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CSE 440 - Autumn 2014
2f: Design Check-In

Tasks:
#1: Perceiving the sound levels of a loud environment

Timmy works in a family restaurant and has been for a few months. He's noticed that sound levels increase as the amount of clientele increases especially with large families and children. After a busy night, he sometimes feels ringing in his ears and has trouble falling asleep at the night. He wonders about the implications of this and whether working in such an environment will affect his future health. He has several friends in the construction industry and knows they are required to use ear protection at their work sites. However, he also knows that he has to be ready to listen to orders from customers and maintain communication with his coworkers.

2: Measure dB levels of a given environment

Jason is a student and wants a way to measure dB levels of a given space so he has some context to what is considered dangerous levels of sound exposure for one of his science projects. He researches different methods of gathering sound data and he finds that there are a multitude of options. There are dedicated sound meters that vary from price and quality as well as phone applications that utilize the build-in microphone to measure sound. He decides to use a phone application since he does not need the high fidelity of a sound meter and is simply curious of the range of dB he encounters on a daily basis. He calibrates the device by going to various venues that display different levels of sound. He decides to test a quiet environment such as a library as a point of reference. He then goes into a moderate sound level space like a grocery store. Finally, he goes to a louder environment like a local concert to capture the highest peak of sound exposure.

#3: Understanding long term effects of high dB exposure

Jack is a sound design student and he is learning about certain dB levels and their relation to everyday objects and occurrences. During his activities throughout the day, he is actively aware and conscious of loud environments around him. With his efforts in trying to reduce the amount of exposure to high dB levels, Jack does some research on the long-term impacts of his current exposure patterns. He finds that even at relatively low dB levels hearing damage can occur and how certain dB levels compare to real-life objects and situations like standing next to the train tracks or operating a lawn mower. He also discovers websites that simulate different stages of hearing loss and is moved by the effects it can have on daily life. This new information further motivates his efforts in maintaining a safe threshold of sound exposure despite his surroundings and constraints from work or otherwise.

#4: Setting a personal aural profile, data tracking, and visual representation

Jennifer is a waitress and an overall aurally conscious individual. She wants to find a way to use the sound meter on her mobile device to actively record sound environments throughout the day. She knows that she has a family history of hearing loss and who it can affect how and when hearing loss will occur. She passively records and periodically logs dB levels of her activities during her workday and plots the data on a two-dimensional graph showing dB levels with respect to time. She notices there are times where dB levels were abnormally high and takes notes on that. She repeats this process for a few days and compares and analyzes this set of information.

