

SPEECH OPERATED SYSTEM FOR HOME APPLIANCES

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
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For my beloved mother and father

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ABSTRACT

The project objective is to build one system that can recognize human voice and then activate the electrical appliances at home. This system called Speech Operated System for Home Appliances; it is software designed using MATLAB R2007a. System is designed to help people with disabilities to do their works at home. Two main parts in this system is voice train process and voice recognition process. Main objectives of this project are design a Graphical User Interface (GUI) and source code that can recognize human voice. This system used speaker independent method; any users who had trained their voice into the system can use the system. This is because, system built to recognize user's speech and not user's identity. System user record their voice by suing microphone, after recording, system processes the voice, store it, and compare it. Then, systems send the data to hardware that has been connected to home electrical appliances through serial connector.

ABSTRAK

Projek ini dijalankan adalah bertujuan untuk membina satu sistem yang boleh mengenalpasti suara manusia dan kemudian mengaktifkan peralatan elektrik rumah seperti lampu, kipas, dan radio. Sistem ini dikenali sebagai Sistem Operasi Ucapan untuk Kegunaan Rumah. Sistem ini ialah satu perisian yang dibina menggunakan perisian MATLAB R2007a. Faedah daripada sistem ini, ia dapat membantu individu yang kurang upaya melakukan kerja-kerja mereka di rumah. Dua bahagian utama dalam sistem ini ialah, proses latihan suara dan proses mengenalpasti suara. Objektif utama projek ini adalah membina Persemukaan Grafik Pengguna (GUI) dan kod program yang boleh mengenalpasti suara manusia. Sistem ini tidak bergantung kepada pengguna, mana-mana individu yang telah melatih suara mereka ke dalam sistem boleh menggunakan sistem. Ini kerana, sistem ini dibina untuk mengenalpasti ucapan pengguna dan bukan identiti pengguna. Pengguna sistem merakam suara menggunakan mikrofon, suara yang dirakam akan diproses, disimpan, dan dibandingkan. Selepas semua proses ini berjalan, sistem menghantar data ke litar yang disambungkan ke peralatan elektrik rumah melalui penyambung sesiri.

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CHAPTER I

INTRODUCTION

1.1 Project Introduction

Speech recognition (also known as automatic speech recognition or computer speech recognition) converts spoken words to machine-readable input (for example, to the binary code for a string of character codes). The term voice recognition may also be used to refer to speech recognition, but more precisely refers to speaker recognition, which attempts to identify the person speaking, as opposed to what is being said. For this project, the system is called Speech Operated System for Home Appliances.

Speech Operated System for Home Appliances project is a project to produce one system that can control any electrical appliances in the house such as lamp, fan, radio, television, etc by using user's voice. User's voice is an input to activate the electrical appliances through this system. This system can make the daily work at home easier for disabilities user who uses the system; this disabilities user does not need any other person help each time they want to use some electrical appliances.

With today's computer technology, human's voice can be recorded and saved into computer memory. The recorded voice that recorded in sinusoidal form can be manipulated using certain mathematical algorithms to change the unique characteristics of that voice into mathematical value so after the changed it can be saved into database as a human voice references.

By using the same mathematical equation, someone voice can be calculate again and transform it into mathematical form and the result from the calculation can be compared with each value that stored in the database. The closest value or higher value of voice is recognized as a real user and right order. From this method, the user's voice can be recognized.

This Speech Operated System for Home Appliances needs a Graphical User Interface (GUI), and programming by using MATLAB R2007a software to make it operate. The system can recognize speech or directive from user. Only the certain person with true voice frequency and identified directive can use the system, the other person can't, this method directly improve the security characteristic of the system. MATLAB R2007a software used to build a Graphical User Interface (GUI) and programming that can recognize the voice of human or specifically people with disabilities. The recognized voice can activate the electrical appliances that user's want to use.

