

应用

阵元切换时间对单通道阵列测向性能的影响

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摘要:

单通道阵列采用单个通道贯续接入各阵元进行采样, 与常规阵列相比, 单通道阵列减少了硬件成本以及通道幅相特性不一致问题对估计性能的影响, 但现有研究均未考虑单通道阵列的阵元切换时间对系统性能的影响。为填补这一空白, 首先参照常规阵列, 明确了单通道阵列中窄带信号的带宽限制及其与单通道阵列阵元切换时间的关系; 再以单通道阵列MUSIC算法为例, 同时考虑信号带宽与单通道阵列阵元切换时间对单通道阵列协方差阵特性的影响, 从理论上推导了单通道阵列MUSIC算法关于扩展相对带宽的一阶估计误差。最后对单通道阵列MUSIC算法与单通道阵列空间FFT算法在不同阵元切换时间下进行仿真, 对两种算法测向误差与阵元切换时间的关系进行分析, 验证了理论推导结果的正确性。

关键词: 单通道阵列; 阵元切换时间; 窄带信号; DOA估计

Effects of Switch Interval on Direction Finding in Switch Antenna Array

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Abstract:

Compared to the conventional array, Each element of the switch antenna array is sampled by a single channel consequently, which not only reduces the hardware cost but also lowers the effects of the differences in gain and phase between the receiving channels on estimation. However, the present researches on the switch antenna array do not take the effects of the switch antenna array's switch interval on direction finding into consideration. For supplying this gap, at first, referring to the conventional array, the band limit of narrowband signal in the switch antenna array is defined, the relationship between the band limit of narrowband signal and the switch interval is proposed also. Then, by citing the MUSIC algorithm in switch antenna array, both signal band and switch interval are taken into account and the MUSIC algorithm in switch antenna array's first-order estimation error is deduced theoretically. Finally, the MUSIC algorithm and the spatial FFT algorithm in switch antenna array are simulated with different switch interval. The relationship between the two algorithms' direction finding error and their switch interval is analyzed. The simulation demonstrates the result of theoretical analysis.

Keywords: switch antenna array switch interval narrowband signal DOA estimation

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