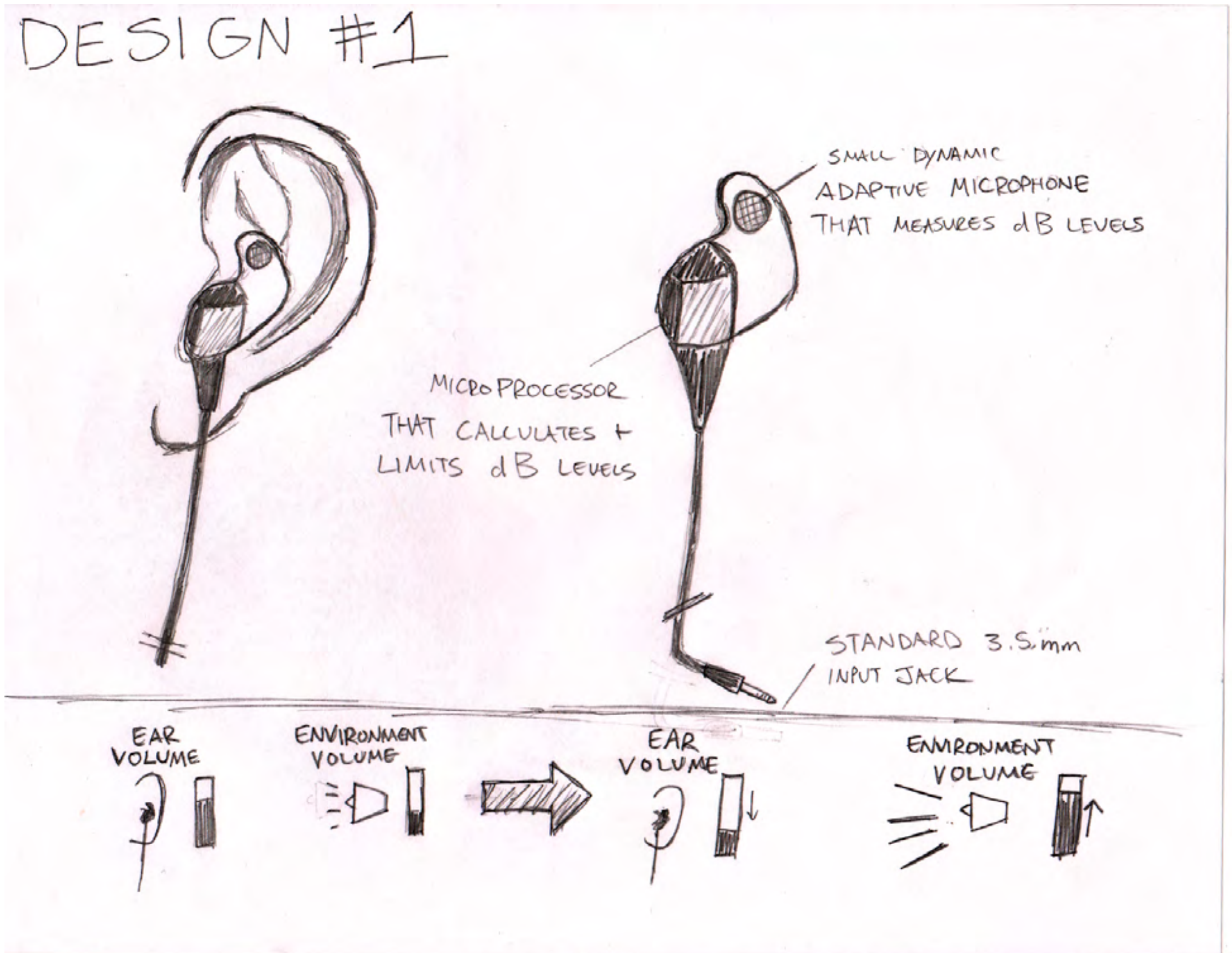
#5: Limiting controllable sources of sound

Cynthia is an avid commuter that frequently listens to music on her commutes whether it is driving in traffic or riding public transportation. During times of high sound levels, she reminds herself to lower the volume of her music as to not increase the likelihood of hearing loss. However, she sometimes forgets or is distracted and accidently leaves music at high volumes despite the addition of the noisy environment around her. To remedy this, she tries to take breaks from her music by either taking off her headphones and using therapeutic silence to try to adverse the effects or use ear plugs to traverse loud environments.

#6: Sharing personal sound data

Paul is a father of two young children who is also an aurally conscious individual. He wants to protect his children from hearing damage on a day to day basis and instill that type of knowledge to them as they grow up. He has heard of a technology that maps and visualizes areas of high dB level in places such as restaurants and other heavy foot traffic intersections. This technology provides a heat map of dB levels across any given space over time. The technology is crowdsourced with data coming from all types of individuals that record sound levels and allows users to share them with friends and family. Since the technology is based on mobile phones and utilizes their geotagging features, it makes it easy for Paul to record the sound level of a space and post the data on a database to be mapped in the near future. With this information as well as other data from other users, Paul is able to look at the sound levels of certain areas of interest and make decisions based on that for himself and his family.

Design #1:

