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TITLE

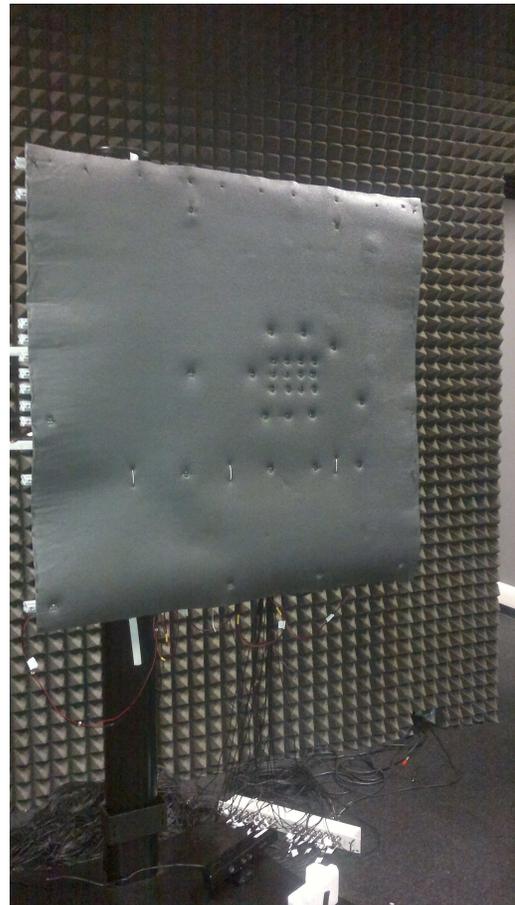
A Method Of Configuring Planar Transducer Arrays For Broadband Signal Processing By 3D Beamforming And Signal Processing Systems Using Said Method, In Particular Acoustic Camera

INVENTORS

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DESCRIPTION

A method of configuring planar transducer arrays for broadband signal processing by 3D beamforming, wherein a superdirective beamforming technique for low-frequency signal components is combined with a sparse and aperiodic array pattern for high-frequency components in a predetermined frequency range, and wherein the positions of the individual transducers at the aperture of the array and the FIR filter coefficients are further optimized in parallel, by a hybrid iterative process including an analytical calculus for determining the FIR filter coefficients and a stochastic calculus for determining the transducer positions at the aperture of the planar transducer arrays, by minimization of a cost function wherein: the cost function expresses the beam pattern as a function of the FIR filter coefficients and the position of the transducers at the aperture of the planar transducer array and consists of a triple integral over the frequency range and over the range of values of two variables, i.e. the linear combination of each of the two components of the vectors that define the beam-steering direction, and the direction of an incident wavefront vector, which is perpendicular to the wavefront and is generated at the point coinciding with the wavefront source; parallel minimization of the cost function with respect to the transducer positions and the FIR filter coefficients; said minimization being carried out in parallel and iteratively, using a stochastic method for transducer positions and an analytical method for FIR filter coefficients; said cost function being expressed by transformation and replacement of variables with two functions independent of the individual transducer positions, said functions having values that are determined on a predetermined grid of points with a given density of nodes before the minimization step, are stored in a table and are read from said table for computation of the cost function during the minimization process.



APPLICATIONS

Acoustic imaging, tridimensional acoustic mapping

KEYWORDS

Transducer, array, FIR, acoustic, wave, wave-front, filter



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BIBLIOGRAPHIC DATA

Metodo Per La Configurazione Di Disposizioni Planari Di Trasduttori Per L'elaborazione Di Segnali A Banda Larga Mediante Beamforming Tridimensionale E Sistemi Di Elaborazione Di Segnali Che Utilizzano Tale Metodo, In Particolare Telecamera Acustica

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