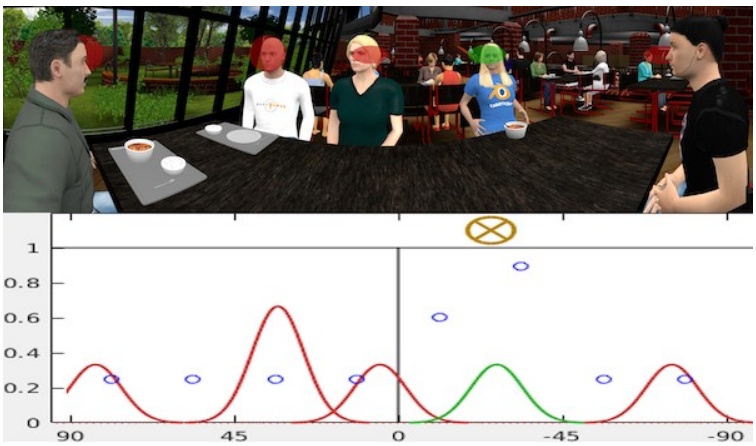
Master thesis
“Combining acoustic scene analysis, movement behavior and multi-directional spatial filtering”

in the divison *Auditory Signal Processing*, for students of Engineering Physics; Hörtechnik und Audiologie; Physik, Technik und Medizin



Background: Advanced signal processing methods for hearing aid aim at enhancing multiple speech signals of interest that arrive from different locations while suppressing disturbing background noise and undesired interfering sources. In order to efficiently apply such techniques for the user’s benefit, information about the acoustic scene as well as the intention of the hearing aid user is required. Acoustic scene analysis can provide estimates of the type and location of a sound source. The user’s motion behavior, including head movement and eye gaze direction, can help to associate sound sources present in the scene with the user’s attention. Therefore, a combination of these streams of information, e.g., in a probabilistic framework, can provide valuable information that helps to utilize the potential of modern spatial filtering methods for better speech understanding and communication in complex acoustic environments.

Aim: You will learn how to apply directional filtering with hearing aid algorithms. You will gain insight into spatial filtering techniques and their interaction with head movement behavior. The focus of this thesis is to combine multiple static spatial filtering algorithms with coherence-based filtering, and to compare the performance of this combination with a steerable beamforming approach.

Approach: In this master thesis you work with virtual audio-visual environments, generated with the TASCAR toolbox for acoustic scene creation and rendering, and real-time hearing aid signal processing conducted with openMHA, a software platform for hearing aid algorithm development. You will modify existing algorithms and develop new methods in Matlab and/or C++.

Required background and skills: Matlab skills, basic understanding of digital signal processing, and a general interest in working with state-of-the-art technology.

Supervision: Volker Hohmann, Hendrik Kayser, Giso Grimm

Literature:
Grimm, G., Kayser, H., Hendrikse, M., Hohmann, V., “A gaze-based attention model for spatially-aware hearing aids,” In 13th ITG Conference on Speech Communication (ITG2018), pp. 231-235, Oldenburg, Germany, 2018.