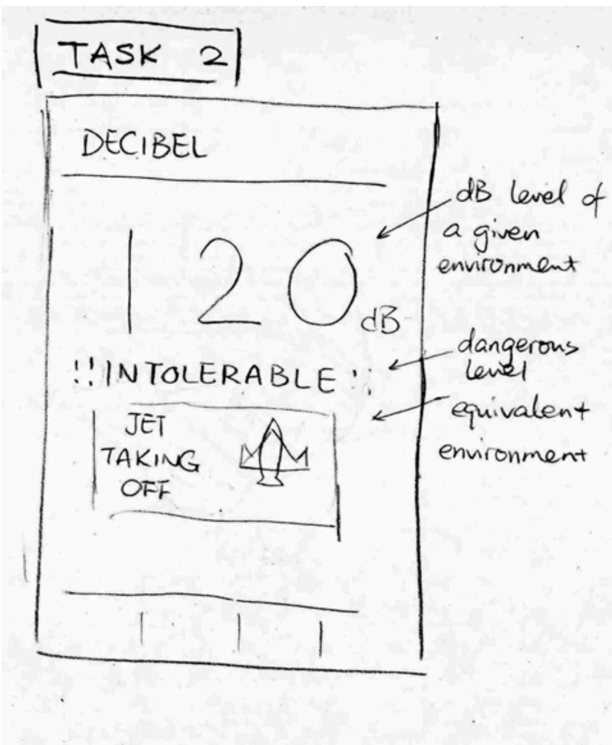


The first design are earphones that adaptively change the volume of the output sound based on the sound levels of the outside environment. The first image shows how the headphones would adhere to the form factor of the ear and how discrete the design would ideally be. Since the shape of the outer and inner ear differ between individuals, it would be exemplary if there was a method of customizing the contour of each ear piece to a particular user using some kind plastic mold to provide the utmost comfort and usability.

The second image of the right shows the earphone in more detail. At the top of the earpiece, there is a small microphone that will actively capture the dB level of the surrounding environment, which satisfies the first task. The main body of the earpiece itself consists mostly of a microprocessor that will receive sound data from said microphone and calculate the amount of sound allowed to the listener. This in turn achieves tasks 1, 2, 3, and 5 as it becomes the mechanism that helps limit the listeners sound intake depending on the sound from the earpiece itself and sound from the surrounding environment as highlighted with the diagram at the very bottom of the image.

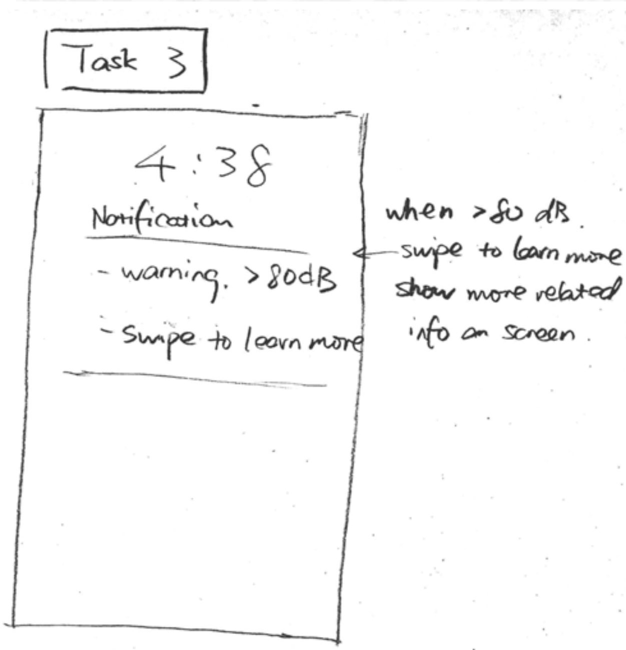
Design #2:

The second design is a phone app interface for our tasks. It measures noise level of surrounding environment by phone's built-in microphone and shows relevant information on different app screens. It includes functionality to show decibel level measured, push notification for alerting people in loud environment, show personalized log and graph to show dB levels corresponding to time, limit the headphone volume, and show heated sound map according to location and time.



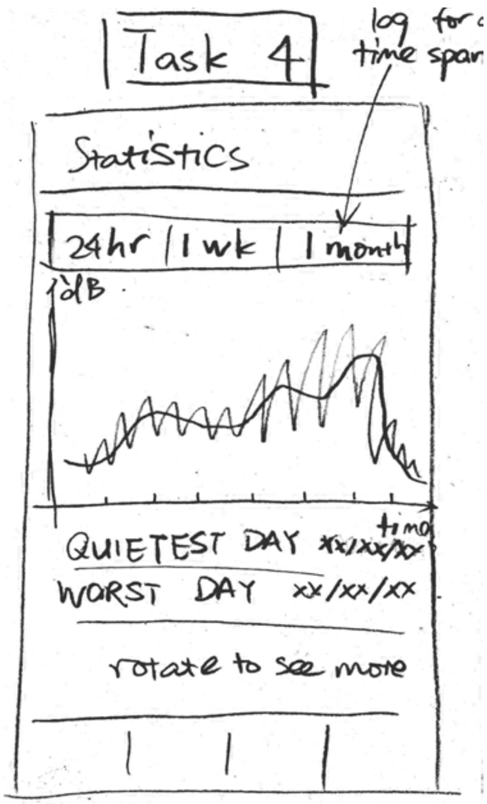
Tasks 1 & 2:

To complete **Tasks 1 & 2**, users can simply open the app and immediately see the decibel level captured by built-in microphone presented on the first screen. This objective indicator helps raise user awareness and user perception of noise (**Task 1**). It also shows the description of the noise level, such as "extreme", "comfortable", and "quiet". Additionally, the design shows an image of the scenario with equivalent sound level (**Task 3**). This information makes the data more readable so that users can compare it to more relatable situations.



