

Voice Controlled Appliances

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Abstract

There is a growing demand for systems capable of controlling large number of distributed devices from a remote central location. Voice controlled system is preferred by many users in some of the fields. This system controls a remote device or switch by using user's speech. Because of their limitation, high cost and technical difficulty, voice recognition systems have traditionally been used only in a few specialized situations. Such systems are useful in instances when the user is unable to use keyboard to enter the data because of user's hands are occupied or disabled and also where voice command is more preferable to use of keyboard. When controlling of switch of a device is difficult then it can be controlled by remote device. When this remote device is controlled by the voice command then it will be easier to user. The software is developed for the purpose of controlling the remote electrical devices through a person's voice command. Through this the knowledge of the recognition of voice by software, necessary electronic device and it's interfacing with the computer signals and controlling of a remote switch is achieved.

Keywords

Speech Recognition System, Speech Synthesis Microcontroller, Embedded System.

1. Introduction

Now a day's, man-machine interfaces are not very user-friendly. One way to enhance the user-friendliness of a user interface is to increase the number of senses that the user interface appeals to. One Because of the increasing number and complexity of the consumer devices the above of the most promising natural input/output possibilities is the speech interface. The current applications using voice synthesis are designed for an environment managing only one device. In this known case the device is equipped with speech recognition and a voice synthesis system. Such solutions are known for example from the field of robotics. In contrast, a consumer household usually

comprises a plurality of different devices, which can be controllable in principle. The desirable characteristics of such a system include scalability that is the efficiency of the communication and the process of speech recognition. Currently the control of controllable device is performed by the use of one or more remote control units which deliver the information or commands in most cases via an IR (infrared) beam. The feedback of the chosen device to the user is normally provided via an optical display of the action resulting from the command. As appliance controls become more capable and precise, one of the challenges facing designers is how to keep controls from getting too complicated and unwieldy while giving choices to users. One approach, so far little used in the appliance industry, is voice technology. With this, a user could, for instance, program a washer to follow a customized program with just a few spoken words.

2. Design of Microcontroller based System

In our project, we are trying to automate various home appliances by interfacing them with PC communication port and controlling them through speech. It is the easiest way of Human-Computer interaction. We are introducing a new technique in which we use speech recognition principles to generate control commands at the PC communication port. The programming languages used in this is MATLAB and microcontroller assembly language programming.

The digital processing capabilities of microcontrollers (MCUs) allow penetration of voice control to embedded systems. Practically any new device containing a microcontroller Unit (MCU) could be controlled by voice.



Fig: Block diagram of "Voice controlled appliances".

Voice controlled appliances consists of mainly microphone, PC for programming, microcontroller,

relay driver, and the output device to be controlled. The microphone is used as input device. It takes the voice command from speaker to our computer system as input for our system and it converts the voice signal into electrical signal. MATLAB software takes the input command & compare with the stored voice command. If compared command matched with original command then MATLAB give command to microcontroller to do further instruction. If compared command mismatched with original command then MATLAB stops further instruction. The PC has communication port which is used to transfer command or data to microcontroller circuit. Connection between PC & microcontroller circuit is done with the help of RS-232 cable, DB -9 connector & IC MAX232. The microcontroller IC89c51 having programmed done already for activating the relay driving circuit after the command compared by MATLAB. It sends the data to relay driving circuit. The microcontroller is having programming for comparing the output of MATLAB with stored data. If the data matches then it give command to relay driving circuit to active high or active low. Relay driving circuit is useful for driving the relay after getting particular voltage or data from microcontroller. It contains IC ULN2803, Relays, transformer & pull-up registers. The relays operated with the help of relay driving circuit. We can use any electrical & electronics appliances for controlling purpose.

3. Design Flow

A full realization of this concept would involve a few distinct steps. First, develop a database of commands the system will respond to. Second, develop voice recognition software that can perform a comparison between a command issued to the system, and the database of commands. Third, develop a sufficient hardware system to translate a matched command into a control signal, and finally into a realized change of state in hardware. Forth, develop the above system to exist on a microcontroller chip such that it operates independently of an external computing source, and interacts with its hardware inputs and outputs independently. Such a system would be integrated in the user's home, use microphones installed in the home as input sources, and would issue control signals to hardware already installed in the home.

