2016 Conference on Advances in Signal Processing (CASP)
Cummins College of Engineering for Women, Pune. Jun 9-11, 2016

A Design for Wireless Music Control System using Speech Recognition

Aishwarya Nilakhe
Student, Dept. of E & TC
NBN Sinhgad School of Engineering
Pune, India
aishwaryanilakhe@gmail.com

Dr. Sushama Shelke
Professor, Dept. of E & TC
NBN Sinhgad School of Engineering
Pune, India
sushama.shelke@sinhgad.edu

***Abstract*—Speech is the most common form of human conversation. It is very essential for communication purpose. Speech recognition technology is considerably increasing and is coming into practice enabling innovative voice driven application. The communication among human computer interaction is called as human computer interface. Speech recognition systems can provide very efficient alternatives for existing systems where controlling a music player physically can be very inconvenient for old or physically challenged people. As the person may find it difficult to be near the music system always, the proposed system gives wireless speech recognition system to control the music player which is at certain distance.**

Keywords---Speech Recognition, MFCC, Raspberry pi

I. INTRODUCTION

Since 1960, scientists were searching the way through which human can interact with computers without having pressed any physical button just by voice command. In those years, voice sampling was a huge challenge. After a lot of research and development by scientists, first voice command system arrived in 1980 which could decipher speech. Now a day, systems have so developed that we can do Automatic Speech Recognition and systems are made accordingly. Nowadays it is an important technique between human and computer. It is Hands free and provides great ease of use to human beings. Specially to physically challenge people who cannot type.

Speech Recognition Systems now a day used in many devices for Domestic Purpose as well as Government and Defense purposes. It is also used in Mobile Phones, Laptops, GPS Devices, Automobiles, Aircrafts, etc.

Our purpose is to bring this very useful technology in Home Entertainment System which is useful for Kids, old people and housewives for entertainment purpose with ease of use, by just commanding or saying the play, pause, forward, backward, stop, etc., they can listen to their favorite music without going near the system and pressing any physical button.

Many techniques has been developed in each stage of speech recognition system, such as MFCC, GHM and HMM [1]. It is one of the most integrating areas of Machining Intelligence, as human interact and do daily activities with speech [2]. Media Players in the computers have been integrated with the open source embedded SR system to control the functioning of a media file by voice command [3]. A systematic analysis of the techniques of speech recognition and how the technology emerged in last seven decades has been done [4]. The study of Hidden Markov Model (HMM) is done to develop a voice based user-machine interface system for physically challenged and also to convert English language to the native language [5]. A lower cost speech recognition home automation has been done using Raspberry Pi and some Filters [6]. Advanced music player also implemented which can be controlled by both voice command and touch eliminating the need of display device for the visually impaired [7]. Also combination of Network Speech Recognition(NSR) and Distributed Speech Recognition(DSR) is used for wireless transmission to give better results [8]. Intelligent home automation systems are designed using Raspberry pi and voice recognition [9]. Also feature enhancement of decoded speech is done in adverse environment [10]. Various speech recognition techniques has been developed using Raspberry pi [11].

The proposed system is used for the wireless speech recognition system for the Music Player used for Home Entertainment. The System works on Raspberry pi using Python Language and a Bluetooth headset which is compatible with Raspberry pi.

II. PROPOSED SYSTEM

The proposed system uses Raspberry pi for speech recognition. The speech signal is transmitted through Bluetooth device such as Bluetooth headset to raspberry pi. The speech is detected, recognized and processed. Using speech commands, music player is controlled. Fig. 1 represents system block diagram.

978-1-5090-0849-0/16/$31.00 ©2016 IEEE

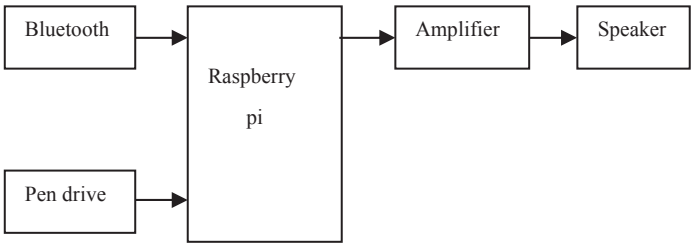

Fig. 1 System block diagram

This system will be having functionality like Play, Stop, Previous and Next. System comprises of Following Main Components.

