Lehrstuhl für Multimediakommunikation und Signalverarbeitung
Universität Erlangen-Nürnberg

Proposal for a Forschungspraktikum

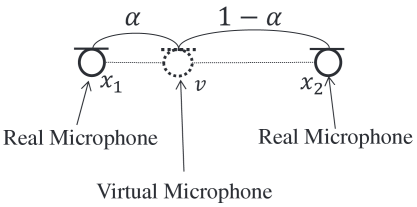
Topic: **Virtual Microphones for MVDR/LCMV Beamforming**

Description: In realistic acoustic scenarios, almost all audio recordings are mixtures of several audio sources, containing the desired source, but also interfering sources and noise. Therefore, signal extraction, which aims at suppressing all sources, except the desired one, is a very active field of research.

An important subset of signal extraction algorithms is the class of data-dependent spatial filters, where the minimum variance distortionless response (MVDR) and the linearly constrained minimum variance (LCMV) beamformers are the most prominent ones. However, the performance of spatial filtering algorithms depends highly on the number of microphones used for recording of the acoustic signals, but the number of microphones is usually kept small in practice due to hardware costs or space and design constraints of the recording devices. It was shown recently that a virtual increase of the number of microphones may lead to an improved performance of spatial filtering algorithms [1]. This method generates additional microphone observations without increasing the number of actual microphones.

The aim of this research internship is the implementation and evaluation of MVDR and LCMV beamformers and the experimental investigation of the effect of additional virtual microphones on the performance of the beamformers. This includes experiments with different acoustic conditions and array topologies. Moreover, a literature survey on the use of virtual microphones for signal extraction is part of this work.

As prerequisite, the student should have MATLAB programming experience and fundamental knowledge in DSP.



Arrangement of real and virtual microphones [1]

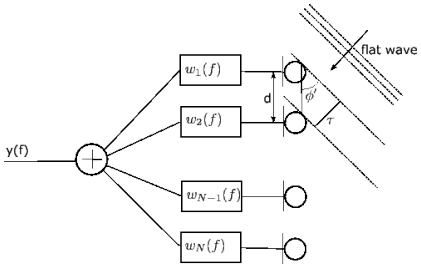


Illustration of the beamforming principle [2]

[1]: Katahira et al. (EURASIP Journal on Advances in Signal Processing 2016): *Nonlinear speech enhancement by virtual increase of channels and maximum SNR beamformer*
[2]: http://www.xavieranguera.com/phdthesis/img365.png

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Available: Immediately