1. Develop a software code for speech recognition: The voice recognition is done with the help of MATLAB software. The programming is done on MATLAB software for taking the voice command

as input to PC, compare it with original voice and send instruction to the microcontroller.

2. Design and fabricate an external circuit to receive data from communication port and produce IR signal.

3. Design and fabricate an input signal receiver circuit and a relay circuit to operate the relays.

4. Test the performance of the voice controlled circuit.

5. Implementation of microcontroller based voice controlled circuitry.

6. The microcontroller based circuit is used to take input from the serial port of PC and drive the relay circuit. It takes the serial input and work as per instructions in the programming.

7. Lamp on, lamp off and fan on, fan off such controlling commands are implemented in MATLAB for the voice recognition.

8. Control the appliances & check its control efficiency.

4. Result & Analysis

We can use any electrical & electronics appliances for controlling purpose e.g. Lamp, Fan, etc. which requires on-off button for control. It will reduce complexity of the switch board. The speech recognition is implemented in MATLAB using several features extraction such as: record, wavread, wavwrite, etc.

Four commands – Fan On, Fan off, Light on and Light off were recorded in different samples (high pitch, low pitch, slow, fast, and normal) by various speakers with different accents for both males and females. Results were listed as below.

100% accuracy for the speakers that the database was trained.

100% accuracy for the command 'LightOn'

100% accuracy for the command 'Lightoff'

100% accuracy for the command 'FanOn'

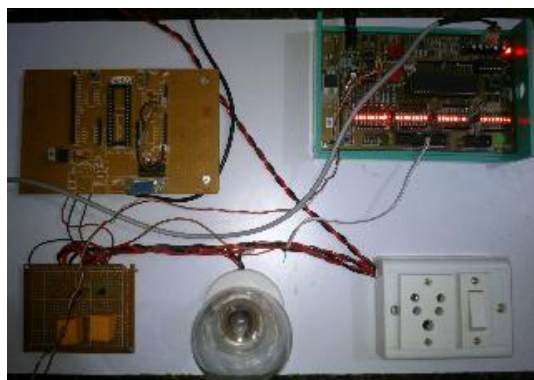
100% accuracy for the command 'FanOff'

And the system is easily interact with people, to control consumer appliances and to access personal and public information. Below are the photographs showing the results for controlling the light.

Light On:



Light off:



5. Conclusion

This is a very creative work focused on designing an intelligent living space with automatic speech recognition system to control all home appliances basically electrical and electronics appliances.

This paper is very useful for persons who are physically disabled & visually challenged. In our paper we are trying to automate various home appliances by interfacing them with PC communication port and controlling them through speech. It is the easiest way of Human-Computer interaction. We are introducing a new technique in which we use speech recognition principles to generate control commands at the PC communication port.

These appliances will support speech interfaces to intelligent software agents that perform various types of searching and computational tasks on behalf of the user. Productivity benefits through Hands Free, Eyes Free Operation & increases the standard of living.

6. Future scope

1. We can use this system for home automation system. It will provide high living standard to human being. The complexity of electrical switches can be reduced by this system.
2. In the area where so many switches are required there it is not possible to remember all the switches at that time this system is very useful. It can implement with only one switch or button.
3. The physically disable people cannot use the remote control for controlling the electrical and electronics equipments so this system will help them for easily handling all the equipments through their voice.
4. It will provide hands free, eyes free controlling operation.

7. References

- [1] M.A. Mazidi, J.G Mazidi, R. D. McKinlay, "The 8051 microcontroller and embedded system using assembly and c".
- [2] John Wiley, "MATLAB Programming Language".
- [3] Hyeopwoo Lee, Sukmoon Chang, Dongsuk Yook, and Yongserk Kim "A Voice Trigger System using Keyword and Speaker Recognition for Mobile Devices" *Member IEEE*
- [4] James R. Evans, Wayne A. Tjoland and Lloyd G. Allred *Ogden Air Logistics Center*, "Achieving a Hands-Free Computer Interface Using Voice Recognition Speech Synthesis", *IEEE AES System Magazine, January*
- [5] Shi Yuanyuan, Liu Jia and Liu Runsheng, "Single-Chip Speech Recognition System Based on 8051 Microcontroller Core", *IEEE Transactions on Consumer Electronics, Vol. 47, No. 1, FEBRUARY 2001*.