BSc/MSc-project

A Real-time hearing-aid simulator for psychoacoustic experiments

Description:

Nowadays, the hearing-aid technology involves multi-channel non-linear amplification and advanced digital signal processing. While numerous parameters can be adjusted to provide an individualized hearing solution, current hearing-aid fitting procedures are relatively simple. Usually, frequency and level dependent gain is first determined based on the listener's pure-tone sensitivity, i.e., the audiogram. Subsequently, advanced features, including algorithms like beamforming and noise reduction, may be activated depending on personal preferences.

A novel approach for fitting hearing aids has been proposed. This involves the classification of the hearing-impaired listeners in different subgroups (profiles) and adjustments based on an individualized set of parameters (parameter space) for each of the subgroups. A profile-based HA parameter space may require different directionality, noise reduction, and compression settings. Recently, a Hearing-aid simulator (HASIM) has been evaluated using objective technical measures and in perceptual experiments. However, the current HASIM is not suitable for real-time processing what limits the type of experiments that can be successfully performed.

The current project has four goals:

1) A literature review about existing real-time hearing-aid simulators.
2) Identification of the requirements for a real-time HASIM that can be used for the investigation of the "profile-based hearing-aid approach".
3) The implementation or integration of a real-time HASIM with multichannel non-linear compression.
4) Evaluation of the real-time HASIM in combination with classic psychoacoustic experiments.

Literature:

Sanchez Lopez, R., Fereczkowski, M., Bianchi, F., Piechowiak, T., Hau, O., Pedersen, M. S., ... Santurette, S. (2018). Technical evaluation of hearing-aid fitting parameters for different auditory profiles. In *Euronoise 2018 - Conference Proceedings* (pp. 381-388)

Curran, J. R., & Galster, J. A. (2013). The Master Hearing Aid. Trends in Amplification, 17(2), 108–134. http://doi.org/10.1177/1084713813486851

Required qualifications: Good command of MATLAB, knowledge about Simulink and real-time processing. Knowledge signal processing, 31236 is a good prerequisite

Responsible institution: DTU Hearing Systems

Allowed no of students per report: 1-2

DTU supervisor: Main supervisor Torsten Dau, co-supervisor Raul Sanchez-Lopez