International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 4 Issue 3, March 2017

ISSN: 2394-4404

Sound Operated Device Control System

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Abstract: ***This paper highlights the importance of human voice that activates devices in home as speech is the preferred mode of operation for human beings. The system responds to pre-stored sound and performs particular function that is, command signals are first stored in the database and when the project is run, a real-time sound or speech signal is compared with the signals stored in the database. The speech recognition system is easy to use inbuilt speech recognition module of the LabVIEW software used that is the system is to be trained in the words (or vocal utterances) the user wants the module to recognize. If the signals match, an appliance/load is turned on/off. For instance, sound command 'Switch on the fan' is used to operate the fan. This system plays an important role for the elderly and physically disabled people to control their appliances in intuitive and flexible way. The graphical user interface (GUI) system is developed using LabVIEW. This paper presents the hardware implementation of a multiplatform control system using LabVIEW and provides the combination of hardware and software technology. With this sound recognition accuracy of more than 90% is achieved.***

Keywords: ***voice recognition, LabVIEW, ON/OFF control, data acquisition, automation.***

I. INTRODUCTION

Nowadays technology is very advanced which is immensely useful for the human beings. Home automation industry is growing rapidly. Voice recognition is an expanding trend for automation. Controlling appliances is a main part in automation. Voice recognition is a standalone and very less expensive technique that may be used to control electrical appliances. Elderly population worldwide is increasing rapidly as a result of the increase in the average life expectancy of people as is the trend shown by the demography of the world population. Such automation systems not only benefit the employed population but it also helps the disabled and the elderly population.

Home automation is one of the major growing industries that can change the way people live. Some of these home automation systems target those seeking luxury and sophisticated home automation platforms; others target those with special needs like the elderly and the disabled. The aim of the reported Sound Operated Device Control System (SODCS) is to provide those with special needs with a system that can respond to voice commands and control the on/off status of electrical devices such as lamps, fans, television etc.

Physically challenged people locate difficulty in power ON/OFF of their home loads such as fan, light, AC etc. They require an attender to do these things. In the absence of the attender their world seems to be more difficult. So a system which can help them to power ON/OFF their home loads even in the absence of an attender will be quite essential. Improvements in speech recognition technology strive to provide a solution for the above said problem.

ISSN: 2394-4404

LabVIEW is a highly productive environment that interface with real world data for creating custom application. With the help of a microphone, real-time sound signal is acquired by LabVIEW functional block. The inbuilt speech recognition module recognizes the input speech of the user and builds messages. Mean recognition accuracy is 67%. This acquired sound is not suitable for cross-correlation or comparison because of the noise within the real-time speech. So, it is advisable to filter the acquired signal using low-pass Butterworth filter to remove unwanted frequencies or noises. Low-pass Butterworth filter gives flat frequency response. Output of the filter is given to the cross-correlation block to compare this signal with pre-stored command. We have used ATmega328p of the arduino board as controller. This project has vital applications especially for handicaps. It can also be used to provide security and authentication.

Figure: Operational Diagram

II. SOUND RECOGNITION TECHNIQUE- OVERVIEW

Voice recognition is the technology by which sounds or phrases spoken by individuals are converted into electrical signals and these signals are changed into coding patterns to which meaning is allocated. This concept could more generally be called as sound recognition or speech recognition. Human voice is mainly focused here, because we most naturally and most frequently use our voices to communicate our thoughts to others in our immediate environments. The user would possibly gain the greatest feeling of immersion to use their voice as the most common form of communication. Initially the sound is given to the signal analyser which analyse the signal and given to the acoustic model and after that the trained data is given at the output. Principle of voice recognition is shown in the Fig.1.

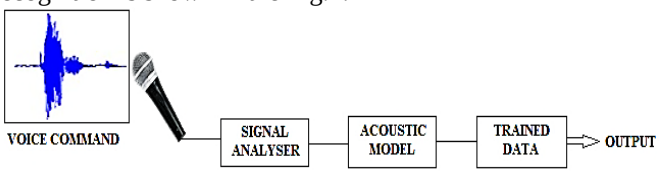

Figure 1: Principle of voice recognition

The first element that is required for voice recognition is the collection of speech data. Database of speech data is built from multiple speech samples then those samples of all the necessary speech data can be recorded and stored. The signal analyser passes the data from the speech sample to the acoustic model for identification. Samples of possible speech data is passed into language models. These possibilities are compared with previous results from the trained model. The speech data with the highest probability of a match is selected as being the correct data and given as output and if the speech data is not match with the sample data in the system then the output is not generated.

