VisAid

Augmented Reality based Visual Aid application for Hard of Hearing and Deaf Individuals

Augmented Reality (AR) technology holds immense promise in addressing the challenges faced by individuals who are deaf or hard of hearing (DHH). This project delves into the efficacy of a visual aid application in augmented reality, designed to bridge the communication gap for individuals who are hard of hearing. With **1 in 6 adults affected by hearing loss** in the UK, the urgency to enhance their auditory experiences becomes evident. Leveraging the power of AR, this research explores the potential for visual cues to enhance their ability to perceive sound direction. The study encompasses a user-centred design approach, involving a comprehensive user study to evaluate the application's effectiveness. The findings from this study not only shed light on the impact of AR technology in this context but also pave the way for further exploration in the domain of assistive technologies and inclusive design.

Introduction & Background

Hearing loss affects millions globally, often resulting in isolation and compromised communication. This project harnesses AR to **enhance visual experiences**, offering a lifeline for those with severe hearing impairments. The research's core objective is to assess the efficacy of an AR-based visual aid application designed to elevate communication, sound localisation, and situational awareness for this community.

While existing assistive technologies primarily focus on sound amplification, the project introduces a novel approach. It addresses the **Cocktail-Party Problem (CPP)**, a challenge in distinguishing sounds in noisy environments, through an AR-based solution. By **augmenting auditory cues with visual prompts**, the research advances AR's potential and aligns technology with the sensory preferences of individuals with hearing impairments, ultimately enhancing their quality of life and fostering inclusivity.

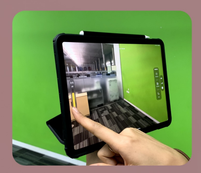
Study Methodology

Study 1

Focusing on Application Usability

9 Participants

NH Participants · Questionnaire · Prototype Demo · Usability Testing · Feedback



Study 2

Focusing on the Application Effectiveness

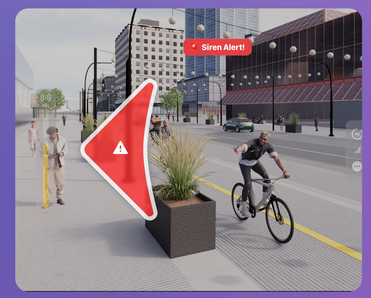
3 Participants

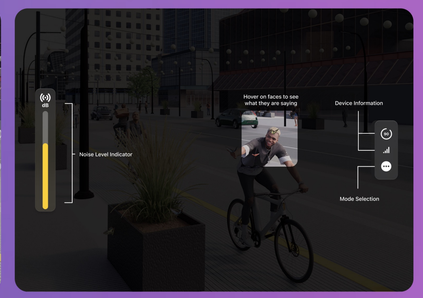
DHH Participants · Questionnaire · Prototype Demo · PPT Lead Study · Usability Testing · Feedback

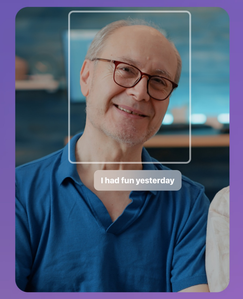
Diagrams and Design

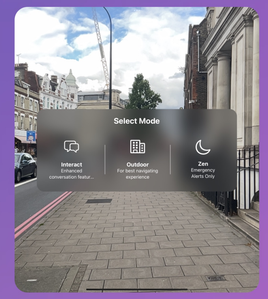
Upon compiling user personas from reputable sources such as W3C and Google's published paper, identified pain points shed light on critical issues. Subsequently, key features were distilled. This guided the creation of an application user flow, transitioning into the development of high-fidelity mockups and an application prototype on the iPad platform.

Multiple scenarios were mocked up with the use of Adobe After Effects to convey the use case of the application with more context. The scenarios included cycle bell alert, police siren alert and live captioning videos.









Testing & Evaluation

Pilot test

A pilot test was conducted to ensure that the study process were smooth and the data was being captured

Study 1

During the first study, the participants were observed and the study materials were edited for the DHH Participants

Interpreters

To ensure smooth and accurate conversation with the DHH participants, professional interpreters were present during study 2.

Results

First-click Test

The test was conducted using 'Optimum Workshop' that records data that can be used to analyse the usability of the application

Quantitative feedback

The answers to the questionnaires were compiled into a spreadsheet for further analysis

Qualitative feedback

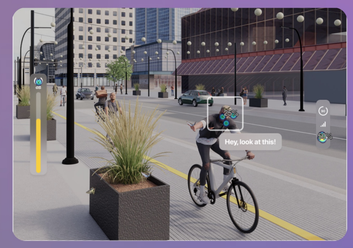
The answers to the interview was carefully transcribed and stored for later evaluation.

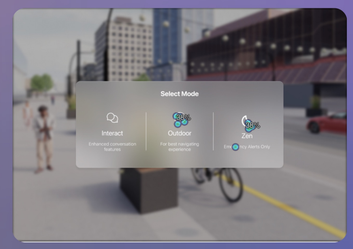
Most useful feature — DHH Participants

10 of 12 agreed they would use the application in the future.

Only 50% of the participants feel that 'Modes' are useful.

Heat maps of first-click test result





"Focus on captioning normal hearing people we are already used to danger alerts"

- DHH Participant 2

Conclusion

In conclusion, this project set out to assess the effectiveness of an Augmented Reality-driven visual aid application in assisting individuals with profound hearing loss or deafness. The conceptual application, named VisAid, was introduced to showcase potential features and user interfaces for addressing the identified challenges. The conducted study utilising VisAid substantiated the potential of AR as a viable direction for tackling issues like CPP. However, it's imperative to emphasise that comprehensive evaluation remains essential to gauge the usability and design of such AR applications. Striking the right balance is crucial, ensuring that the technology enhances rather than hampers an individual's visual experience.

Future Work

Continuing with the research, future work will involve refining the application design based on insights gleaned from the conducted tests. To gain a more precise understanding of the application's usability, the next step would involve prototyping the application on an AR HMD. Additionally, Electroencephalography (EEG) can be employed to measure the brain activity of a user with hearing impairments during conversations with and without the application. This approach aims to provide conclusive evidence and a deeper understanding of the application's impact.

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