Chair of Multimedia Communications and Signal Processing
University Erlangen-Nuremberg

Proposal for a Master thesis

Topic: **Blind Sampling Rate Offset Estimation for Wireless Acoustic Sensor Networks through Coherence Drift Estimation**

Description: In Wireless Acoustic Sensor Networks (WASNs) spatially distributed nodes allow for multi-channel array signal processing tasks, e.g., speech enhancement, Blind Source Separation (BSS), Localization, Acoustic Echo Cancellation (AEC) etc. As opposed to single microphone arrays that capture a sound field only locally, WASNs provide different perspectives on the acoustic scene. An important area of application of WASNs are smart home environments which should assist residents in their daily life.
However, the individual nodes are not always sampled synchronously due to clock imperfections. Thus, already a minor offset or mismatch in sampling rate causes a linearly increasing time delay corresponding to a phase shift in the STFT-domain between the microphone signals of different nodes, which may severely degrade the performance of signal processing algorithms. Hence, the Sampling Rate Offset (SRO) must be estimated and compensated for.

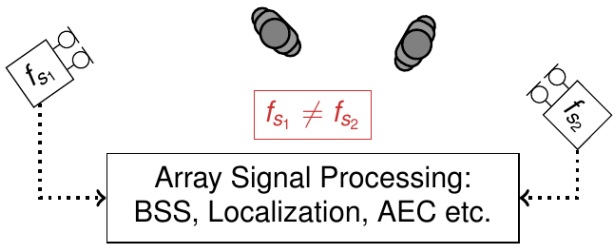

Figure 1: Wireless Acoustic Sensor Network

In the field of "blind" SRO estimation there is no additional reference information (e.g., an external clock signal) available and the SRO is to be estimated from the asynchronous sensor signals alone. For example, in [1] the phase drift of the coherence between the sensors is used in a least-squares framework to estimate the SRO.
The aim of this thesis is to conduct a literature survey of promising methods and compare these. This thesis further entails the implementation and evaluation of algorithms for SRO estimation in WASNs beginning with the method described in [1].
As prerequisites, the student should have an interest in signal processing, an affinity to math and Matlab programming experience.

[1] M. H. Bahari, A. Bertrand, and M. Moonen, "Blind sampling rate offset estimation for wireless acoustic sensor networks through weighted least-squares coherence drift estimation," *IEEE/ACM Transactions on Audio, Speech, and Language Processing*, vol. 25, pp. 674–686, March 2017.

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Available: Immediately