III. PROPOSED SYSTEM DISCRIPTION

An input voice is directly given to the microphone, it converts the voice command into electrical signal. The signal from the microphone is fed to the data acquisition module. Then the output of the data acquisition is given to the filter for filtering the signal. The noise free voice signal from the filter is given to the comparator which compares it with the voice pre-stored in the database and is given to the decision making device. From here it is passed to the controller, switching devices, and then to the load. The device is operated according to the command. The general block diagram for the proposed method is shown in the fig 2.

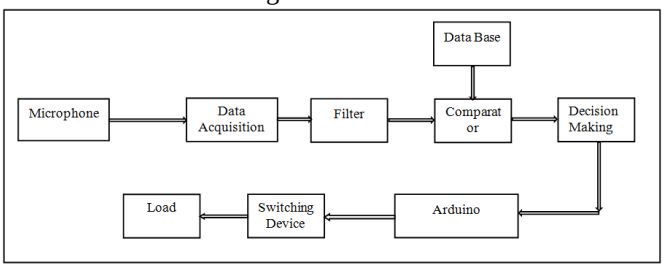

Figure 2: Block diagram of the project with connection between different modules

Fig 2, shows the block diagram of the project with connections between different modules. Various processes like speech acquisition, speech filtering, speech comparison and decision making are easy to program in LabVIEW because of its user-friendly graphical programming environment. A predefined command is stored in the system. With the help of a microphone, real-time sound signal is acquired by LabVIEW functional block.

This acquired sound is not suitable for cross-relation or comparison because of the noise within the real-time speech. So it is advisable to filter the acquired signal using low-pass Butterworth filter to remove unwanted frequencies or noises. Low-pass Butterworth filter gives flat frequency response. Output of the filter is given to the cross-correlation block to compare this signal with pre-stored command.

Command signals are then stored in the database and when the project is run, a real-time sound or speech signal is compared with the signals stored in the database. The speech recognition system is easy to use inbuilt speech recognition module of the LabVIEW software used that is the system is to be trained in the words (or vocal utterances) the user wants the module to recognize. If the signals match, an appliance/load is turned on/off. For instance, sound command 'Switch on the fan' is used to operate the fan.

The project includes the following programs:

- ✓ Main Voice.vi
- ✓ Speechdetection FINAL VI.vi
- ✓ Dictionary.vi
- ✓ LINX.Digital Write N Channel.vi

IV. FUNCTIONALITY AND EXPERIMENTAL SETUP IN LABVIEW

Acquisition of audio file. Acquired real time sound command is stored in the Acquire Sound Data module. The Acquire Sound Data module in LabVIEW is done with the help of Virtual Instrument, or VI, shown in fig. Filter parameters are configured by setting low-pass Butterworth filter as cut-off frequency 3000HZ and filter order 4. Device ID is set as '0' for one-input device. Remaining blocks parameters are taken as by default.

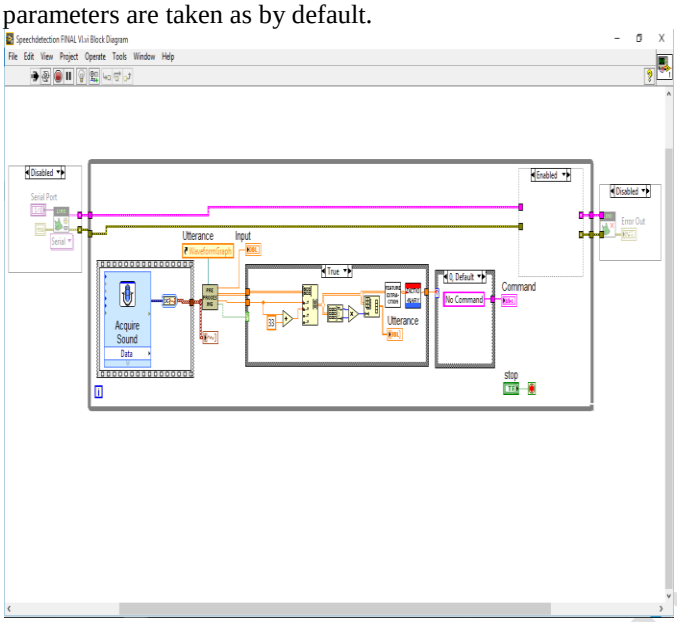

Figure: Speechdetection FINALVI.vi

Acquire Sound Data module creates or records audio command given by the user. The acquired sound is automatically stored in the default path as is shown in the front panel of VI. This is known as the pre-processing VI.

