Optimization Methods for Audio Processing

Call for proposals related to pre-doc positions financed via the VSM

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The usefulness of optimization methods for task in audio processing is obvious. Convex methods [5], or more recently also non-convex methods [7] are applied in signal processing. Because the task is the solution of a concrete problem, often heuristic approaches are sufficent. Here, we aim at an application-oriented mathematics approach, of integrating mathematical research directly into the application, and not just applying mathematics. So, the task for this project is to use - but also develop - the mathematical theory to solve challenges in audio processing.

In this project, we will tackle the following tasks in audio signal processing, amongst others:

- *Audio Inpainting*: We will extend our recently developed method [8] for filling gaps in audio signals by extending the ADMM method in there, and go beyond convex approaches, using full spliting methods [3].
- *Fast Griffin Lim*: We have developed a method that solves a particular phase retrieval problem very efficiently [6]. We will improve this approach by applying inertial and memory effects [1].
- *Double System Identification*: We aim at a better estimator for the speech production filter [4], i.e. speaker identifcation, in the case when the speech signal is distorted by a transmission system (for instance, a mobile phone) by fractional optimization approaches [2].

We are aiming at solving the challenges, but also treating the mathematical background, e.g. showing convergence. While the general idea is given, the detailed direction, which problems are tackled, or which approach will be used, will be worked out with the successful applicant.

This *application-oriented mathematics* project extends the audio processing part of the project "'NoMASP: Nonsmooth Nonconvex Optimization Methods for Acoustic Signal Processing"'. The PhD student will be integrated closely into this project team, as well as the Acoustics Research Institute.

References

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