1.2 Project Objective

There are several objectives involved in this project; all objectives are explained below. After completed the whole project, all objectives filled. The objectives are:

1. The main objective, design a Graphical User Interface (GUI) and source code that can recognize user's voice and then activate the electrical home appliances. This objective makes the daily home work easier for people with disabilities to do their work.
2. Analyzed the used of biometric method such as human voice as a directive to activate any electrical appliances. This objective makes the human's voice as an input to the system.
3. Learned more about MATLAB R2007a software functions and operations. MATLAB software can do more than on operation such as:
 - a) Command window editor
 - b) M-file editor
 - c) Figure (Graph)
 - d) Graphical User Interface (GUI)
4. Produce and improve the security level of the system by increasing the percentage of accuracy to activate the appliances. Only the real or trained user and right command can activate the appliances.
5. Learned the basic technique to apply mathematical methods, record voice, save voice, play recorded voice, and also recognize or compare the user's voice in MATLAB R2007a software.

1.3 Problem Statement

In this part, statement of the problem and why the problems selected to be improved are explained below. The problems statements are:

1. Many systems today have used remote control to activate certain home electrical appliances, the appliances such as air-conditioner, television, radio, and so on. This method is difficult to a person who can't move or paralyzed. So, because of this type of problem, the systems that use voice as an input or directive designed.
2. More Speech Recognition System now used isolated recognition method to recognize human's voice. This isolated method can only recognize one word at a time. There is a time limit to recognize user's voice. The improvement for isolated method is continuous method, by using continuous method, user can give a longer voice command to activate an appliances.

1.4 Project Scope

The scope of project that has been used to complete this project is explained as below:

1. Use MATLAB R2007a to design a complete source code that can save and load database, record voice, save voice, play recorded voice, and recognize or compare the user's voice. All source code typed in m-file of MATLAB.
2. Design a Graphical User Interface (GUI). The designed GUI will make the system or software more interactive and easy to use. GUI is related with m-file editor. Without m-file editor, GUI can't operate.
3. Design a connection between systems to hardware through serial port. The system or software can transmit data to hardware and receive data from hardware. Without hardware the system can't be connected to electrical appliances.
4. The system use continuous method to record and recognize user's voice, it means the system can recognize more than one word that came from user at a time. But the time limit is set so the recognition process is not too long. The system is depending on user, only real user can use system.

1.5 Methodology

There are 4 phases of methodology in order to achieve the objective of the project. The first phase is project planning, second phase is literature review, third phase is design the GUI and source code, and the final phase is testing the system.

1. Design GUI

Design interactive GUI using MATLAB software. There are two GUIs designed in this project. One GUI used to train user's voice and the other one is for user's voice recognition.

2. Test GUI function

Test the function of GUI, both GUIs tested to make sure there are no errors in GUI or any parts malfunction. If, an error occurred, GUI source codes that related to the error modified.

3. Design Recognition Source code

Design a complete system with source code to save and load database, record voice, save voice, play recorded voice and recognize or compare the user's voice.

4. Test System

Test the system to make sure it can recognize user's voice and perform the directive from that command voice. Convert the system or software from MATLAB operation into installation or exe format.

