SoundMate: A Hearing Aid Application

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Abstract---In today's world, a high percentage of youngsters faces the problem of hearing impairment. According to various studies more than 18% of world population is suffering from the same. Although hearing aid is widely used and helps the impaired for communication, these devices alone are not satisfactory as the user cannot use earphones to listen to any audio. Because of their impairment they are deprived of using headphones or earphones for entertainment purposes like normal youngsters do. Even though many of them use hearing aids as a solution, many people are not comfortable with using them and using hearing aids may result in some limitation of their personal life like use of earphones. It will make these patients unable listening to music and watching movies using earphones in public. So as a solution to this problem we came up with an idea of using smart phones along with earphones as a hearing aid. Thus, we are planning to develop an application that can be used to boost volume for them, in each ear separately, so that they can hear their surroundings clearly. It also includes an additional feature where one can also access the media like audio or video, maintaining the custom boosted volumes. This helps the user to listen to music or watch videos as well.

Keywords: Hearing Impairment, Hearing Aid Application

I. INTRODUCTION

A hearing aid is a device to improve hearing by making the sound audible to a person with hearing loss or impairment. Recently a large use of mobile multimedia platforms, especially smartphones gave new life to pocket hearing aids. A smartphone can function as a hearing aid under a simple software programmed to control the audio subsystem of the device. Although a smartphone cannot be considered as a substitute for hearing aid devices, it can still be advantageous because it is comfortable for the users and there is no need to buy an additional device. The principle of hearing aid application operation is that the microphone receives an acoustic signal and converts it into a digital form. Sound amplification is achieved by mobile computational platform, in accordance with the degree of users hearing loss. The processed audio signal is transformed into audio signal and output to the user into the headphones/headset. Hearing aid applications have two operational modes: setup mode and hearing aid mode. Setup mode determines the user's hearing characteristics. Hearing aid mode corrects the user's hearing in accordance with user's hearing thresholds. Hearing aid application have several advantages

- ? using of different types of headphones and headsets
- ? high sound quality due to large speakers and a long battery life
- ? does not require special equipment and qualifications
- ? does not cause any psychological inconvenience
- ? the user does not need to carry any separate device.

This paper aims at maximizing the quality of hearing for the hearing impaired. It provides a solution to the limitations of hearing aid devices. It captures the sound and adjusts the frequencies and adapts them to the user's specific capabilities.

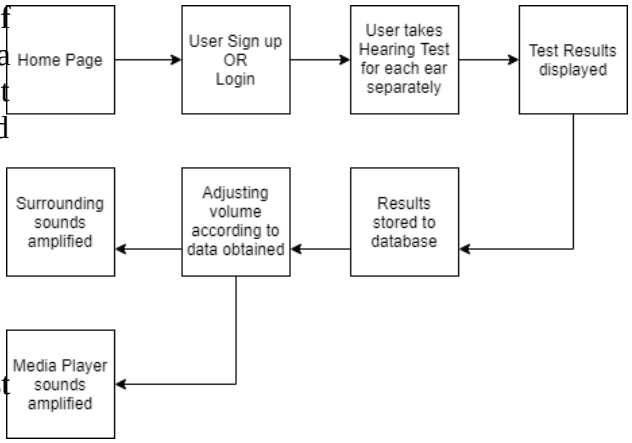

Fig 1. Block Diagram of working of the system

II. SYSTEM STUDY

Our proposed system will have four phases. The first phase is displaying a log in phase. If the user is new, he/she can create an account. The specifications provided by the logged in user will be applied to his account only and when logged out, goes back to the default settings. This phase is included so that many users can use the same device with different user specified volume adjustments for each user. The second phase is a Hearing test, which will play an audio of gradually increasing loudness. The user is meant to tap when the sound is audible, to mark their threshold of audible db. Analysing the data, the app finds the percentage of hearing loss in each ear. Next, the volume of the system is adjusted according to the collected data in each ear separately. User can also manually adjust volumes according to their preference. The next phase is Communication. The app is now ready to use for communication purposes. The adjusted volumes will remain throughout for the logged in user until he/she logs out or switches account. The external sound is captured in mic and is fed to the earphones. Unwanted noise is cancelled. The internal sounds are amplified according to the collected data and fed to the earphones. With this, the user may use multimedia and listen to audio from their devices. The final phase is the exit app or log out. With this the user signals that he has done using the app and needs the volumes back to default so that others can use the devices. If the user switches account, the volume adjustments get adjusted according to the switched user's specifications.

KEY FEATURES OF THE SYSTEM

- Includes hearing test
- Able to adjust volumes individually for each ear
- Amplify without affecting quality
- Available for free to all users
- Simple operations with easy installation procedure
- Performance and reliability

III. SYSTEM DESIGN

Our System will be programmed using Android Studio for implementing the features required and MySQL for constructing and managing the required databases.

The features required are:

- Registration/Login
- Conducting Hearing Test
- Displaying the Test Results
- Adjusting volumes for each ear

The databases required are:

- Database for Login
- Database for storing test results for each user

Our system will have three roles/actors which interact with it:

App: The app provides the user with the interface to interact with it. It first displays a login/register page for the user to register to the app. The registration page then leads to a hearing test, which will play a test audio and the user is required to notify when the audio is audible. After this, the app displays the test results. Whenever the user logs in, his test results can be seen or updated by performing another hearing test.

Administrator: The administrator manages the databases of the application. It saves the registration details of the user to a database along with their username and password. It also saves the results of the hearing test of the respective users to the database so that the specifications of the user's audible volumes is obtained. Then app manages the adjusting of the volumes after the hearing test is conducted. It takes the respective values of the volumes from the database and adjusts the volume settings internally so that the user can hear accordingly.

