Android Based Smartphone As Hearing Aid

Dr. K Saravanan [1], M.S. Veeresh Prasad[2], Vinod Kumar Y. S[3], Ajay. H[4]
[1, 2, 3, 4] Dept of Information Science and Engineering
[1, 2, 3, 4] New Horizon College of Engineering

Abstract- *This paper describes android based mostly Smartphone as hearing aid that is associate android application that's helpful for Hearing-loss individuals. Affected by hearing-loss may very be frustrating, and in several things, it may ruin one's life. Counting on the severity of the case, impairment might be treated in most usual cases. However, for deafness caused due to receptor harm, hearing aids is the viable resolution. With the help of technology, some smartphones are presently capable of serving those who area unit having issues with hearing.*

Keywords- Android Application, Speech to text, PLP features.

I. INTRODUCTION

Android primarily based smartphone as hearing aid could be a technology which facilitates hearing-loss persons invaried things. Concerning nine million folks within the world are thought-about to be hearing-loss persons. This project aims to lower the barrier in communication by developing a conveyable device that act as a wise assistant. The device will act as a synthetic ear. Through this device the disabled persons will even create a telephony communication that is outlined as almost an impossible issue for them. Thus, our primary goal during this project is to provide a typical life-style for hearing-loss peoples as traditional ones.

During this project, once a normal person tries to communicate with a disabled person with the help of this device, the device starts vibratory informing that somebody is around you for interaction. It takes inputs from the microphone, then the device will speech to text (STT) conversion and displays it on the device screen, supported what the conventional person conveys. The user will offer reply as text message. The output is obtained from the speaker present in the smartphone. A sophisticated prediction texting construct is going to be provided, so the delay in communication are often reduced. The main objective of the project is to develop an android app using features and hardware available in the android smartphone.

II. PROBLEM DEFINITION

The problem statement is to build an application which helps the hearing-impaired individuals to facilitate them the use of smartphone. This project also facilitates the disabled persons with multiple language support. Thus, our primary goal in this project is to provide a standard lifestyle for hearing-loss people as normal ones.

III. EXISTING SYSTEM

The present solution for hearing loss is wearable hearing aid, voice to text telephone, wireless hearing aid earphones. However, the main problem is there are different solutions for different requirements. The mentioned criteria bring issues like portability, availability, costly. 'n' number of solutions for 'n' number of problems. A person who is suffering from hearing loss will not be able to attend the calls. He/ she will not be able to access the media like voice recordings and television. The present solution for television access is the hearing aid compatible earphones, which is expensive. Solution for listening to a speaker is hearing aids, which is dependent on battery cells usually of least backup. Voice to text conversion telephone for attending telephone communication, which has portable issues.

IV. SYSTEM DESIGN

1. Language Selection

Here the user will be able to select the language of his/ her choice. The availability of different languages depends on those provided in the smartphone operating system. Usually the android smartphones are provided with 120 different languages. The basic ASR speech recognition model supports all of those languages. Language is nominative among a recognition request's language Code parameter.

2. Background Detection

The application will be able to detect the background noise that are going on in the ambience. When there are any audible actions being performed in the ambience, then the application detects what is going on and lets the user know the same through display output. For example, if there is a crowd

standing nearby talking, then the application detects the situation and provides the output as “Crowd”.

3. Voice Detection

The user on conversation the voice is received by the microphone and provides the input to the application. The given input voice is then converted to the speech by the Speech to Text module included in the application.

4. Voice to Text Conversion

This module converts the detected voice into the text that is displayed on to the application screen. The user gets the output from the android application on the smartphone display in the form of text.

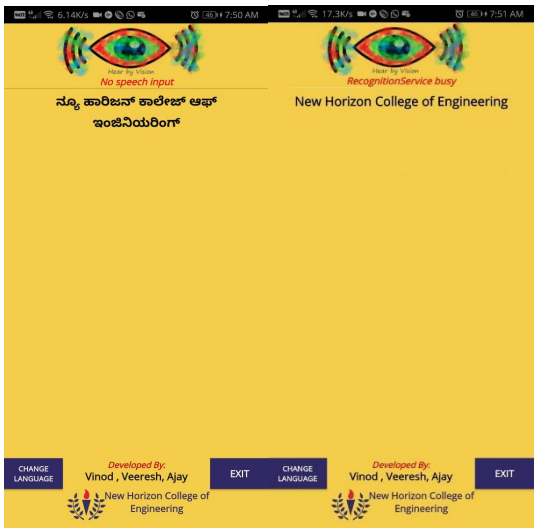

Figure 2: Android Application showing output

V. IMPLEMENTATION

1. Microphone

Microphones work a lot like the human ear! In human ear the ear drum vibrates when struck by sound waves and is converted into an electrical signal which is interpreted by your brain. A microphone operates in much the same way. A microphone's diaphragm converts vibration into electrical energy.