5. Project Methodology in flow chart form

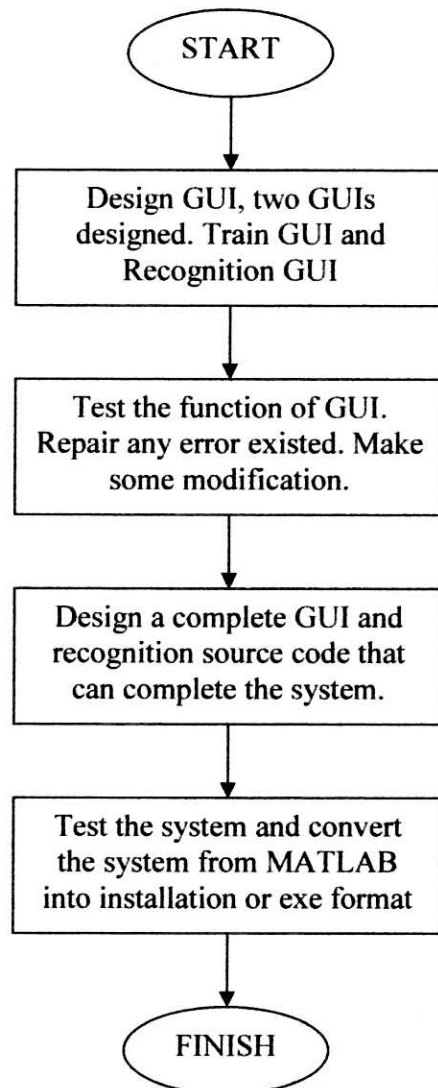


Figure 1.0: Methodology flow chart

6. Speech Operated System process flow chart

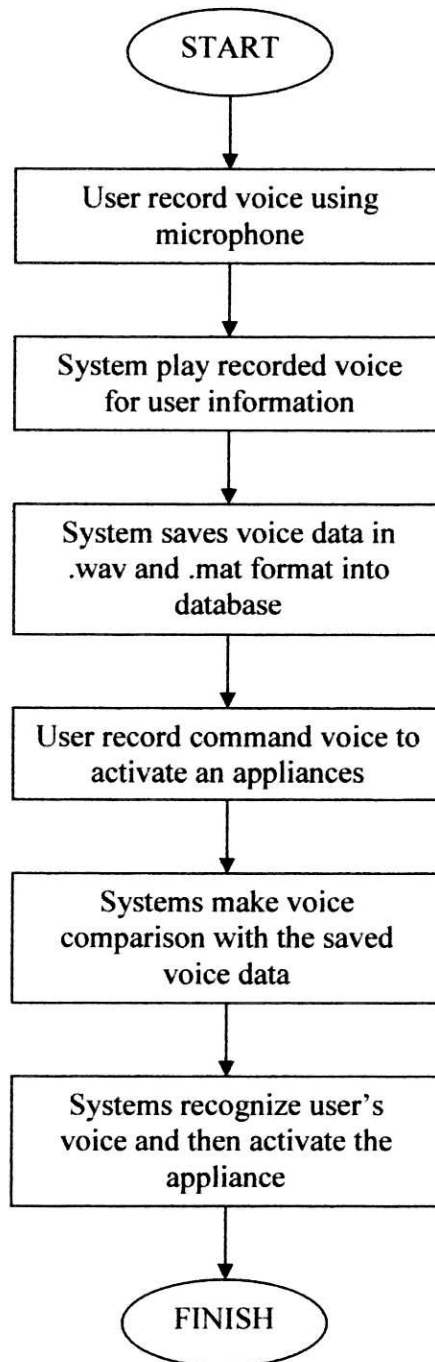


Figure 1.1: Speech Operated System process

1.6 Report Structure

In this report structure, the short explanation for each chapter in this report will be discussed.

1. Chapter I. In this chapter, the topic discussed is about introduction for Speech Operated System for Home Appliances, project objectives, problem statements for other project that has been analyzed, involved project scope, and project methodology that has been used to complete the project.
2. Chapter II. Literature review about project. All results from analysis of literature review discussed in this chapter. Analysis that has been conducted is analysis method, project theory explanation, Speech Operated System operation and Speech Operated System construction.
3. Chapter III, chapter that involved project methodology explanation. The methods that has been used to complete the project overall. Contents of methodology is, project initial planning, searching of resource material, software construction process, and for the final part, project test, seminar, and report writing is involved.
4. Chapter IV. Discussion for produced results after the Speech Operated System for Home Appliances completed. The results that will be discussed are software flow chart, Graphical User Interface (GUI), and programming.
5. Chapter V. Conclusion and suggestion to improve the project in the future. Summary for all results found after completed the whole project.