

研究论文

独立信号与相干信号并存的二维DOA估计新方法

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摘要:

利用L形阵列结构的优势,结合一种有效的去除高斯噪声方法,提出了一种计算简便且阵列利用率高的独立信号与相干信号并存的二维波达方向(DOA)估计新方法.该测向方法首先对独立信号进行DOA估计,并利用相干信号的特性消除其干扰;然后利用独立信号的Toeplitz特性,获得仅含相干信息的数据矩阵,并采用基于压缩感知理论的测向方法进行相干信号的DOA估计.理论分析和实验仿真结果表明,所提方法具有去噪性好、计算简便及阵列利用率高等性能.

关键词: 二维波达方向估计 L形阵列 独立信号与相干信号 Toeplitz特性 压缩感知

2-D DOA estimation of coexisting uncorrelated and coherent signals

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Abstract:

The common two dimensional (2-D) direction of arrival (DOA) estimation algorithms for coexisting uncorrelated and coherent signals are based on the complex array structure, such as the uniform rectangular array, so the computational complexity is high and the array aperture is not utilized efficiently. By taking advantage of the L-shape array and adopting an efficient method to eliminate the Gaussian noise, a new 2-D DOA estimation method is proposed. Firstly, the DOAs of the uncorrelated signals are estimated and the influence of the coherent signals is eliminated by utilizing its characteristics. Then, the data covariance matrix containing the coherent information only is obtained by exploiting the Toeplitz property of the uncorrelated signals, and the DOAs of the coherent signals are estimated by the direction finding method based on the compressed sensing theory. Theoretical analysis and simulation results show that the proposed method has a small computational load, high array aperture as well as excellent estimation performance.

Keywords: 2-D DOA estimation L-shape array uncorrelated and coherent signal Toeplitz property compressed sensing

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参考文献:

- [1] Xu X, Ye Z, Peng J. Method of Direction-of-arrival Estimation for Uncorrelated, Partially Correlated and Coherent Sources [J]. IET Microwaves, Antennas & Propagation, 2007, 1(4): 949-954.
- [2] Zhang Y F, Ye Z F. Efficient Method of DOA Estimation for Uncorrelated and Coherent Signals [J]. IEEE Antennas and Wireless Propagation Letters, 2008, 7: 799-802.
- [3] Krim H, Viberg M. Two Decades of Array Signal Processing Research [J]. IEEE Transactions on Signal Processing, 1996, 13(4): 67-94.
- [4] 刁鸣, 安春莲, 王文龙. 非圆信号的四阶累积量测向新方法 [J]. 哈尔滨工程大学学报, 2012, 33(1): 112-

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[5] Qi C Y, Chen Z J, Wang Y L, et al. DOA Estimation for Coherent Sources in Unknown Nonuniform Noise Fields [J]. IEEE Transactions on Aerospace and Electronic Systems, 2007, 43(3): 1195-1204.

[6] 符渭波, 苏涛, 赵永波, 等. 双基地MIMO雷达相干源角度估计方法 [J]. 西安电子科技大学学报, 2012, 39(2): 120-126.

Fu Weibo, Su Tao, Zhao Yongbo, et al. Method for Angle Estimation of Coherent Sources in Bistatic MIMO Radar [J]. Journal of Xidian University, 2012, 39(2): 120-126.

[7] Park C S, Choi J H, Yang J W, et al. Direction of Arrival Estimation Using Weighted Subspace Fitting with Unknown Number of Signal Sources [C] //Proceedings of the 11th International Conference on Advanced Communication Technology. Piscataway: IEEE, 2009: 2295-2298.

[8] Ye Z F, Zhang Y F, Liu C. Direction-of-arrival Estimation for Uncorrelated and Coherent Signals with Fewer Sensors [J]. IET Microwaves, Antennas & Propagation, 2009, 3(3): 473-482.

[9] Ye Z F, Zhang Y F. DOA Estimation for Non-Gaussian Signals Using Fourth-order Cumulants [J]. IET Microwaves, Antennas & Propagation, 2009, 3(7): 1069-1078.

[10] Wang G M, Xin J M, Ge C Y, et al. Direction Estimation of Uncorrelated and Coherent Narrowband Signals with Uniform Linear Array [C] //Proceedings of 2011 1st International Symposium on Access Spaces. Piscataway: IEEE, 2011: 101-104.

[11] Liu F L, Wang J K, Sun C Y, et al. Spatial Differencing Method for DOA Estimation Under Coexistence of Both Uncorrelated and Coherent Signals [J]. IEEE Transactions on Antennas and Propagation, 2012, 60(4): 2052-2062.

[12] Zhang Y F, Ye Z F, Xu X, et al. Estimation of Two-dimensional Direction-of-arrival for Uncorrelated and Coherent Signals with Low Complexity [J]. IET Radar, Sonar & Navigation, 2010, 4(4): 507-519.

[13] Ye Z F, Zhang Y F, Xu X. Two-dimensional Direction of Arrival Estimation in the Presence of Uncorrelated and Coherent Signals [J]. IET Signal Processing, 2009, 3(5): 416-429.

[14] 陈建, 王树勋, 魏小丽. 一种基于L形阵列的二维波达方向估计新方法 [J]. 吉林大学学报(工学版), 2006, 36(4): 590-593.

Chen Jian, Wang Shuxun, Wei Xiaoli. New Method for Estimating Two-dimensional Direction of Arrival Based on L-shape Array [J]. Journal of Jilin University (Engineering and Technology Edition), 2006, 36(4): 590-593.

[15] Bilik I. Spatial Compressive Sensing for Direction-of-arrival Estimation of Multiple Sources Using Dynamic Sensor Arrays [J]. IEEE Transactions on Aerospace and Electronic Systems, 2011, 47(3): 1754-1769.

[16] Wang Y, Leus G, Pandharipande A. Direction Estimation Using Compressive Sampling Array Processing [C] //IEEE Workshop on Statistical Signal Processing Proceedings. Piscataway: IEEE, 2009: 626-629.

[17] Cotter S F, Rao B D, Engan K, et al. Sparse Solution to Linear Inverse Problems with Multiple Measurement Vectors [J]. IEEE Transactions on Signal Processing, 2005, 53(7): 2477-2488.

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2. 刘寅; 吴顺君; 张怀根; 吴明宇; 李春茂. 一种快速的基于压缩感知的多普勒高分辨方法[J]. 西安电子科技大学学报, 2011,38(2): 82-87
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