

Master thesis “Speech enhancement for hearing aids using a combination of binaural and periodicity features”

At the Abteilung Medizinische Physik, a master thesis is invited with the theme “**Speech enhancement for hearing aids using a combination of binaural and periodicity features**”

Background: For decoding a target speech signal from a mixture of spatially distributed sounds, the auditory system uses a number of auditory features. Research into this type of human “Auditory Scene Analysis” (ASA) showed that binaural features, related to the spatial direction of sounds, and periodicity features, related to the voice pitch, are among the most important cues that support the decoding of speech information from a mixture of sounds. Earlier work of the group [1] used auditory model-based periodicity processing for improving single-channel speech enhancement. The incorporation of binaural features, however, remains to be investigated.

Aim: Development and evaluation of a speech-enhancement algorithm for combined binaural and periodicity processing based on the single-channel scheme of [1].

Approach: In a first step the scheme [1] will be reviewed and re-implemented for a combination with additional features. Methods of adding binaural features for binaural spatial filtering in addition to the periodicity filtering of [1] will be investigated. Note that a proof-of-concept has already been achieved. Then, the processing and its parameters will be optimized using instrumental measures of speech quality and signal-to-noise ratio enhancement. Finally, the optimized algorithm will be evaluated in a subjective speech test with normal-hearing subjects.

Required background and skills: Matlab skills, signal processing, psychoacoustic models

Contact:

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[1] Z. L. Chen and V. Hohmann, “Online monaural speech enhancement based on periodicity analysis and a priori SNR estimation,” IEEE/ACM Transactions on Audio, Speech and Language Processing , vol. 23, no. 11. pp. 1904–1916, 2015.