International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-9 Issue-2, July 2020

Mobile Hearing Aid

Himakar Sai Chowdary Maddipati, Manoj Kumar Alluri,Venkata Sai Maneesh Morampudi, Likhitha Kolupuri, Anuradha Chinta

Abstract: ***This is about developing an android app for replicating the mechanism of hearing aid machine. Majority of the Hearing Impaired people cannot afford hearing aids due to higher cost of the Instruments. Similarly Audiometry Test for assessing the Deafness levels are also costly. Affordable Smartphone are available with majority of the Hearing Impaired people in Indian. So, we propose a Mobile Application which consists of the following three Features. This APP enables Ear phones of Phone to function as Hearing Aid for people with hearing disability. This APP converts speech to Text so that Hearing impaired people can know what other people are talking without using SIGN Language. This APP provides Pure-Tone AudiometryTest to assess level of Hearing Loss.***

Index Terms: Hearing aid, Audiometry Test, Pure tone audio, Audiogram, Android Media API, Android Speech Recognizer API.

I. INTRODUCTION

The 2011 Indian census cites roughly 5 million people with ”hearing impairment”, where as India’s National Association of the Deaf, estimates that 18 million people are deaf. Most of the people cannot afford hearing Aid . Hearing Impaired people make use of Sign Language for communicating with other people. Audiometry test for finding level of Deafness costs around Rs 1000 in India. There are many varieties of Hearing Aids available in the Market. Buying these devices is very costly affair. Hearing Impaired people face difficulties while communicating with normal people. Many software applications have been developed to help people with Hear- ing difficulties. Those applications do not address the three problems faced by Hearing Impaired people. In this paper we have surveyed various ways to find out the solution to this problem. We propose to develop a Mobile APP which could be used by the Hearing Impaired people to use Smartphone as Hearing Aid for listening, Speech to text conversion and for Audiometry testing .So that all people living in remote areas and belonging to various classes can access hearing aid services and audiometry.

Manuscript received on May 25, 2020.
Revised Manuscript received on June 29, 2020.
Manuscript published on July 30, 2020.

***** Correspondence Author

Himakar Sai Chowdary Maddipati, Department of Computer Science and engineering, VR Siddhartha Engineering College, Kanuru Vijayawada, India. Email: maddipati.himakar@gmail.com

Manoj Kumar Alluri, Department of Computer Science and engineering, VR Siddhartha Engineering College, Kanuru Vijayawada, India. Email: alluri.manog9@gmail.com

Venkata Sai Maneesh Morampudi, Department of Computer Science and engineering, VR Siddhartha Engineering College, Kanuru Vijayawada, India. Email: mvsmaneesh@gmail.com

Likhitha Kolupuri, Department of Computer Science and engineering, VR Siddhartha Engineering College, Kanuru Vijayawada, India. Email: likhitha.knd@gmail.com

Anuradha Chinta, Department of Computer Science and engineering, VR Siddhartha Engineering College, Kanuru Vijayawada, India. Email: anuradha.chinta4@gmail.com

II. RELATED WORK

A. Software Based Audiometer System

LabVIEW software is used to develop a GUI for audiometery test. [1]In the developed GUI, the user can configure the amplitude of white noise, frequency, and amplitude of pure tone sound signal. User can change sound amplitude values with a 5 dB step in range between 0 dB-80 dB and 250 Hz-8000 Hz. In the first step, the user configures a channel desired by the user is selected to test. After selection of channel, the user can add white noise for passive sound channel and configure amplitude of white noise. The last point of the generated amplitude of sound hearing by patient gives amplitude threshold of Hearing for specific frequency level. The different frequency values for test process are used in the developed interface. These frequency steps are selected as commercial audiometer devices. The audiometer test results can be seen in GUI screen as shown below. A computer based audiometer Test system is designed on LabVIEW software. The software based audiometer system has been designed for 9 different frequency values like using in audiometer test sequences commonly.

