

短文与研究通讯

一种互耦条件下多径信号的2D DOA估计方法

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摘要:

在均匀圆阵的阵列结构下, 提出了一种互耦条件下相干多径信号的2D DOA估计方法, 该方法基于RARE降秩理论, 首先对多径相干源进行去相干处理, 并对与俯仰角相关的互耦矩阵进行补偿, 然后将圆阵导向矢量转换成新的波束空间阵列流型, 同时将俯仰角与方位角变量构造到两个独立的函数中去, 实现在互耦未知的情况下用求根的方法估计出方位角, 再根据俯仰角向量函数与噪声零空间的关系通过1D参数搜索得到俯仰角的估计, 最后再与方位角配对, 得到2D DOA估计结果. 整个估计过程仅需要1D参数搜索, 不需要预先知道空间信源个数及相关性, 俯仰角与方位角能正确配对, 克服了RARE算法中2D DOA 伪估计问题, 没有孔径损失, 计算量较RARE算法增加不大. 仿真结果验证所提方法的有效性.

关键词: RARE; 多径; 互耦; DOA估计

A Novel Method for Multipath Signals’ 2D DOA Estimation in the Presence of Mutual Coupling

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Abstract:

For compact uniform circular arrays (UCAs), a novel method for multipath signals’ 2D DOA estimation in the presence of mutual coupling is presented. Based on the rand reduction theory(RARE), this method decoherents the multipath coherent signals, and compensates the elevation-dependent mutual coupling, then changing uniform manifold into new beam space array manifold and constructing two independent function of elevation angle and azimuth angle, realizes the estimation of azimuth angles in the presence of unknowing mutual coupling based on the relation between elevation angle function and noise vector null space by 1D parameter search, Finally, 2D DOA estimation is obtained through matching estimation results. Without aperture loss and preknowing the numbers of multipath signals, the estimation process only need 1D parameter search, meanwhile, can match the azimuth angles with elevation angles exactly, overcome the problem of fake 2D DOA estimation in RERE theory whose computation cost is as much as the new proposed algorithm. Simulation results validate the availability of the method.

Keywords: RARE multipath mutual coupling DOA estimation

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