

算法研究

基于子带SDL的宽带自适应波束形成

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摘要:

针对宽带波束形成通常需要大量阵元或延迟线所带来的硬件开销较大, 波束形成效率相对较低的问题, 提出一种基于子带阵元延迟线 (SDL) 的宽带自适应波束形成算法。该算法首先建立子带SDL模型, 然后利用分析滤波器组将阵元接收的宽带信号分解为子带信号并进行相应的子带线性约束最小方差 (LCMV) 波束形成, 最后通过综合滤波器组得到全带的波束形成。仿真结果表明, 子带波束形成不仅具有比全带波束形成更高的效率, 更好的频率不变性, 更强的抗干扰能力及更快的收敛速度, 而且可以大大降低硬件开销。

关键词: 宽带自适应波束形成; 子带滤波器组; 阵元延迟线; 线性约束最小方差; 过采样广义DFT滤波器组

Wideband Adaptive Beamforming with Sensor Delay Lines in Subbands

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Abstract:

Wideband beamforming usually needs a large number of sensors or tapped delay lines, which lead to heavy hardware load and low beamforming efficiency. To alleviate this problem, a subband sensor delay lines (SDL) based wideband adaptive beamforming algorithm is proposed. Firstly, a subband SDL model is developed. Based on this novel model, received signal is decomposed by analysis filter banks, then the linearly constrained minimum variance (LCMV) algorithm is used in each subband beamformer. In the end, the output of subband beamformers are recombined by synthesis filter banks. Simulation results demonstrate that, comparing with fullband beamforming, subband beamforming has higher efficiency, better frequency invariance, stronger anti-jamming capability, and faster convergence speed. Moreover, subband beamforming can release heavy hardware load largely.

Keywords: wideband adaptive beamforming subband filter banks sensor delay lines (SDL) linearly constrained minimum variance (LCMV) oversampled generalized DFT filter banks

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