

VOICE RECOGNITION HOME AUTOMATION SYSTEM (VRHAS)

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Abstract. Home automation is currently getting widespread recognition due to the convenience it provides. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, and other systems, to provide improved convenience, comfort, energy efficiency and security. This research is focus on creating a voice recognition system as an aid to home automation. Reason for choosing voice is because it is easily being reproduced by human. Besides that, usage of voice gives a control system that can be effective and convenient to be used. The application of this system involve modifying the switching system from the traditional way which is physical contact with a switch to a safer way where the usage of voice to replace all the physical contact. This project involve a simple switching system that used the transistor along with relay to power the devices, a voice recognition system that consists of voice recognition chip HM2007 and the PIC18F8722 microcontroller. The HM2007 serves as the recognition chip that listens and interpret the command by the given input while the PIC18F8722 serve as the brain of the system that will coordinate the correct output with the input command given. This project able to recognize the command trained by the user and successfully to execute the correct output. This project is a small scale design which consists of 8 commands that used to control three different switches. The command is able to individually switch on and switch off each of the switch. Besides that, the command also able to switch on and off all the switch at the same time.

Keywords: Voice recognition; home automation system

Abstrak. Automasi rumah adalah satu cabang teknologi yang sedang giat diperkembangkan disebabkan kemudahan yang diberikan. Alasan untuk memilih suara adalah kerana ia mudah dihasilkan oleh manusia. Selain itu, penggunaan suara memberikan sistem kawalan yang berkesan dan selesa untuk digunakan. Penerapan sistem ini melibatkan pengubahsuaian sistem suis dari cara tradisional yang merupakan sentuhan fizikal dengan beralih ke cara yang lebih selamat di mana penggunaan suara untuk menggantikan semua sentuhan fizikal. Projek ini melibatkan sistem suis mudah yang menggunakan transistor bersama-sama dengan geganti untuk kesemua sambungan kuasa ke peranti, sistem pengecaman suara yang terdiri daripada cip pengecaman suara HM2007, dan mikro pengawal PIC18F8722 untuk membina sistem. HM2007 berfungsi telinga yang akan mendengar dan mentafsir arahan masukan yang diberikan sementara PIC18F8722 berfungsi sebagai otak dari sistem yang akan menyelaraskan keluaran yang betul dengan arahan masukan yang diberikan. Projek ini boleh mengecam arahan yang dilatih oleh pengguna dan berjaya untuk melaksanakan keluaran yang betul. Projek ini merupakan reka tiga

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bentuk berskala kecil yang terdiri daripada 8 arahan yang digunakan untuk mengendalikan suis yang berbeza. Arahan ini boleh secara individu untuk menghidupkan dan mematikan suis. Selain itu, arahan juga mampu menghidupkan dan mematikan semua suis pada masa yang sama

Kata kunci: Pengecaman suara; sistem rumah automatik

1.0 INTRODUCTION

Home automation is a technology that can aid user in controlling electrical peripheral in a house by integrating them together. Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care.

This research involves the usage of voice recognition to replace the standard switch. The main reason of this project is to offer the user a better way to activate a system or devices. Other than aiding the user to switch a peripheral on or off, this project is able to reduce the chances of the user get injured or shock in case of current leakage.

In this project, the main part of the research is to test and verify the capability of the usage of the voice to clearly give out the command to activate a switch or a system. In some past research, voice and sound related project have been done and it proof to be able to control some simple system. Thus this project aim to expand the usage of the voice related system.

This paper proposes to design a fully functional system that have the ability to recognize the voice of the user and clearly differentiate between the command given by the user which reflected by the activating a correct system and also the ability to retain the system functionality of the system if there is no command given.

This paper is organized as follows. We discuss on the related work on the past voice project, follow by the methodology, the result and finally the conclusion and some future work.

2.0 RELATED WORKS

There are some project that been completed which regard to the application the voice in the controlling method. First of all is the project that makes use of the sound of clapping hand that serve as the way used to control the brightness level of the lamp. This method makes good use of the light sensor to detect the current light intensity in the room then make a correct adjustment to the brightness. This project shows that the sound is capable to serve as a controller well. The pro of

this project is the offering of the controller that will required less human contact to do the controlling work but this only applied to a single system.[1]

Second project is the usage of the voice as the controller for the wheelchair application. In this project the usage of the voice as the steering for the wheelchair that will function to control the direction of the movement of the wheelchair. This application allows the user of the wheelchair that cannot control the movement of the wheelchair physically to be able to move more freely. Pro of this project is the usage of voice to enable the less fortunate to be able to be more self-depending.[2]

There is another project that applied the voice as one of the security purposes whereby in that project voice is usage as the key for accessing a security door. This system is develop to enable the voice as one of the important element used to unlock a door after a series of password is entered through the keypad installed along with the system. By having this way of controlling the security of an area is improved as voice is unique for each person.[3]

As there are lot of voice application that been researched and applied out there, I would like to suggest a system of activating of switch through the usage of the voice. By using this way the switch activating process can be done without actually need the user to walk to the switch each time when they want to switch it on. Besides that, this method also reduces the chances of direct contact with the power source which also mean safer.