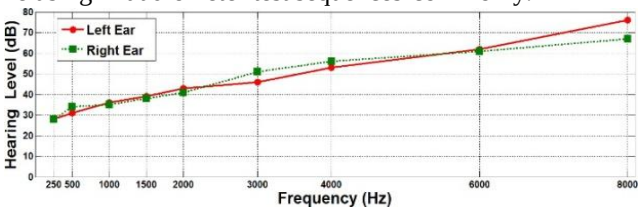

Fig.1. Audiometry Test Result

B. Android based aid for The Deaf

The typical model that created consists of ZigBee technology that reports the triggering of the various devices in the house,[4] which normally requires the deaf person to hear them. The central station/server would be an android based mobile application and would lie with the disabled user. Sound sensors that take the incoming speech inputs at the respective remote stations control the overall system. These sensors send the voice commands to the microcontroller Arduino. The microcontroller unit takes decision and sends the commands to the android phone using a pair of ZigBee transceivers and eventually through Bluetooth.

The second part of the project consists of a speech to text converter. An android application is built for the same, using MIT App Inventor. Design and implementation of the home assembly system, using ZigBee technology in API mode, so as to create a mesh network, has been established properly. The threshold set of the sound sensor at the two remote stations, was achieved using the sound sensor, FC-04.

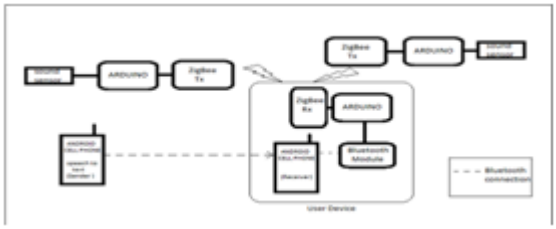

Fig. 2. Functional Block Diagram

C. VOISEE COMMUNICATOR: An Android Mobile Application for Hearing-impaired and Blind Communication

To address the communication needs of, hearing-impaired and blind an App is developed in Android. [3]This App helps message based communication between Hearing Impaired and Blind people. Figure below represents the design of the voice communicator. It is where the user will have to input a message into the device, and then the device having a prepaid SIM will send the input message to the telecommunication network. And in return, the telecommunication network will first check if the account is capable of sending the message, and if it does then it will forward the input message back to the device and the device will give the output message into the user. The application relies on the data storage of contacts and messages fetched from the device. The device which is used serves as the medium of communication between the sender and receiver.

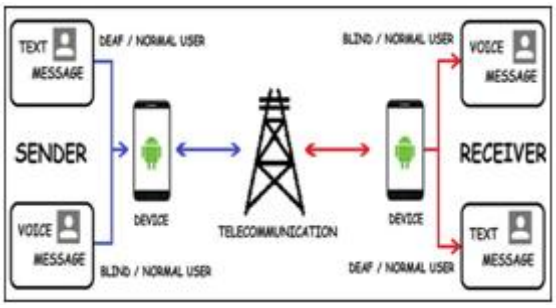

Fig. 3. Voisee communicator Architecture

III. METHODOLOGY

Mobile Hearing Aid is an Android Application which helps Hearing Impaired people to communicate better with Surrounding Environment and people. It consists of the following two modules:

1. HEARING AID
2. AUDIOMETRY TEST

A. Hearing Aid

First the hearing aid is used to catch the noise signals in the air and convert them into electrical signal in order to transfer them through the earphones. For this process the hearing used first initiates the hearing aid method which is used for recording the audio through the earphones, create audio record object and an audio track with android media API after that it saves the record in the format of an audio file. It can also playback the last recorded audio file. It can invoke the speech to text interface if the user requires and can also allow the user to change the settings in default phone equalizer so that the user could have a better and improved experience. Finally the when a user calls the audiometry test it will direct the user to it.

B. Audiometry Test

The audiometry test is used generate a graph of hearing capabilities of the user so that he can self assess himself on his hearing capabilities for this process first we need to train the earphones as all the users may not be using the same set of earphones for this we will be using pre calibration activities. To test these earphones initially the user have to place the earphones on the screens of mobile phones later after that the phone will generate sounds of different frequencies and will calibrate the earphones according to their response to their inputs. once after that process was completed the user will plug-in his earphones and start to the test and the application will generate the audio sine waves of different frequencies(500,1000,3000,4000,6000,8000)with a sound note of 5,10,20,25 dbs at each frequency. once the user hears those sounds then he responds to them by clicking on the screen and the application uses FastFourierTransforms (FFT) to calibrate the rms value of the audio heard. From rms value, to calculate Decibel value for FFT of audio Cooley-Tukey algorithm is employed. Decibels/volume at each frequency from the calibration are stored in a file for using in audiometric test. Calibration Complete Activity gives information to user about completion of calibration and navigates user to Audiometry TestActivity. Audiometry Test Activity uses PlaySound(genTone()) method Generates and plays audio sine waves of 2second duration at different frequencies(500,1000, 3000,4000,6000,8000)Hz for Left and Right ears. dispatch- TouchEvent(MotionEvent e) method executes when the user touches the Mobile screen when he hears the audio. The method determines the minimum Decibel level heard at each of the above Frequencies. Minimum decibels at each of the frequencies are stored in a file. Finally Test Complete activity Obtains saved Test results from file and displays the results in TableLayout and navigates the user to Audiometry activity.

