

基于最小冗余线阵的阵列扩展方法

作者: 李博, 孙超

单位: 西北工业大学声学工程研究所

基金项目:

摘要:

针对均匀传感器线阵应用被动合成孔径技术进行扩展阵列中存在阵元数较多利用率较低, 且噪声累积误差问题, 提出了一种基于最小冗余线阵的阵列扩展方法。该算法将四阶累积量方法和被动合成孔径技术相结合, 能够采用较少的阵元获得较大的阵列扩展效果。先用四阶累积量方法对最小冗余阵作匀速直线运动采集的连续测量量作预处理, 获得虚拟均匀线阵效果, 而后, 利用重叠相关器处理上述数据组获得相位修正因子补偿连续测量时产生的相位差, 将时域信息转化为空域信息, 获得阵列扩展效果。该算法采用阵元数少, 从而提高了阵元利用率, 降低了运算量, 而且能够有效抑制高斯噪声。此外, 该算法保留了被动合成孔径技术无需知道源和接收阵相对运动速度等先验信息的优点。仿真和实验结果表明, 在阵元数很少时, 该算法仍可以有效扩展阵列孔径, 能够准确估计分辨出多目标的到达角, 抑制高斯噪声, 且运算量低。

关键词: 阵列信号处理; 最小冗余线阵; 阵列扩展; 合成孔径; 四阶累积量

A New method for array extension based on Minimum Redundancy Linear Array

Author's Name:

Institution:

Abstract:

A new array extension method based on non-uniform linear array is proposed to overcome the low hydrophone utilization rate problem and accumulated noise error existing in the most passive synthetic aperture methods based on uniform linear array. The proposed method combines forth-order cumulant with passive synthetic aperture method to extend array using fewer hydrophones. Firstly, successive measurements of a virtual uniform linear array are constructed by applying forth-order cumulant to measurements of minimum redundancy linear array. Then, the array is extended by compensating phase differences from an overlap-correlator. The proposed method not only improves utilization of hydrophones, but also effectively suppresses Gaussian noise. Moreover, it inherits the advantages of the passive synthetic aperture method. Simulation and experiments results show that this method can provide larger aperture with fewer hydrophones through less iterations and effectively suppress Gaussian noise and reduces computation burden.

Keywords: array signal processing; minimum redundancy linear array; array extension; synthetic aperture; forth-order cumulant

投稿时间: 2010-08-20

[查看pdf文件](#)