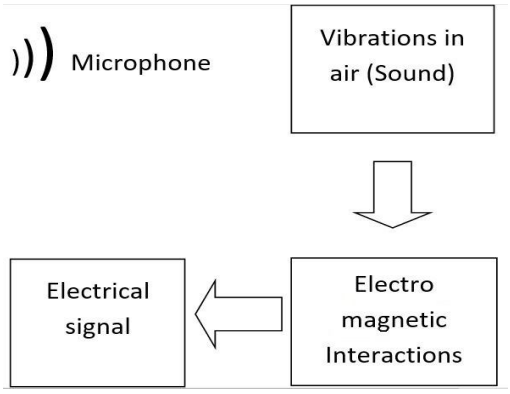

Figure 1: Working of Microphone

2. Speech Recognition

Speech Recognition works on human inputs that facilitates the machines to react on inserted text, voice, or the other inputs. It allows users to dictate to their computers or on phones so that their words get converted to a text in a word processing or email document. Speech is powerful which brings a human dimension to different electronic devices. The algorithms used in this form of technology include PLP features and deep neural networks.

VI. ALGORITHM

Perceptual Linear Prediction

The technique for the analysis of speech, the perceptual linear predictive (PLP) technique, is presented. This technique uses three concepts from the psychophysics of hearing to derive an estimate of the auditory spectrum: the critical-band spectral resolution, the equal-loudness curve, and auto regression model.

1. Spectral Analysis

The speech segment is weighted by the Hamming window W(n). The typical length of the window is about 20 ms[1]. For a 10kHz sampling frequency, a 256-point FFT is needed for transforming the 200 speech samples from the 20 ms window, padded by 56 zero valued samples. The real and imaginary components of the short-term speech spectrum are squared and added to get the short-term power spectrum.

2. Critical-band spectral resolution

The spectrum is warped along its frequency axis into the Bark frequency. This particular Bark-hertz transformation is due to Schroeder[1]. The resulted warped power spectrum is then converted with the power spectrum of the simulated critical band curve.

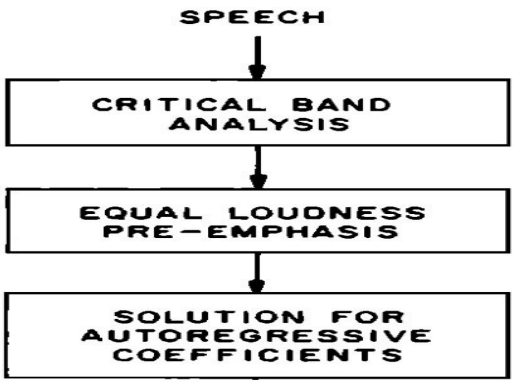

Figure 2: Perceptual linear prediction process

3. Equal-loudness pre-emphasis

The sampled critical band spectrum is pre-emphasized by the simulated equal loudness curve. It is an approximation to the non-equal sensitivity of human hearing at different frequencies and simulates the sensitivity of hearing at about 40-dB level.

4. Autoregressive modeling

This is the final operation of the PLP analysis, is used to yield the autocorrelation function. The autoregressive coefficients could be further transformed into some other set of parameters. This function basically provides the output based on the already produced output, otherwise, predicts future behavior based on past behavior.

VII. FLOWCHART

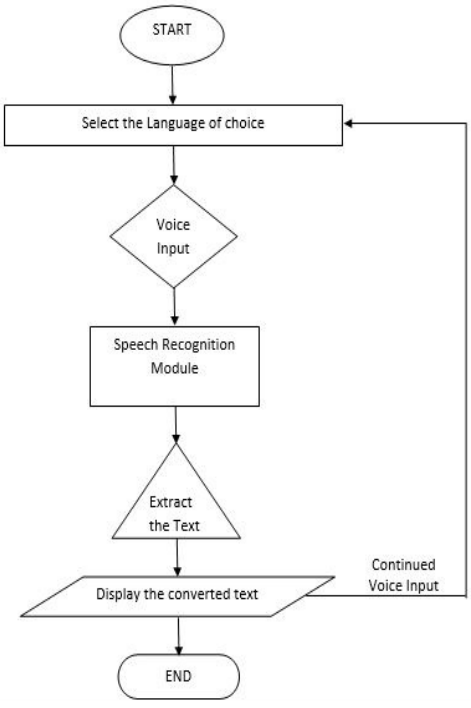

Figure 3: Flow Diagram of the application

Initially when the application is opened, the user is prompted for selecting the language of choice. The application redirects the user to the smartphones setting menu to change the language. Then the voice input is given by the user, which is received by the microphone. The speech is sent to the speech recognition module which in turn produces respective text as output. The process is into loop if the conversation is continued and if there is no input available then the application closes.

VIII. CONCLUSION

The compact and cost-effective solution for the android based smartphone as hearing aid has been achieved by the android application development. The application was successfully completed using the android Speech to Text API and a fully working android smartphone. The hearing-loss person can now make use of the application and get access to common activities involving audibility. This application can further be used to develop an android application to help the blind people by including Text to Speech API.

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AUTHORS

1. First Author- **Dr. K. Saravanan**, Assistant Professor in NHCE, Bangalore in the Department of Information Science and Engineering.
Role: Project Mentor.
Email: k.saravanan@gmail.com

2. Second Author- **M S. Veeresh Prasad**, Pursuing B.Tech final year in NHCE, Bangalore in the Department of Information Science and Engineering.
Role: Team Member.
Email:vp1nh16is054@gmail.com

3. Third Author- **Vinod Kumar Y.S**, Pursuing B.Tech final year in NHCE, Bangalore in the Department of Information Science and Engineering.
Role: Team Member.
Email:vinu0987654321@gmail.com

4. Fourth Author- **Ajay. H**, Pursuing B.Tech final year in NHCE, Bangalore in the Department of Information Science and Engineering.
Role: Team Member.
Email:ajayhanu63@gmail.com