IV. RESULT

Application is deployed in the andriod application and its is as shown in the below diagram. Here if we can see on the output screen that their are five components which are for hearing, playback, speech to text, equalizer and audiometry texts once if the user clicks any of hte following buttons the application we direct the user to resultant destination wherever he desires. later we can see that the application redirects to auidometry tests.

Fig. 4. Hearing Aid App

later after opening the audiomerty test the user goes thourgh the earphone calibration process and takes the hearing capability test the application will produce a graph based the responses of the user to the hearing aid test and later after the application displays the graph as shown below graph marking the right ear hearing capacity in red and left ear hearing capacity in blue on the graph generally the test takes about 10-15 minutes to complete and the results will be more accurate if the user uses a good quality earphones.

V. CONCLUSION

By using this Application, sound Recognition is made possible for hearing impaired people by using mobile earphones. This application successfully helped hearing impaired people to understand the speech of others by speech to text conversion. This application also made it easy to take Pure-Tone Audiometry test to assess hearing levels. Finally we were successful in implementing all the modules of this application.

REFERENCES

1. Design and Implementation of Software Based Audiometer System-BY Mehmet Cem Catalbas and Hasan Guler – Journal of Image and Graphics, Vol. 5, No. 1, June 2017
2. Development and Evaluation of a Portable Audiometer for High-Frequency Screening of Hearing Loss From Ototoxicity in Homes/Clinics –BY Peter G. Jacobs*, Member, IEEE, Grayson Silaski, Debra Wilmington, Samuel Gordon, Member, IEEE, Wendy Helt, Garnett McMillan, Stephen A. Fausti, and Marilyn Dille
3. VOISEE COMMUNICATOR: An Android Mobile Application for Hearing-impaired and Blind Communications-BY Junar Arciete Landi-cho ,Mindanao University of Science and Technology, Philippines-International Journal of Interactive Mobile Technologies.
4. ANDROID BASED AID FOR THE DEAF-BY Apeksha Khilari ,Manasi Marathe, Aishwarya Parab, Manita Rajput-International Journal of Technical Research and Applications e-ISSN: 2320-8163.
5. Hearing Aids -by Gerald R. Popelka , Brian C.J. Moore, Richard R. Fay,Arthur N. Popper.
6. Professional Android 4 Application Development- by Reto Meier
7. https://developer.android.com/reference/android/media
8. https://developer.android.com/reference/android/speech/SpeechRecognizer
9. HEARING MEASUREMENT- BY John R. Franks, Ph.D.
10. Data Structures and Algorithms using Java-O'Reilly School of Technology course
11. The Scientist and Engineer's Guide to Digital Signal Processing -By Steven W. Smith, Ph.D.
12. Audiometry Screening and Interpretation -JENNIFER JUNNILA WALKER, MD, MPH, U.S. Army Health Clinic, Schofield Barracks,Hawaii

AUTHORS PROFILE

Himakar Sai Chowdary, pursuing Bachelor of Technology, pursuing 4th year in Department of Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada. His areas of interest include java, Artificial Intelligence, Android development, Virtual Reality

Manoj Kumar Alluri, pursuing Bachelor of Technology, pursuing 4th year in Department of Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada. His areas of interest include machine learning, python programming, Android development.

Venkata Sai Maneesh Morampudi, pursuing Bachelor of Technology, pursuing 4th year in Department of Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada. His areas of interests include Block chain, Android development, AI.

Likhitha Kolupuri, pursuing Bachelor of Technology, pursuing 4th year in Department of Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada. Her areas of interests include Android development

Anuradha Chinta, currently working as Assistant Professor, Department of Computer Science and Engineering, VR Siddhartha Engineering College, Vijayawada. She has more than 6 years of teaching experience and has received an m-tech degree. Her area of interest includes Machine Learning and Data Mining.