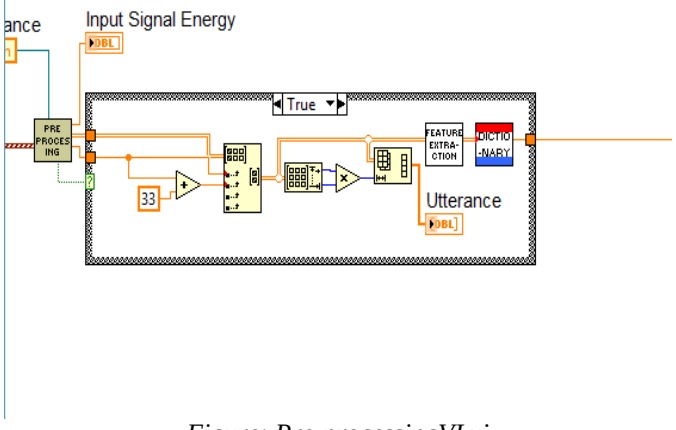

Figure: Pre-processingVI.vi

For storing command, the system has to be trained at first. The training is initialised in the dictionary by creating a matrix wherein input sound command is stored. On acquisition of the command the status label goes green in colour. In the dictionary, the input sound command stored is checked for best match with the trained commands. The mean for the commands in the matrix is taken and corresponding signal to operate the load is taken.

LINX Digital N Write Channels.vi: The controller is fed with LINX inbuilt in LabVIEW used for serial communication. Corresponding Com port associated with the LINX device is selected and provided with the Do Values.

USB-to-serial communication cable is attached to the laptop. This cable is detected at the label named 'Visa Source Name' as shown in the front panel. After running this VI, other first two Vis automatically run in the background. Run-time command is given to the device to turn on or off.

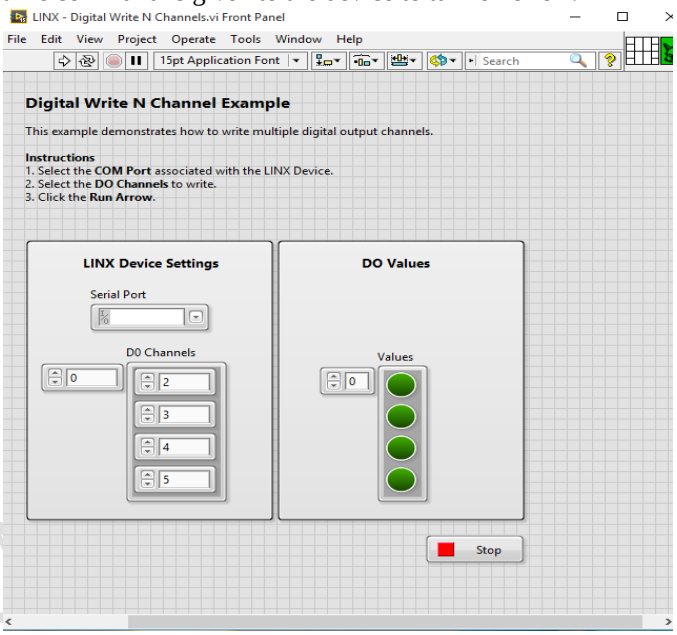

Figure: LINX-Digital Write N Channels.vi

V. RESULTS

ON/OFF CONTROL

Simulated output for ON/OFF control is shown in the fig below.

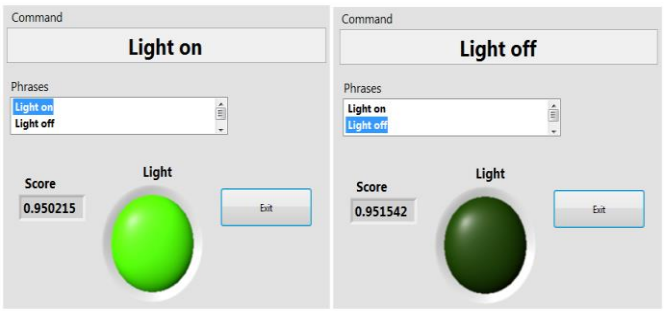

Figure: Output Window

Two command window shown in fig above. First window shows the light device which is ON because the signal i.e., sound matches with the pre-stored signal and light is glowing.

