VR Spatial Hearing Loss Demo

to simulate how a person with hearing loss perceives the world for the local hearing aid store hoerportal24 in Ingolstadt.

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1 Ideation report

1.1 Team

- Maria Novik: Ukraine. 23. UX Design Masters Student. Web design specialist, past Web-developer. Bachelor's degree focused on Computer Science.

- Fabian Baumann: German. 28. UX Design Masters Student. Hearing aid professional and owner of the hoerportal24 hearing aid fitting concept practiced in the local store in Ingolstadt.

1.2 Motivation

Many people don't know how a hearing loss feels. Our brain adapts seamless to change of our hearing capabilities, so even people with hearing loss often don't recognize it. Patients with hearing loss get used to hearing their surrounding with hearing loss. A car driving by or the sound of birds and even the voice of loved once always seems normal, even with hearing loss. At first this seems to be a good thing, but speech has its fixed frequency range. Therefore, understanding is a major problem with hearing loss, but never the sound around us. Many customers don't know how a hearing loss sounds and wish to experience it to better understand the situation a related person might be in.

1.3 Idea

Having a VR simulation to bring the customer in a very abstract but clear to understand audio scenario makes it possible to demonstrate him how a hearing loss would sound.

Simple objects that emit sound and can be turned on and off let the user create an individualized scene for the customer to experience. The simulation can be used for normal hearing customers to experience life with an unfitted hearing loss.

The user should be able to interact with objects such as a plate. The plate could be dropped to simulate impulsive sounds with and without hearing loss. A singing bird flying by could help pointing out the loss of orientation with a hearing loss and a car driving by emitting noise could simulate how hard it is to understand a person directly in front of the user.

The surrounding must be abstract and rater simple to not generate the illusion of an actual outside scene but a simulation that can be exited any time.

Figure 1: The drill emits a sound only when placed on the pallet. Therefore the user gets a feeling of missing feedback when using tools or handling plates.

1.4 Outcome

The outcome would be a first scene that enables the user to activate different sound sources and speech coming from a person in front of the user. The user should be able to walk around in the abstract area and interact with some of the objects. It shall be possible to toggle between normal hearing and hearing loss, to quickly point out the differences.

1.5 Goal

The finished project should be capable of being used as an evaluation tool to find out if this type of simulation can be used in a hearing aid store to help the customer experience a hearing loss in a simple and fun way. Each object should emit a sound for normal hearing and if activated the sound for the simulated hearing loss. This can be achieved by creating a hearing loss filter for each sound.

Figure 2: Abstract surrounding with a bird that emits sound, as an example of an object for the special hearing loss simulation.

1.6 Requirements

1.6.1 Hardware

The local store hoerportal24 will offer two VR headsets (Oculus Rift and Go) with controllers that can be used for the project. Furthermore, there is a pool of sound sources available under license (only used for demos inside this specific store) that can be used for the project.

1.6.2   Software

As of the software Unity and Blender will be used.

1.6.3   Outlined implementation

We plan to develop the project in an Agile way by setting up short sprints and delivering an increment. Here is an outline for the upcoming sprints.

- Set up source control with git for working in a team.

- Prepare a demo that contains simple objects that after touching produce sounds, which is a basis for our interaction.

- Create 3D models for a user interface in 3D modelling software Blender.

- Integrate the art created in Blender to the program in Unity.

- Develop the UI Interactions in VR.

- Create a mode for hearing loss simulation. This can be achieved by applying a hearing loss filter to each sound.