduction to the overview of this project and its objectives. It also explains the scopes, problem statement and methodology of the project.

Chapter 2 describe about the literature review on some important sources to start the project and explanation of devices used in the project.

Chapter 3 it will cover up all the project methodology and processes involved to achieve the desired goal. Hardware and software technical details are also explained in this part.

Chapter 4 explains the result of this project and the operation of the circuit. In this chapter the analysis of the project also will be discussed.

Chapter 5 explains the future recommendation for the project for future improvement.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

In this chapter literature studies which are relevant to this project are discussed. Carrying out the literature review is important in providing a broad view on the field of this project. As a result, the objective and scope of project had been identified. This chapter provides the summary of literature reviews on key topics related to the voice recognition control system application.

2.2 Voice Recognition Control System Navigation

There are many types of voice recognition control system navigation. The navigation here is the process of controlling the device to operate using voice command. There are some similar projects that had been done previously. However, different methods are used to operate the home appliances.

2.2.1 Case Study : An Environmental Control System

Adil Awad and Rami Khatatba designed an environmental control system that was used for a residential house. It enables a person to control any house appliance by voice and therefore is especially important for people with limited physical ability. For example this voice activated environment control system was custom designed and delivered to an elderly person who lives alone in a house. She has severe arthritis, is overweight, and has had several open-heart surgeries. [8]

The system has been installed and functioning within two weeks. Initial testing proved this design to be worthwhile. Figure 2.1 shows top view of the entire system. [8]

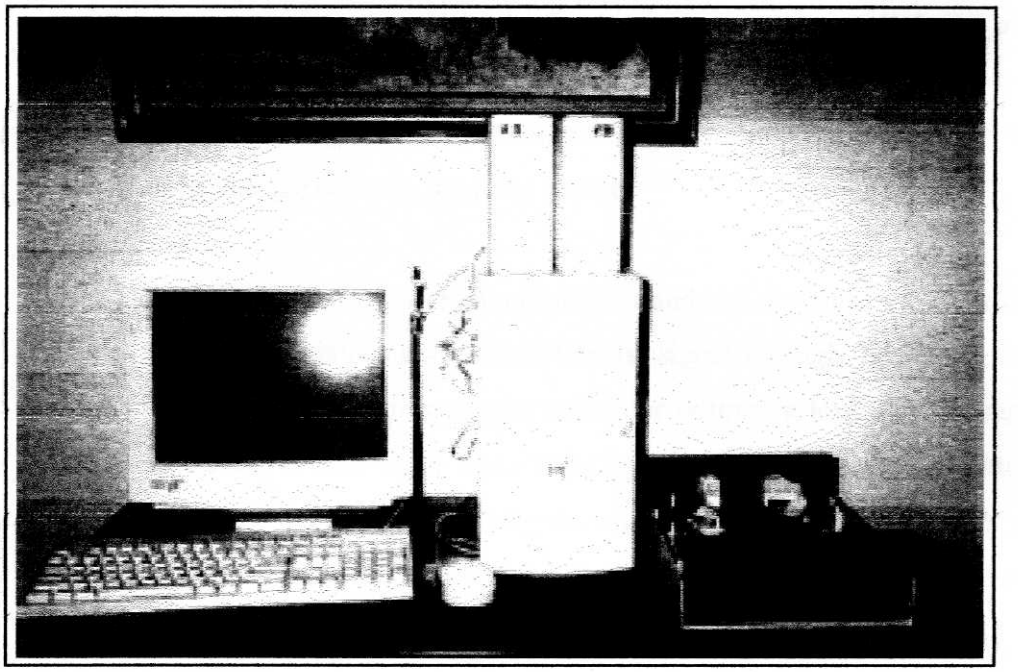

Figure 2.1 Top view of the system.

The system consists of two software (voice recognition and Visual Basic implementation) and three hardware (opto-isolating, decoding and relay) circuits. The software portion of this project consisted of two Microsoft dependant programs: Visual Basic 6 and Realize Voice Lite. Visual Basic was used to write a user-friendly visual drop-down menu with an embedded implementation program. Similarly, Realize Voice Lite was used for speech recognition purpose. Realize Voice Lite accepts discrete

commands, such as "TV-ON," and therefore was found to be the best voice recognition software for this project. [8]

When the user gives a discrete voice command such as "TV-ON" to the system, the voice recognition engine tries to match the input command with one of the menu options. If a match is found, the menu will display "TV-ON" on the screen and at the same time will try to output certain 4-bit binary bit pattern through the parallel port. Since Visual Basic doesn't have input/output capabilities, a 32-bit input/output dynamic link library that gives Visual Basic the ability to write and read from the parallel port has been copied in the working directory. An embedded program that includes subroutines for each different command was then written. Each of these subroutines, as in the "TV-ON" case, outputs or writes a distinct 4-bit binary bit pattern to the parallel port and at the same time displays the command implemented on the screen. The 4-bit output is then sent through an opto-isolating circuit, which protects the parallel port from being damaged by a sudden voltage spike in the relay circuit. [8]

When a signal high or "1" is received at the anode of the light emitting diode (LED) its corresponding transistor turns on and lets the signal through. Similarly, for an input of low or "0", the corresponding output transistor outputs a low, thus letting the signal through. Therefore a four-input opto-isolating circuit was used to isolate the external circuit from the PC without changing the signal output from the parallel port. The output of the opto-isolating circuit was fed to a 4-16 decoding circuit built out of 74LS154 IC chip. [8]

The decoding circuit decodes the four-bit signal and outputs all high except for one output. This output that remains low is thus the decoded output that represents that specific voice command given by the user. All 16 outputs are then inverted using a 74LS04 inverter to turn that decodes output to a high "1" state and switches the rest to a low state. This coded or high output is then interfaced with its designated relay circuit. [8]