Alternative Designs Report

Bekesy Test for Mobile

Samir Dahmani, Joe Wolanski, Nihit Mody

Client #19
Dr. Doug Oliver, UConn Health Center, 263 Farmington Avenue, Farmington CT
Alternative Designs

Design 1

The user will begin by identifying the type of headphone he/she is using, choosing from a list of headphone varieties and possibly models i.e. over-ear, ear-buds. Next the user will be prompted to choose from a list of frequencies that he/she will have the option of playing and attempting to hear. Each frequency will be assigned an age range. The age range will reflect the average maximum frequency of sound that individuals with healthy hearing can perceive. The frequencies will be scaled and calibrated contingent upon the type of headphone selected in the starting menu. The user will then be able to determine whether or not he/she is suffering from hearing impairment based on their test results. Some limitations of the app depend on the operation of the app. The app will work optimally in a quiet environment, using a pair of Sony MDR-V6 headphones, or otherwise similar digital monitoring headphones.

Hardware

Hardware: Android Phone/Tablet

User interface: Touch Screen

Hardware interface: Monitor Headphones

Something similar to an app like the one displayed below:
Design 2

The fundamental concept behind the Bekesy audiometer is that the patient records his or her own threshold automatically on an audiogram black. When the audiometer is turned on, a pure tone at a midrange frequency will come through the earphone. The subject will control the intensity of the stimulus by pressing a button while listening to a pulsing (0.5s) pure tone whose frequency slowly moves through the entire audible range. This is what is called an “interrupted” tone. The intensity diminishes as long as the button is depressed. When the intensity is too low for the subject to hear the tone, the button will be released and the intensity will start to increase. When the subject again hears the tone, the button will be pressed again, producing a zigzag trace. The test will involve diagnostics on each ear, after which the tracings of both the left and the right ear will be compared. The test will be usable to differentiate between cochlear and neural hearing losses.

Because of the importance of having the calibration of the headphone and output jack be constant across all users of the app, the mobile platform chosen for the development of the app is Android Platform, using the wildly popular Google Nexus 7 Tablet. Due to the widespread use of Apple ear buds, the app will be calibrated according to the ear buds and Nexus 7 combination. Such uniformity is not so apparent in Android phones, due to the variety of manufacturers (and likewise headphones and/or output gains).

Hardware: Android Phone/Tablet

User interface: Touch Screen

Hardware interface: Google Nexus 7 Tablet, apple earbuds
The UI layout for design 1 could be a square with a big button in the center. Or two buttons like below. There would not be a lot of client facing information to make it straightforward and easy to use. This design could also feature a running display of frequencies being played: 250, 1000, 4000 and 8000 etc. The app would compile
user data and create a graph of each ear at the end over a normal hearing threshold.

Design 3

A pure-tone air conduction hearing test determines the faintest tones a person can hear at selected pitches (frequencies), from low to high. During this test, earphones are worn so that information can be obtained for each ear.

The person taking the test can respond indicate whether or not they hear a sound by clicking a sound. A “toast” would then enter the screen to indicate that a sound has been played (like above). The app would compile user data and create a graph of each ear at the end over a normal hearing threshold.

Hardware

Hardware: Android Phone/Tablet

User interface: Touch Screen

Hardware interface: Monitor Headphones