Automated HRTF Individualisation Based on Localization Errors in 3D Space

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Background

Spatial audio has never been more important. Though there has been a steady stream of interest in applications of spatial audio in fields like defence - primarily applied to Virtual Auditory Displays (VADs)(**?**) - virtual, augmented, and mixed reality form a large component of the current technological zeitgeist. One major stated goal of these technologies is that of immersion. This doesn't have to mean that the user feels as if they have been transported to somewhere completely new, they just have to believe in the virtual elements of the experience. No matter whether the intended application is entertainment, productivity, or assistance (unsure about this line), the end user must be deceived into believing in what they are experiencing.

Audio has parity with visuals here, as just small errors in either can irreparably break immersion(**?**). Reproducing spatial audio convincingly involves a number of factors, including reflections and occlusion caused by the room and the objects in it. This project however, will focus entirely on the effect the anthropometry of the listener has on the audio signal - the attenuation of the sound caused by the various body parts that they sound waves come into contact with.

In most applications of spatial audio, representing/reproducing the spatial characteristics of a sound is done using Head-Related Transfer Functions, or HRTFs, along with their time-domain counterparts Head-Related Impulse Responses, or HRIRs.

Literature Review

Generalised HRTFs

Models

Clustering

Frequency Scaling

Structural Models

Database Matching

Principal Components Analysis

Understanding PCA

PCA and HRTFs/HRIR

test citation (Hölzl, 2012)

Search Methods

Simulated Annealing

Method

Analysis

Discussion

Bibliography

Josef Hölzl. *An initial Investigation into HRTF Adaptation using PCA IEM Project Thesis*. PhD thesis, Graz University of Technology, 2012. URL `https://github.com/jhoelzl/HRTF-Individualization`.