Auditory Selectivity

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Abstract
Auditory selectivity (A.S) is a tangible artwork that increases one's umwelt of sounds in their environment, which they fail to perceive due to the brain filtering background information. Through the interaction with this artifact, one will be able to experience the difficulty of filtering information. They will have the ability to use a mallet and hit the different sides of the octahedron, which is a metaphor for the brain selecting what is important. Without hitting anything, they will experience the frustration from the overwhelming background sounds being portrayed by sound and lights.

Demo video:
https://www.youtube.com/watch?v=_j7RlGi3kx8&feature=youtu.be

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Umwelt; Arduino; Filtering; Ambient Sounds; Tangible;

ACM Classification Keywords
Applied computing: Arts and humanities: Media arts

Introduction and Background
Our project, auditory selectivity is a tangible artwork with the main concept to expand the user's umwelt of their surrounding ambient sounds which they fail to perceive due to the filtering of information by the brain. For example, in a classroom environment, one may not notice ordinary classroom ambient sounds such as the movement of chairs. By filtering out information, we lose full awareness of our surroundings.

By interacting with our prototype, the user will experience how the brain selectively filters out information as their process of hitting the sides of the octahedron is a metaphor for the brain to filter out sounds from the ambient environment. In a larger picture, the user will experience that filter a specific sound is not as straightforward as they think as when the user hits the sides of the Octahedron with the mallet, the side that is hit may not always be the only side that will be filtered. Moreover, this project can also help people understand what people with ADHD goes through and how difficult it is for them to filter specific information.

We have discovered four other projects that demonstrate similar qualities as A.S. The Spinotron is a three part experimental design targeting continuous sonic feedback in tangible interfaces by presenting users with different iterations of sound design [4]. The AudioCube allows users to manipulate sounds by maneuvering the individual cubes within the area of its designated table, to explore sound design [2]. Blackbox

Figure 1. User testing of the Auditory Selectivity object.

is another experimental design tangible in which several independant boxes with different inputs/outputs are given to users to understand abstract electronic interfaces [7]. Closely tying to our concept of filtering, the sound locket is a piece of jewellery that records and plays back sounds depicting memory cuing to reminisce this locket momento [6].
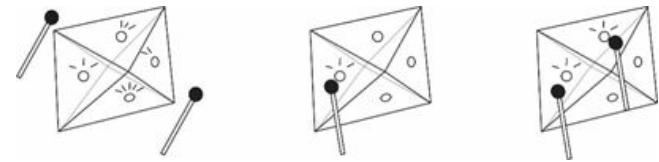
Research through Design/Art Method

Our goal is to be able to design an interactive system where users are able to easily identify what each component is meant to do, before discovering and understanding how each sound produce reflects back to their everyday ambient surrounding.

Concept

Our concept is to expand the user's umwelt of their surrounding ambient sounds which they fail to perceive due to the filtering of information by the brain. A research study was conducted and coined the "Cocktail Party Effect" where participants participated in a cocktail party [4]. Once the participants were in a conversation, they filter out surrounding sounds and focus their auditory senses on the person who is conversing with them [4]. In a larger sense, what one hears is very selective; when one is in the classroom, one may not hear the sound of pencils moving in a classroom. However, the downside of this is that one will lose awareness of common sounds in the environment and may forget what is happening in their surroundings. This project aims to remind the user that many things are simultaneously happening in the environment and the sounds that the users are making are only part of the overall ambient sounds.

Figure 2. The figure on the left represents the clusters of sound being played together with the LED lights in rhythm. The middle figure demonstrates that when the mallet touches one side, then the side that is touched will play the sound and blink, but another side may also accompany it. The right figure conveys that multiple mallets can be used together.

