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Amélioration des performances des méthodes d'identification de sources acoustiques en environnement complexe et incertain

As an inverse problem, sound source localization in three dimensions relies on two distinct cornerstones. One is the physical model chosen to describe the acoustic propagation of the sources to identify and the other is the algorithmic process used to derive information from measured acoustic data.

An Equivalent Source Method (ESM) aiming at the simulation of realistic Frequency Response Functions (FRF) is proposed to cover the first point. The underlying idea is to substitute the acoustic behaviour of a radiating object by a set of acoustic monopoles calibrated with respect to the boundary condition on its skin. Such a method allows to perform 3D Conventional Beamforming (CBF) with FRF taking into account the acoustic environment and the influence structure. Misleading sound source localization outcomes due to ground reflections or diffraction are therefore prevented.

The use of such transfer functions raises conditioning issues, thus a large part of this PhD framework is devoted to the ESM optimisation and its integration in inverse methods such as Bayesian focusing.

With a view to using the method for wind tunnel applications, a strategy to include the contribution of wind tunnel convective effects at low Mach number is investigated. To this end, a geometric routine based on Amiet's model is coupled with the ESM boundary condition step and assessed on wind tunnel data.

As the end-of-line imaging results also depends on the input measurement, a reflexion about Cross Spectral Matrix denoising in the context of wind tunnel acoustic measurements is finally initiated.