User: The user interacts with the system. The user first registers to the application. Then he/she takes the hearing test and specifies his/her audible range. The user can then view the test results. Next the user can either take the face-to- face communication page or go to media and listen to music in their custom adjusted volumes. The user can also update their adjustments by conducting another hearing test.

Two use case diagrams are provided to better understand the way the three roles interact with each other. The first use-case diagram shows the overall interaction and the second use-case diagram shows the detailed interaction during the hearing test.

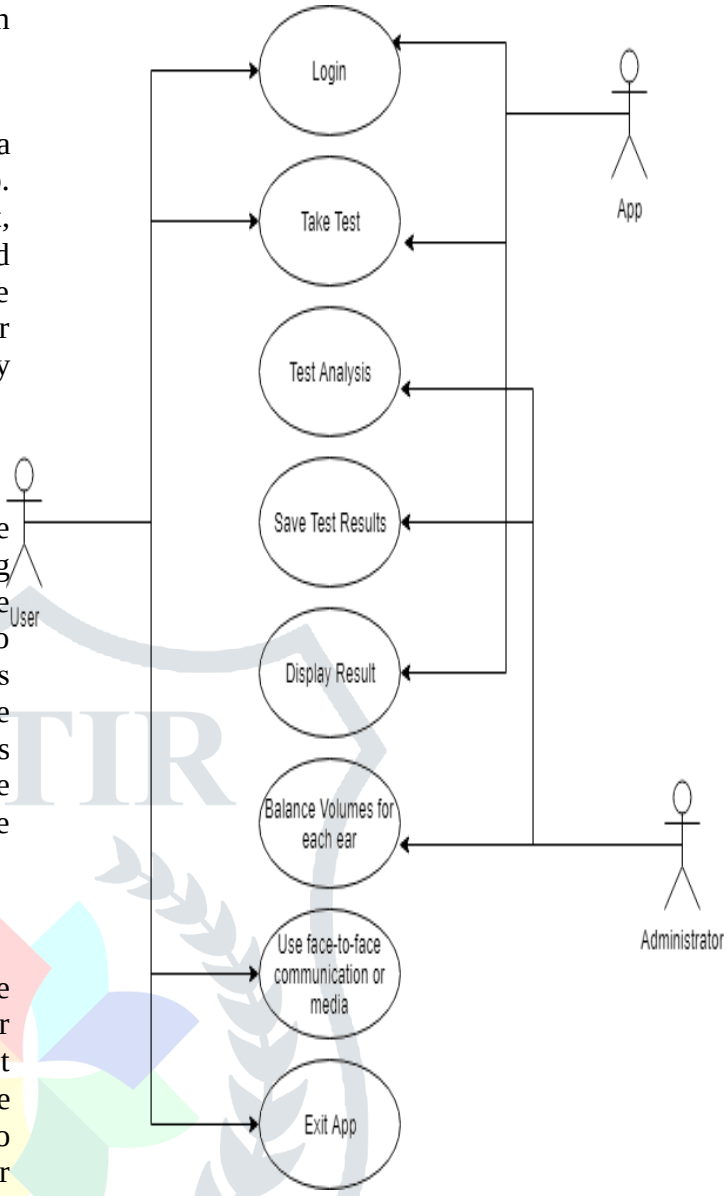

Fig 1 Use case diagram for SoundMate application

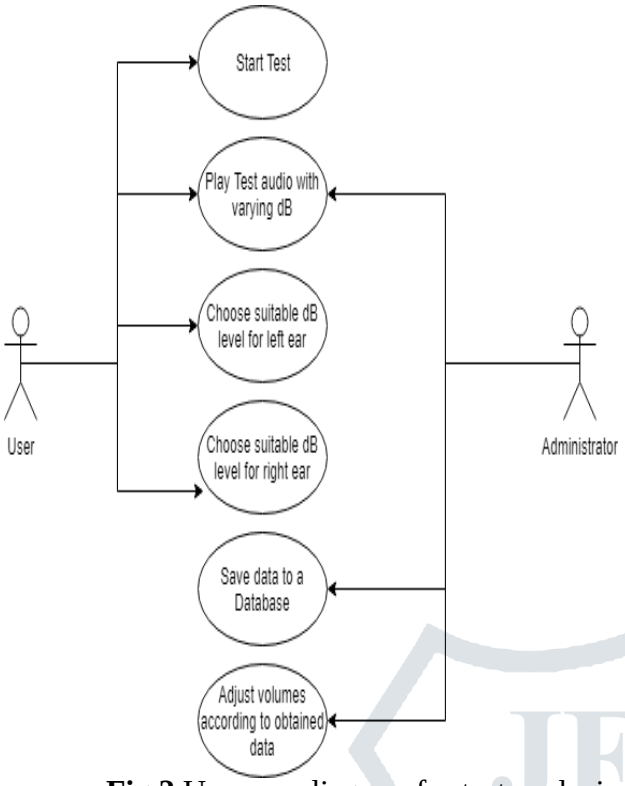

Fig 2 Use case diagram for test analysis

The interfaces of our application includes a home page, a login page and a registration page. It also includes a Music Player containing four functional buttons: play button, pause button, forward button, backward button. It also includes a seek bar showing the progress status. Start time, end time and ongoing time is displayed above the seek bar.

4. CONCLUSION

The paper presents a smartphone-based hearing aid providing a solution to the limitations of hearing aid devices. It is capable of adjusting volumes for each ear separately. In this way the user can specify the different volumes needed for each ear. This is done by a hearing test for each ear separately. This feature is useful in schools for the hearing impaired. Each student can have their systems audio adjusted to the comfortable volumes of their choice. So if an audio is being played in labs, each student will be able to hear it much clearly with their custom adjusted volumes.

5. REFERENCES

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