3.0 METHODOLOGY

In order to realized this project, first of all there must be a system that able to capture the voice and at the same time storing it into a memory which will be used later for the recognition purposes. For achieving this first step, the HM2007 Voice Recognition IC Chip is used. In this particular IC Chip, it consists of the analog to digital converter (ADC), memory addressing system and also the comparator [4]. Figure 1 shows the connection of the HM2007 with other primary component such as 8kX8 SRAM memory. In this circuit, the memory functions to store the voice that was initially trained by the user. These memory stored is the main database for the recognition process. This is because when the user is using the system, the HM2007 will internally compare the current input command with the initially trained voice. If the voice is match then the output will be send out.

By having the voice recognition board, the process of capturing and interpreting the voice or command by the user is completed. Thus, another system is required to coordinate the output of the system to the corresponded input command given by the user. Thus, a microcontroller system is needed for the coordination work. In this project, the PIC18F8722 microcontroller is selected because of the feature available on it which is the number of connection port [5],

[6], [7], [8]. This connection port is split into various applications such as Liquid Crystal Display (LCD), distance sensor, input port from the voice recognition board and also output port to the relay system that will be discussed in the next paragraph. Figure 2 shows the microcontroller board used.



Figure 1 Circuitry of voice recognition board using HM2007



Figure 2 BIGPIC4- Microcontroller board using PIC18F8722

Since this project aim is to control the connection of the electrical devices with the power supply from the power sources. Thus, interfaces must integrate between the system and the power supply. As generally known that electronic related board usually use or required about 5 v to initiate and power on the system but in Malaysia the power supplied is at the rate of 240 V at 50 Hz. Therefore a relay system is applied for the purpose of connecting the power supply once the command is given by the user. By using this method, it reduced the chances for the direct contact with the switch with human. This will surely give a boost to the reduction of chances to get shock in case of current leakage. The relay used in this project required a 5 V Dc input and have a max contact voltage of 240 V AC. The choice of relay will depend on the input voltage which in this project the input voltage is from the microcontroller about 5 V

4.0 RESULTS AND DISCUSSION

The outcome of this project is the creation of a fully functional voice recognition home automation system that will enable the user to control the electrical devices in a house by using voice. Figure 3 show the prototype of the system.



Figure 3 Full system of VRHAS

In order to ensure that the command by the user trigger a correct and desired output, the training process of the system is required to follow the preset number of code as in the Table 1.

Table 1 The configuration of the command

Number used to store	Command Execution
01	Switch on S1
02	Switch off S1
03	Switch on S2
04	Switch off S2
05	Switch on S3
06	Switch off S3
07	Switch off all
08	Switch on all

The training process is a simple process which consists of a few steps listed below:

- (1) A training process has to take place by keying the desired number from 01 to 20 follow by the # button. This action will cause the LED to light up.
- (2) Once the LED is lit up, users are required to speak the word that they want to train to the microphone attached.
- (3) The LED will blink indicating the training process is done.
Repeat step 1 to 3 for other switch.
- (4) Just in case once wish to change to another word for a number that already trained, the user will need to perform step 1 to 3 again with the new word that wish to be used as the command.

Next is the sample output of the system which has two main parts. First is the actual connection between the devices and the power supply. Follow by the display on the LCD that will keep track which switch is activated. The switch is being coded to be S1, S2 and S3 respectively. In Figure 4 is the welcoming note once the system is start up or restarted. Next is the Figure 5 which shows that the system is in the standby mode. During this mode the system is ready to take any command from the user. Figure 6 shows the testing of one of the switch which is S1 to be set on through the command of 01.

By referring to Figure 3 shows the complete design of the system. Just as mention on the paragraph above the first part is the connection between the

devices and the power supply is refer to the multi adapter attached to the system. From this adapter the user will plug in the devices that wish to be control.



Figure 4 Welcoming note



Figure 5 Standby mode



Figure 6 Sample output with S1 on

5.0 CONCLUSION

This paper proposed the techniques to control the switching by using human voice is successfully designed. Through the testing result, this system proof to be able to functioning accordance to the command give by the user. In addition, the use of such techniques can reduce the possible of physical contact between human and the switch. This project can be research furthermore on the focus of the distance sensor and detection system to ensure the source of command is received being carried out in a more efficient way. Besides that, another angle of research can be carried out is by focusing on the voice capturing system so that the effectiveness of the system can be increased.

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