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Characterization of a virtual array based on MEMS microphones for the analysis of acoustic sources

Alberto Izquierdo and Juan J. Villacorta
- TeleCommun. Eng. School. Signal Theory Dept., Univ. of Valladolid, Valladolid, Spain

Lara del-Val
- Industrial Eng. School. Mech. Eng. Dept., Univ. of Valladolid, Paseo del Cauce, Valladolid, Spain, lvalpue@eii.uva.es

Luis Suarez
- Superior Tech. School, Civil Eng. Dept., Univ. of Burgos, Burgos, Spain

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ABSTRACT

Using arrays with digital MEMS microphones and FPGA-based acquisition/processing systems allows to build systems with hundreds of sensors at a reduced cost. This work analyzes the performance of a virtual array with 6400 MEMS (80 × 80) microphones. The system is composed by a 2D positioning system that places a physical array of 64 microphones (8 × 8) in a grid with 8 x 8 positions, obtaining a spatial aperture of 2 x 2 meters. The measured beampattern is compared with the theoretical one for several frequencies and pointing angles. The beampattern of the physical array is also estimated for each one of the 64 positions used by the positioning system. Also, the measured beampattern and the focusing capacity are analyzed, since beamforming algorithms assume spherical wave due to the large dimensions of the array. Finally, frequency and spatial responses for a set of different acoustic sources are obtained showing angular resolutions of the order of tenths of degree.