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Sound field reconstruciton using a spherical microphone array. - DTU Orbit (08/11/2017)

Sound field reconstruciton using a spherical microphone array.

A method is presented that makes it possible to reconstruct an arbitrary sound field based on measurements with a spherical microphone array. The proposed method (spherical equivalent source method) makes use of a point source expansion to describe the sound field on the rigid spherical array, from which it is possible to reconstruct the sound field over a three-dimensional domain, inferring all acoustic quantities: sound pressure, particle velocity, and sound intensity. The problem is formulated using a Neumann Green's function that accounts for the presence of the rigid sphere in the medium. One can reconstruct the total sound field, or only the incident part, i.e., the scattering introduced by the sphere can be removed, making the array virtually transparent. The method makes it possible to use sequential measurements: different measurement positions can be combined, providing an extended measurement area consisting of an array of spheres, and the sound field at any point of the source-free domain can be estimated, not being restricted to spherical surfaces. Because it is formulated as an elementary wave model, it allows for diverse solution strategies (least squares, ℓ1-norm minimization, etc.), revealing an interesting perspective for further work.

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