Automatic analysis of the influence of "Hearables" in groupconversations

Students

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Introduction: Noise-cancelling headphones are becoming increasingly popular due to their ability to significantly enhance the listening experience by reducing background noise. As a result, the market for these devices is rapidly expanding and expectations for their performance are on the rise. One innovative concept from Sonova AG is to merge the benefits of noise-cancelling headphones with the functionality of traditional hearing aids, creating a new category of device known as "Hearables". These devices aim to cancel out noise and enhance the intelligibility of speech in conversations. However, if the algorithm used to achieve this relies on a beamformer, it may only improve the voices of individuals in the direct line of sight of the wearer. This could present challenges in group conversation settings, where the effectiveness of the device may vary depending on the position of the speaker in relation to the listener.

Objective: The objective of this semester project was to develop a streamlined approach for testing the impact of these "hearables" in group conversations. To achieve this, a series of experiments were conducted in a specialized laboratory, known as the Real-Life Lab, which was equipped with a motion tracker system and a variety of audio speakers to simulate real-world acoustic environments. The experiments were designed to closely mimic real-life group conversations, taking advantage of the lab's ability to facilitate free movement of participants. Additionally, digital signal processing and statistical methods were implemented to enable more meaningful evaluations of the data collected. The ultimate goal was to simplify the process of testing the effectiveness of these hearables in group conversations, and to provide valuable insights for future research and development.

Result: This project provided valuable insights into the execution and design of experiments, utilizing the state-of-the-art equipment available in the Real-Life Laboratory. The collected data was processed in a way that allows for intuitive visualization and interpretation of the experiments. A Python API was developed to provide tools for basic evaluation and comparison of the results. Additionally, a database was established to facilitate scalability for ongoing research, and it can be easily operated by individuals with minimal programming experience.

Advisor
Hannes Badertscher

Subject Area
Data Science, Electrical Engineering

Project Partner
Sonova AG, Stäfa, Zürich

Conventional hearing aids from Sonova AG.
Sonova AG

Real Life Lab at Sonova AG.
Sonova AG

Situative Plot of the Laboratory visualizing the temporal course of an experiment.
Own presentment

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