Task 3:

The app alerts users when they are in loud environment with a decibel level greater than 80dB to raise their awareness. Users can swipe to learn more about relative information or go to relevant websites. This process will eventually form users' habits to maintain a safe threshold of sound exposure and achieve our education purpose.



Task 4:

The app records personal logs of sound environment data throughout users' days. It also visualizes the data by providing users two-dimensional graphs showing dB levels with respect to time for different time spans. Users can compare and analyze their data much easier and in a timely manner because this process actively and automatically generates the data and graphs.

Task 6:

One design feature we discussed (and was suggested by some of our inquiry participants) was a geographical map of accumulated noise data. To achieve this, our design includes a "heated sound map" to show noise levels at different times in a map interface. This is filled out when users upload their location and time information from their phones. When we have enough data, we can crowdsource with personal data and geotags to generate the map. Using this feature, users can focus on a location, set the time, and easily view the available noise data.

Design #3:

Our third design delves into the possibility of using a wearable device to help track sound. This could be an ideal implementation for many reasons. Unlike a phone, a watch would rarely be kept in a pocket or backpack and be completely exposed to environmental noise nearly 24/7. Also, many current gen smartwatches incorporate personal informatics into their designs already. Apple's upcoming iWatch, for example, has bio sensors that measure heart rate and activity levels and their users would be accustomed to this kind of personal feedback. Adding noise tracking would not be a major conceptual leap for many people. The diagrams shown are below based loosely on the iWatch screen dimensions and UI, but these could easily be adapted to similar interfaces.

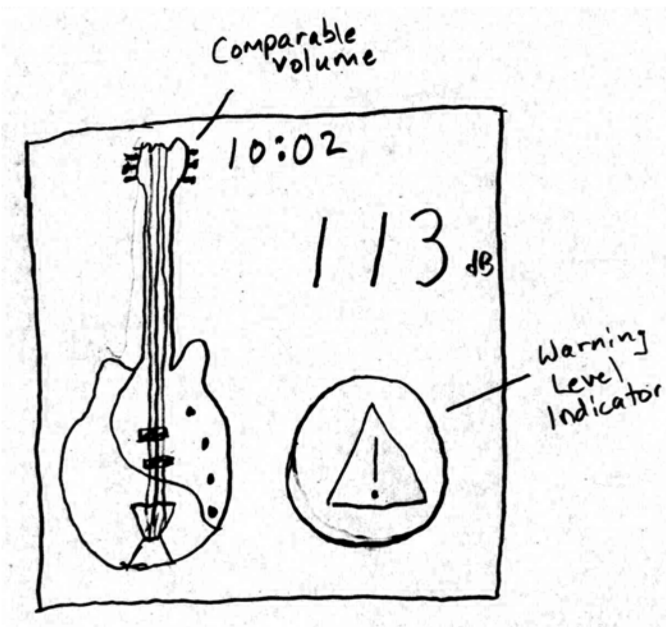


Figure 1:

This figure demonstrates the push notification alert when users are in excessively loud environments (**Task 5**). The watch will buzz, and the users will be presented with this screen. Here you see the current dB level (**Task 2**), a graphical indicator of the severity, and a second visual representation of equivalent (and relatable) exposure (**Task 3**). In this case, a rock concert. Clicking the warning icon takes you to the main application screen.