1. Raspberry Pi
2. Bluetooth device with Microphone
3. Speaker with amplifier circuit

The 1st part will be sending the speech signal through Bluetooth to the Raspberry pi. The 2nd part consists of speech recognition n=and interfacing of music player. For the ease of use, the prototype uses music loaded in pen drive.

The speech recognition on Raspberry pi can be done in three different ways.

1. Raspberry pi Voice Recognition by Oscar Liang
2. Raspberry pi Voice control by Steven Hickson
3. Jasper Voice Recognition system

The 1st two voice recognition systems are online whereas the 3rd system works offline.

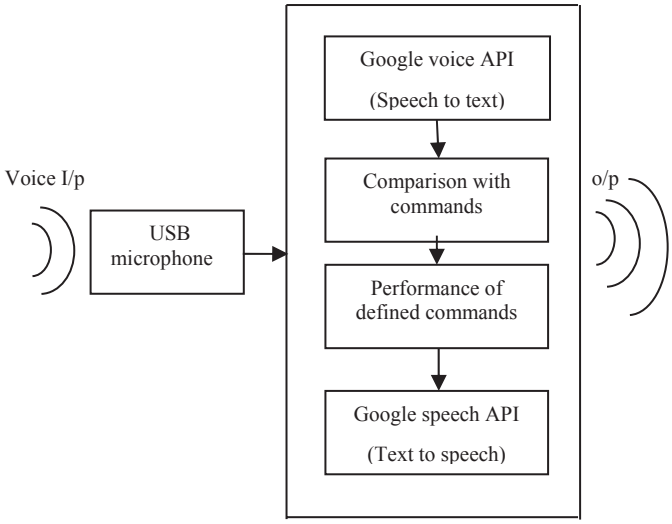

Fig. 2 Block diagram of online voice recognition system

Google API is used by Oscar and Steven's system as it provides precise and more accurate results. The voice command by the user is captured by the microphone. Raspberry pi doesn't have sound card in it therefore USB microphone is must be used for the input purpose. Once voice is captured by microphone, it is converted to speech by using Google voice API. The text is then compared to previously stored commands. After comparison the text is again converted to speech using Google API. Fig. 2 shows the block diagram of online speech recognition system.

The proposed system uses offline speech recognition system. Although it is not as precise as online system, it has a big advantage that it can be used without internet connection in the rural areas where internet access is not available.

III. FLOW OF IMPLEMENTATION

The typical flow of automatic speech recognition is shown in Fig. 3.

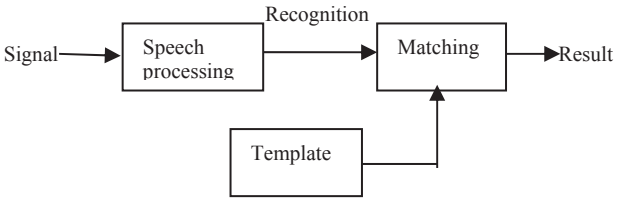

Fig. 3 Automatic Speech Recognition

Automatic speech recognition consists of following steps.

A. Speech signal input

The input speech signal is taken from the user. Voice training can be done if the system is speaker dependent.

B. Speech processing

Speech processing consists of various steps such as analysis, feature extraction, modeling and testing. The proposed system will use Mel Frequency Cepstral Coefficients(MFCC) technique for feature extraction.

C. Template matching

The input speech signal is compared with the saved template. The difference distance is measured. The result will be of the template which has minimum distance.

D. Algorithm

The Jasper algorithm is implemented on the Raspberry pi module. Once the voice command is transmitted by Bluetooth headset, it will be received at receiving Bluetooth module interfaced with Raspberry pi. It is then processed on the Raspberry pi using Sphinx directory. Sphinx directory has in built speech recognition functions same as MATLAB. The music player is interfaced with it and it is controlled by voice commands.

An amplifier circuit is connected at the output end of the Raspberry pi followed by speakers. This amplifies the power of the signals. The audio amplifier used is LM 386. It is low

voltage audio power amplifier which can increase the gain from 20 to 200. The inputs are at ground reference and the output biases to one-half the supply voltage. The power drain is only 24mW at power supply of 6V. Fig. 4 shows the general system flow.

