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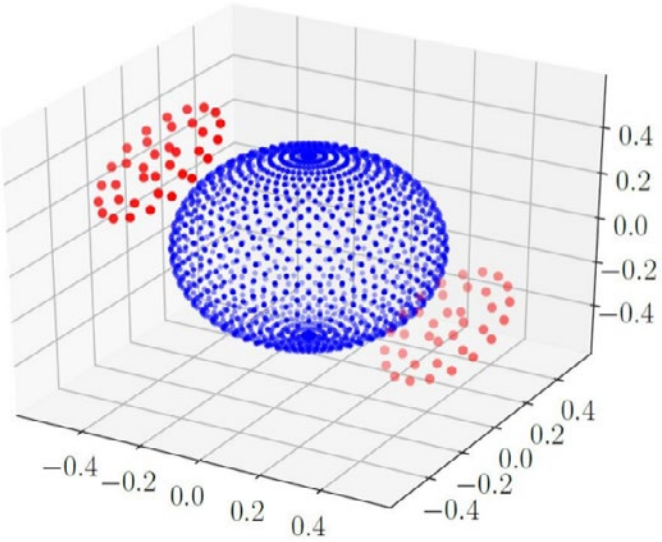
Advanced statistics for acoustic imaging. Acoustic source reconstruction with noisy data.



PROBLEM DESCRIPTION

Acoustic imaging problems consist in identifying acoustic sources from microphone array noisy measurements and quantifying their sensitivity to external, uncontrolled perturbations. Important issues on spatial positions of the microphone arrays arise in sequential acquisitions.

CHALLENGES AND GOALS

To measure the sensitivity of reconstruction methods to external nuisance parameter (reflection property, temperature, etc.) and to construct an experimental design in a sequential learning context.

MATHEMATICAL AND COMPUTATIONAL METHODS

A mathematical model provides us with a framework for sources reconstruction from given measurements. This ill-posed linear inverse problem can be solved among others by classical beamforming approaches or Bayesian algorithms. Advanced statistical tools are involved in the analysis of the sensitivity to external conditions. To better identify the positions of the microphones, a sequential measurement design has been constructed to take advantage of properties of a recent Bayesian algorithm.

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RESULTS AND BENEFITS

Our analysis on sensitivity points out external conditions which strongly influence the stability of the result. A data driven guide for the measurements is given by a new sequential Bayesian experimental design to be implemented on the softwares developed by MicrodB.

Collaboration has been conducted under the FUI program LUG2 (fund ed by BPIFrance and Auvergne-Rhone-Alpes Region).

Industrial software for acoustic source reconstruction using state-of-art statistical methods.

New Bayesian methods for solving ill-posed inverse problems lead to identify the factors that influence the stability of the reconstruction algorithm.

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