

Proposal for a Master Thesis

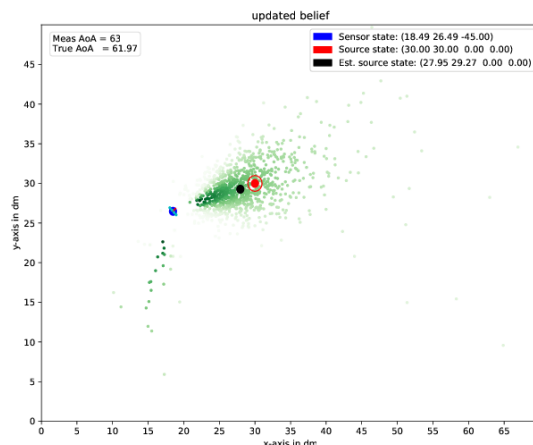
Topic: Evaluation of Observation Models for Direction of Arrival Estimation

Description: *Direction of Arrival* (DoA) estimation is a classical task arising in many research areas dealing with sensor arrays, e.g., communication, radar, or speech enhancement. Knowledge of the DoA can be exploited in various applications, such as speaker localization and tracking, but also for steering a beamformer.

Especially for tracking, not only the estimate is needed, but also the statistical properties of the underlying random variable. Hence, a statistical observation model is usually developed to describe the estimation process. In this context, several aspects have to be considered, e.g., bias, phase wrapping or trimming.

The goal of the thesis is to evaluate different observation models for acoustical DoA estimation. As a starting point, a specific DoA estimator, e.g., MUSIC [1], ESPRIT [2] or SRP-PHAT [3], has to be implemented. Subsequently, different statistical observation models should be evaluated based on simulated data. Finally, the models should be evaluated on recorded microphone signals.

Apart from the interest in statistical signal processing, the student should have basic PYTHON programming experience.



Particle Filter for Acoustic Source Tracking

[1] Schmidt R., *Multiple emitter location and signal parameter estimation*, IEEE Transactions on Antennas and Propagation, 34(3):276-280, 1986

[2] Roy R., Kailath T., *ESPRIT - Estimation of Signal Parameters Via Rotational INvariance Techniques*, IEEE Trans. Signal Process., Vol. 37, No. 7, 1989

[3] DiBiase J.H., Silverman H.F., Brandstein M.S. *Robust Localization in Reverberant Rooms*, Microphone Arrays, Digital Signal Processing, Springer, Berlin, Heidelberg, 2001

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Available: Immediately