MA16-053 - Infinite Dimensional Signal Processing Techniques for Acoustic Applications (INSIGHT)

Abstract

Signal processing is a key technology that forms the backbone of important developments like MP3, digital television, mobile communications, and wireless networking and is thus of exceptional relevance to economy and society in general. The overall goal of the proposed project is to derive highly efficient signal processing algorithms and to tailor them to dedicated applications in acoustics. We will develop methods that are able to exploit structural properties in infinite-dimensional signal spaces, since â€“ typically â€“ ad hoc restrictions to finite dimensions do not sufficiently preserve physically available structure. The approach adopted in this project is based on a combination of the powerful mathematical methodologies frame theory (FT), compressive sensing (CS), and information theory (IT). In particular, we aim at extending finite-dimensional CS methods to infinite dimensions, while fully maintaining their structure-exploiting power, even if only a finite number of variables are processed. We will pursue three acoustic applications, which will strongly benefit from the devised signal processing techniques, i.e., audio signal restoration, localization of sound sources, and underwater acoustic communications. The project is set up as an interdisciplinary endeavor in order to leverage the interrelations between mathematical foundations, CS, FT, IT, time-frequency representations, wave propagation, transceiver design, the human auditory system, and performance evaluation.

Scientific disciplines:
Analysis (40%) | Signal processing (30%) | Acoustics (30%)

Keywords:
compressive sensing, frame theory, information theory, signal processing, super resolution, phase retrieval, audio, acoustics

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Further links to the persons involved and to the project can be found under
https://wwtf.at/funding/programmes/past/ma/MA16-053/