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短文与研究通讯

冲击噪声背景下基于归一化的线性约束特征干扰相消器

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摘要：

针对冲击噪声背景下，常规波束形成算法性能下降的问题，本文提出一种适用于任意未知统计特性的代数拖尾冲击噪声环境下的基于归一化的线性约束特征干扰相消器（N-LCEC）算法。该算法在附加线性约束的条件下，以噪声功率最小化为目标函数；通过对输入信号进行无穷范数归一化，使变换信号的二阶统计量在代数拖尾的冲击噪声环境下存在且有界，然后将自适应权矢量约束于噪声子空间的方法，提高了波束形成器在冲击噪声背景下的性能。N-LCEC算法无需噪声特征指数的先验信息，适用冲击噪声环境更广；N-LCEC算法具有运算简单，干扰抑制能力强，同时保持静态方向图的副瓣特征等优点。仿真结果验证了该算法的有效性和优越性。

关键词： 阵列信号处理； 线性约束特征干扰相消器； 分数低阶矩； 冲击噪声

Normalized-LCEC Amid Heavy-Tailed Impulsive Noise of Unknown Statistics

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Abstract:

To solve the performance degradation of beamformer amid heavy-tailed impulsive noises of unknown statistics, a new beamforming approach to combat the arbitrary unknown heavy-tailed impulsive noises of unknown statistics is presented. The new approach, termed as Normalized-Linearly Constrained Eigencanceler (N-LCEC) algorithm, is formulated as one to minimize the noise power of the beamformer’s output subject to a pre-specified set of linear constraints. To improving the performance of the beamformer amid heavy-tailed impulsive noise of unknown statistics, the new algorithm put the weighting vector to the noise subspace after the input signal being infinity norm snapshot normalized which to keep the second-order-statistics of the input signal existing and finite. This new N-LCEC algorithm has these advantages: (1) simpler computationally with a closed-form solution, (2) needing no prior information nor estimation of the impulsive noise’s effective characteristic exponent’s numerical value, (3) applicable to a wider class of heavy-tailed impulsive noises of unknown statistics, and (4) offering better interference-rejection and low sidelobe. Simulation results demonstrate the validity and superiority of the proposed algorithm.

Keywords: Array signal processing Linearly Constrained Eigencanceler Fractional Lower Order Moments Impulsive noise

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