On the other hand, the second window shows the light is off because the sound is not matched with the pre-stored voice signal in the system and hence the light remains off.

For ON/OFF control, spoken word is displayed in command with the help of voice recognition technique and it compare with the already store word in phrases, if it matches it

makes the light to switch ON and light will glow otherwise it won't respond and light remains OFF. The value of the score gives the accuracy of each spoken words by voice recognition.

The simulation of ON/OFF of the fan is similar to that of light. In fact, the fan operates when the sound matches otherwise the fan remains switch off.

VI. CONCLUSION AND FUTURE SCOPE

Control of appliances using voice reorganization technique is simulated LabVIEW software and the results have been presented to demonstrate the proposed system. The simulated result shows that at most 4 loads could be operated simultaneously and were achieved with a voice recognition accuracy of 95%. This system recognizes the input very well and manages to gives response. Recent advancements in technology are making lives easier. This work is intended to help elderly and disabled persons by implementing voice as a control mechanism so that they can observe and control the home appliances with their limited facility. Sound Operated Device Control System is practical and helpful to people with certain types and degrees of disability. Therefore, the system is highly competent and it consumes low power. Though we are mostly focussing on operation of multiple devices by multiple users using voice recognition based system interface, in future it is possible to make tests with a large data set of sound commands and also the number of appliances to be controlled can be increased. It can also be fined-tuned with the help of neural network to train voice commands. Prospect work entails building the system to be in Online and Improved user friendly GUI. Future effort is to build the whole scheme to be accessible to a user in online situation and computerization of loads by giving voice instructions using cell phone.

REFERENCES

[1] Laisa.C.P, Nichholas S. Almeida, Ana G. D. Correa, Roseli D.Lopes, Marcelo K.Zuffo, "Accessible Display Design to Control Home Area Networks", IEEE Trans. Consumer Electronics, Vol.59, No.2, pp. 422-427, 2013.

[2] Basil Hamed, "Design & Implementation of Smart House Control Using LabVIEW", International Journal of Soft Computing and Engineering (IJSCE), Vol. 1, Issue-6, pp. 98-106, Jan 2012.

[3] Mark S Hawley, Stuart P. Cunningham, Phil D. Correa, Roseli D. Green, Pam Enderby, Rebecca Palmer, Siddharth Sehgal, and Peter O'Neil, "A Voice-Input Voice-Output Communication Aid for People with Severe speech Impairment", IEEE Trans. Neural system and Rehabilitation engineering, vol. 21, no. 1, pp. 23-31,, Jan 2013.

[4] Y.Usha Devi, "Wireless Home Automation System Using Zigbee", International Journal Of Scientific & Engineering Research, vol.3, pp. 1-5, 2012.

[5] Patricio, G.; Gomes, L., "Smart house monitoring and actuating system development using automatic code generation," Industrial Informatics, 2009. INDIN2009. 7th IEEE International Conference on, vol., no., pp.256-261, 23-26 June 2009.

[6] W. Xianmei, L. Lingyan, D. Ti, W. Zhiliang, "Smart home control system for the disabled using the head and the mouth movement." IEEE 29th Chinese Control Conf., pp. 3527-3530, July 2010.

[7] Ajay K. Yadav, Alokit Upadhyay, Shekhar Rastogi, Sonali Shukla, "Controlling of Devices Through Voice Recognition Using MATLAB", International Journal of Electrical and Electronics Engineers, ISSN- 2321-2055 (E), Volume 07, Issue 01, Jan- June 2015.

[8] Byoung-Kyun Shim, Kwang-wookkang, Woo-Song Lee "An Intelligent Control of Mobile Robot based on Voice Commands", Proc.IEEE, vol 98, no.8, pp.1107-IIIO, Oct.2010.

[9] Seth teller, Matthew R.Walter, MatthewAntone "A Voice-Command able robotic forklift working alongside humans in minimally prepared outdoor environments" Proc.IEEE Robotics and Automation, vol 9, no.25, pp.526-533, May 2010.

[10] Amrutha S, Aravind S, Ansu Mathew, Swathy Sugathan, Rajasree R, and Priyalakshmi S, "Speech Recognition Based Wireless Automation of Home Loads- E Home", International Journal of Engineering Science and Innovative Technology (IJESIT), Volume 4, Issue 1, January 2015.