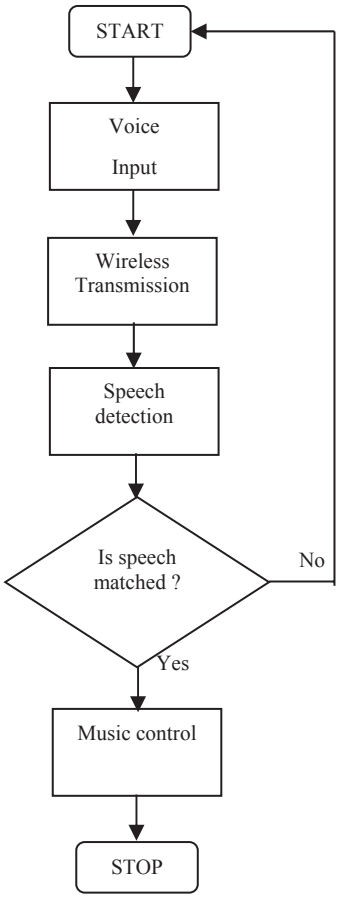

Fig. 4 Flowchart of the proposed system

IV. RESULTS AND FUTURE SCOPE

The work of the proposed system is under progress. As python is completely different language than other programming languages, the intermediate results can not be shown. The advancement can be done by using wi fi module instead of Bluetooth so that the system can work online as well as offline.

V. CONCLUSION

The paper represents the proposed system of speech based wireless control system for music player. The MFCC algorithm will be used for feature extraction in speech recognition. The speech recognition will be done on raspberry pi as it is palm size compact computer which can be used for various advanced applications. Also the software architecture flow is presented in the paper to design the proposed system. The system can be further modified to online speech recognition and offline speech recognition for music player control.

References

[1] Santosh K. Gaikwad, Bharti W. Gawali, Pravin Yannawar, "A review on Speech Recognition techniques", International Journal of Computer Applications, Vol. 10, Nov 2010

[2] Preeti Saini, Parneet Kaur, "Automatic Speech Recognition: A Review", International Journal of Engineering Trends and Technology, Vol. 4, 2013.

[3] Surabhi Bansal, Ruchi Bahety, "Speech Recognition", Unpublished.

[4] Taabish Gulzar et.al., "A Systematic Analysis of Automatic Speech Recognition: An Overview", International Journal of Current Engineering and Technology, 2014.

[5] Bhupinder Singh, Neha Kapur, Puneet Kaur, "Speech Recognition with Hidden Markov Model: A Review", International Journal of Advanced Research in Computer Science and Software Engineering, Vol. 2, March 2012.

[6] Prasanna G., Ramadass N., "Low Cost Home Automation Using Offline Speech Recognition", International Journal of Signal Processing Systems Vol. 2, Dec 2014.

[7] G. Kiruthikamani, E. Esakki Vigneswaran, "Advanced Music Player with Audio Recognition And Touch Interface For Visually Impaired", ARPN Journal of Engineering and Applied Sciences, Vol. 10, April 2015.

[8] Angel M. G´omez, Antonio M. Peinado, Victoria S´anchez, Antonio J. Rubio, "Recognition of Coded Speech Transmitted over Wireless Channels", IEEE Transactions on Communication, Vol. 5, Sept 2006.

[9] Pallavi V. Hajari, Ashwini G. Andurkar, "Review Paper on System for Voice and Facial Recognition using Raspberry Pi", International Journal of Advanced Research in Computer and Communication Engineering, Vol. 4, April 2015.

[10] Hong Kook Kim, Richard V. Cox, Fellow, Richard C. Rose, "Performance Improvement of a Bitstream-Based Front-End for Wireless Speech Recognition in Adverse Environments", IEEE Transactions on Speech and Audio Processing, Vol. 10, Nov 2002.

[11] Ms. Sneha K. Upadhyay et.al., "Intelligent System Based on Speech Recognition with Capability of Self-learning", International Journal For Technological Research In Engineering Vol. 1, May 2014.