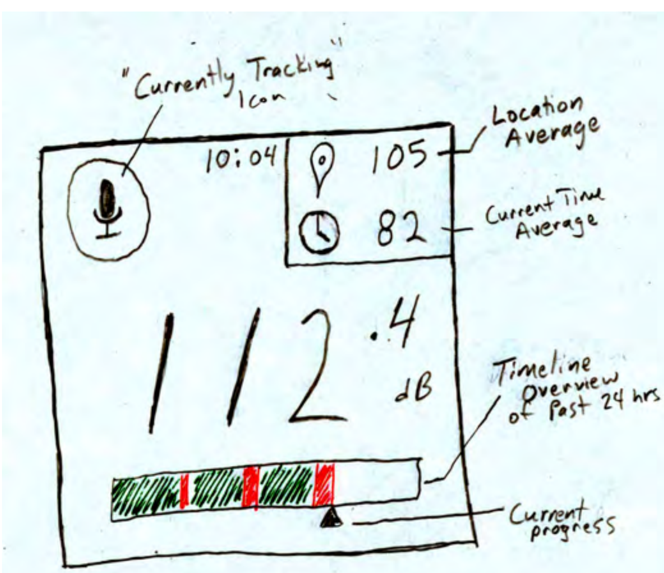


Figure 2:

This figure is the default "splash screen" of the noise tracking app. The primary purpose of this screen is to provide users with current sound levels (**Tasks 1&2**) but there is other info as well. Top left is the icon that indicates tracking is occurring (tapping it turns it off). The top right shows averages for your current location as well as current time (**Task 3**). The bottom bar is a visual representation of a 24 hour period to quickly gauge exposure at a glance (**Task 3**). The start/end time is customizable in settings.

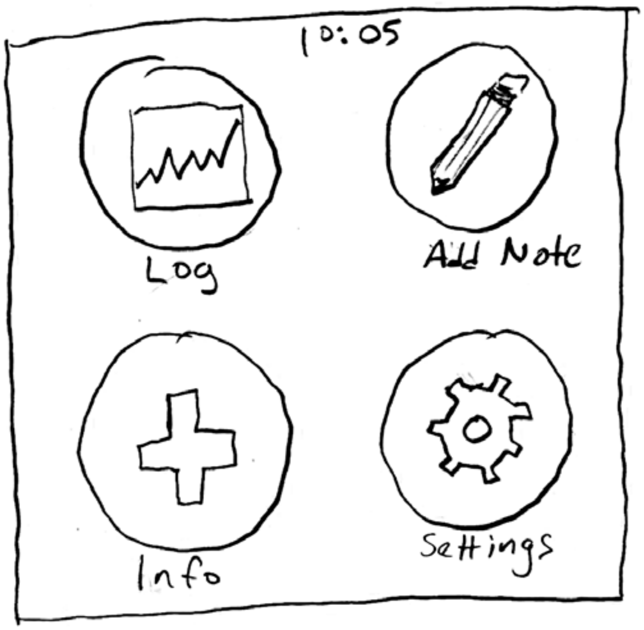


Figure 3:

Pressing the screen in Figure 2 takes you to the options menu shown in this figure. Here you have options to view a log of past data (**Task 3**), add notes to your current measurements to review later (**Task 4**), show information about long term damage at your current exposure levels (**Task 5**), and view/change application settings.

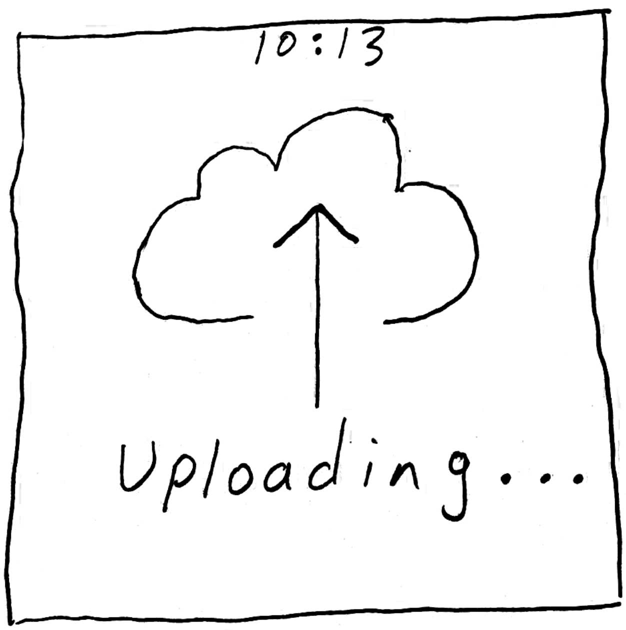


Figure 4:

Periodically the app will send recent measurements to a cloud database. This will allow the user to view and interact with their data on either their smartphone or personal computer. There they will be able to see their history in more detail, share with other users, and view a geographical sound map of all users tracking noise (**Task 6**).