Interaction and User Experience

The process of the user interaction has three steps (see Figure 2). First, the user will enter a room and see an octahedron shaped object hang in a way that a gong would, with a similar size. This object will make loud unfiltered noises depending on the environment that it is in. For example, if it is placed in the classroom, it will make sounds such as chalk writing on the chalkboard, keyboard on the computer typing and so on. Beside this octahedron shaped artifact are two mallets. The mallets afford the user to hold them and suggests to the user that they should hit the sides of the octahedron shaped artifact (see Figure 1). In addition, the sides will also look similar to a drum's batter head which encourages the user to hit it. Once the user hits it, the cluster of the sounds will disappear and only the unique sound of the side that the user hits will be played. Since there are two mallets, this allows the user to hit different sides simultaneously. The mallet is a metaphor for the filtering done by the brain. Hence, it can filter, out the
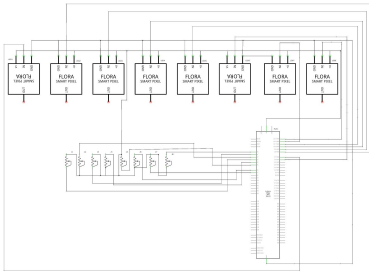
Figure 3. Schematic overview.
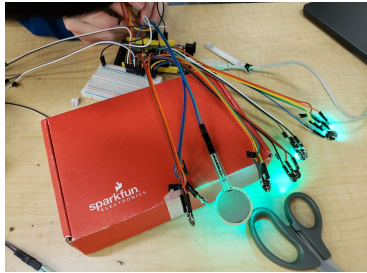
Figure 4. The capacitance touch sensors are the source of input.
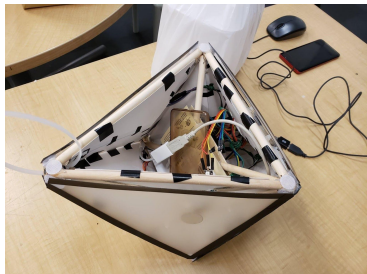
Figure 5. The phone will be placed inside the case and connected with the OTG cable.

rest of the sounds and only focus on one particular sound or focus on two sounds at the same time. Once, the user stops hitting sides, just like how the brain stops filtering out all the noises, all the sounds will be played after a short pause.

When the user first sees and listens to the octahedron artifact, they will feel as if they are overwhelmed by the disarray of sounds and lights blinking. This will make them feel uncomfortable and confused since they cannot depict what each individual sound is. This is the feeling that one will have when the brain stops filtering the sounds from their surroundings. Beside it will be two mallets and afford holding and hitting the sides of the octahedron artifact. Since they are overwhelmed by the noise, hitting the sides of the octahedron can act as a way of relieving stress. The moment they hit one side, the collection of sounds will disappear and the side they hit will play a sound. Other sides may also play a sound to demonstrate the difficulty of the filtering process. This will encourage the user to continue hitting the sides of the octahedron and trying hitting different sides.

Technical Implementation
We used capacitance touch sensors as the input source which detects when the strike of the mallet (see Figure 4). Once detected, it will notify the Arduino Mega which will then activate the actuators being the RGB LED and the phone speaker which was connected through the OTG cables (see Figure 5). The phone will also provide power for the Arduino.

Discussion and Conclusion
Following the extensive research on similar projects, what struck us as interesting in regards to our system, is that Auditory Selectivity is first in its kind to combine the concept of cognitive filtering to a tangible auditory device. We believe the strength lies with the structure and assembly of our tangible object in which it easily affords user interaction, and is easily transportable.

Auditory Selectivity allows the users to experience the task of filtering information done by the brain and it allows them to understand that this process is not as straightforward as they may have imagined. It also allows them to understand how much information is being filtered and what they are aware of only a tiny fraction of the information in their surroundings. By having the demo mode playing lots of noises, this makes the user feel uncomfortable or overwhelmed which promotes their interaction with our tangible artwork.

Our tangible artwork, Auditory Selectivity allows users to experience the process of the brain filtering ambient sounds in their surroundings. Through this process, they will understand the importance of filtering and how difficult the process is. By striking the sides of the octahedron artifact with mallets, being a metaphor for the brain to filter information, they will realize that the side that they hit may not always be the side that is focussed, but additional sides may also be focussed. This project will also allow the users to experience what people with ADHD faces with their limited attention spans. Similar to how the mallet may not always select the sides that is struck, people with ADHD will also have difficulty focusing on specific tasks. The time given to complete this project limits us to fully incorporate the features we had in mind, moving

forward, we could change the ambient sounds dependant on the environment the tangible object is located in.

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