

电子技术

改进的基于四阶累积量的MUSIC算法

唐建红, 司锡才, 初萍

(哈尔滨工程大学信息与通信工程学院, 黑龙江 哈尔滨 150001)

摘要:

超宽带测向系统中, 天线体积受限严重影响到系统的测向精度和解模糊能力,且天线阵列的孔径限制着阵列最多能分辨的目标信号个数, 而一些优秀的算法如空间平滑算法和旋转不变子空间(estimation of signal parameters via rotational invariance technique, ESPRIT)算法损失了天线阵列孔径. 针对这些问题, 在传统的四阶累积量多重信号分类(multiple signal classification, MUSIC)算法基础上提出了一种改进的算法. 该算法根据四阶累积量矩阵构成的规律, 去除了原四阶累积量矩阵的数据冗余, 有效地减小了运算时间, 为其实际应用提供了必要条件. 计算机仿真和实测数据仿真的结果表明, 本改进算法可以快速地实现虚拟阵列扩展, 同时对有色高斯噪声也有一定的抑制作用.

关键词: 空间谱估计 四阶累积量 多重信号分类算法 虚拟阵列扩展

Improved MUSIC algorithm based on fourth order cumulants

TANG Jian hong, SI Xi cai, CHU Ping

(Coll. of Information and Communication Engineering, Harbin Engineering Univ., Harbin 150001, China)

Abstract:

In an ultra wideband direction finding (DF) system, the limitation on the volume of an antenna affects the DF accuracy of the system and the capability of solving ambiguity seriously. And the utmost number of target signals, which can be resolved by the array, is limited by the aperture of antenna arrays. Some excellent algorithms, such as spatial smoothing algorithm and estimation of signal parameters via rotational invariance technique (ESPRIT) algorithm, lose even the aperture of antenna arrays. Aiming at these problems, an improved algorithm is proposed on the basis of the traditional algorithm of fourth order cumulants (FOC). The algorithm keeps the capacity of virtual array extending, removes data redundancy of the primary FOC matrix, and reduces the computer time effectively, thus providing necessary conditions for practical application. Both of computer simulation and practical measurement data simulation prove that the improved algorithm can implement virtual array extending speedily and inhibit from Gaussian colored noise to some extent at the same time.

Keywords: spatial spectrum estimation fourth-order cumulant multiple signal classification algorithm virtual array extending

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