

## 论文

### $\alpha$ 稳定噪声环境下IIR自适应滤波递归整体最小P-范数算法

张斌<sup>1,2</sup>;冯大政<sup>1</sup>;刘建强<sup>1</sup>

1. 西安电子科技大学 雷达信号处理重点实验室, 陕西 西安 710071
2. 空军工程大学 电讯工程学院, 陕西 西安 710077)

#### 摘要:

当无限脉冲响应(IIR)系统输入和输出信号被 $\alpha$ 稳定噪声干扰时, 传统的最小平均P-范数(LMP)算法的解会出现较大偏差, 而整体最小平均P-范数(TLMP)算法存在收敛速度慢的问题. 为此提出一种适用于自适应IIR滤波的递归整体最小P-范数(IIR\_RTLP)算法, 首先整体考虑输入和输出信号受 $\alpha$ 稳定噪声干扰的影响, 使得基于P-范数的误差期望值达到最小; 然后采用矩阵求逆引理和幂迭代法递归更新自适应滤波器的系数, 使其可跟踪时变系统, 并提高算法收敛速度. 仿真结果表明, IIR\_RTLP算法比TLMP算法有较小的系统估计误差和较快的收敛速度.

关键词: 稳定噪声 自适应滤波 IIR系统 递归整体最小P-范数 幂迭代

### Recursive total least $l_p$ -norm algorithm for adaptive IIR filtering in $\alpha$ stable noise environments

1. Key Lab. of Radar Signal Processing, Xidian Univ., Xi'an 710071, China
2. The Telecommunication Inst., Air Force Eng. Univ., Xi'an 710077, China)

1. Key Lab. of Radar Signal Processing, Xidian Univ., Xi'an 710071, China
2. The Telecommunication Inst., Air Force Eng. Univ., Xi'an 710077, China)

#### Abstract:

When both the input and the output of a linear system are corrupted by  $\alpha$  stable noises, the classical least mean  $l_{p</sub></sub>$ -norm (LMP) algorithms usually provide a biased solution and the total least mean  $l_p$ -norm (TLMP) algorithms suffer from slow convergence. The aim of this paper is to develop a recursive total least  $l_p$ -norm (IIR\_RTLP) algorithm for adaptive IIR filtering with noisy data. The proposed IIR\_RTLP algorithm makes the expectation of  $l_p$ -norm of the error be minimized when both the input and the output are corrupted by  $\alpha$  stable noises. In order to trace the time-varying system and increase the speed of convergence, the IIR\_RTLP algorithm recursively updates the adaptive filter coefficients on the basis of the matrix inversion lemma and the power iteration. Simulation results show that the IIR\_RTLP algorithm can lead to faster convergence and a smaller system error than the existing TLMP algorithms for adaptive IIR filtering.

Keywords: stable noises adaptive filtes IIR system recursive total least  $l_p$ -norm power iteration

收稿日期 2008-09-05 修回日期 网络版发布日期

DOI:

基金项目:

国家自然科学基金资助(60672128)

通讯作者: 张斌

作者简介:

#### 参考文献:

- [1] Kassam S A. Signal Detection in Non-Gaussian Noise [M]. New York: Springer, 1988.
- [2] Nikias C L, Shao M. Signal Processing with Alpha-Stable Distributions and Applications [M]. New York: Wiley, 1995.
- [3] Arikan O, Belge M, Cetin E. Adaptive Filtering Approaches for Non-gaussian Stable Process [C] //Proc ICASSP'95. New York: IEEE, 1995:1400-1403.

扩展功能

本文信息

Supporting info

PDF(639KB)

[HTML全文](1KB)

参考文献[PDF]

参考文献

服务与反馈

把本文推荐给朋友

加入我的书架

加入引用管理器

引用本文

Email Alert

文章反馈

浏览反馈信息

本文关键词相关文章

▶ 稳定噪声

▶ 自适应滤波

▶ IIR系统

▶ 递归整体最小P-范数

▶ 幂迭代

本文作者相关文章

▶ 张斌

▶ 冯大政

▶ 刘建强

PubMed

Article by Zhang,b

Article by Feng,T.Z

Article by Liu,J.J

[4] Davila C E. An Algorithm for Efficient, Unbiased, Equation-error Infinite Impulse Response Adaptive Filtering [J]. IEEE Trans on Signal Processing, 1994, 42(5): 1221-1226.

[5] Haykin S. Adaptive Filter Theory [M]. 2nd ed. New York: Prentice Hall, 1996.

[6] Zhang Bin, Zheng Weixing, Feng Dazheng. Highly Efficient Surface-search Algorithm for Adaptive FIR Filtering [J]. Chinese Journal of Electronics, 2007, 16(2): 370-375.

[7] Golub G H, Van Loan C F. An Analysis of the Total Least Squares Problem [J]. SIAM Number Anal, 1980, 17(6): 83-893.

[8] Davila C E. An Efficient Recursive Total Least Squares Algorithm for FIR Adaptive Filtering [J]. IEEE Trans on Signal Processing, 1994, 42(2): 268-280.

[9] Feng D Z, Bao Z. Total Least Mean Squares Algorithm [J]. IEEE Trans on Signal Processing, 1998, 46(8): 2122-2130.

[10] Feng D Z, Zheng W X. Fast Approximate Inverse Power Iteration Algorithm for Adaptive Total Least-squares FIR Filtering [J]. IEEE Trans on Signal Processing, 2006, 54(10): 4032-4039.

[11] 张贤达. 矩阵分析与应用 [M]. 北京: 清华大学出版社, 2004: 117-121.

[12] Feng D Z, Zheng W X. An Adaptive Algorithm for Fast Identification of IIR Systems [C] //Proceedings of the 44th IEEE Conference on Decision and Control. New York: IEEE, 2005: 4257-4262.

本刊中的类似文章

1. 刘丰;程俊;王新梅.一种基于Harr小波的均衡器结构[J]. 西安电子科技大学学报, 1997,24(4): 0-0
2. 赖睿;杨银堂. 场景自适应的红外焦平面阵列非均匀性校正新方法[J]. 西安电子科技大学学报, 2009,36(2): 228-232
3. 彭志威;保铮;廖桂生.子波变换域的快速自适应滤波算法[J]. 西安电子科技大学学报, 1998,25(4): 0-0
4. 暂时无作者信息.跟踪机动目标的自适应 $\alpha$ - $\beta$ 滤波算法[J]. 西安电子科技大学学报, 1998,25(3): 0-0
5. 暂时无作者信息.基于子波变换的自适应滤波[J]. 西安电子科技大学学报, 1999,26(2): 0-0
6. 暂时无作者信息.扩频信号频域谱相关自适应滤波技术的研究[J]. 西安电子科技大学学报, 1999,26(3): 337-342
7. 宋万杰;罗丰;吴顺君.时-空二维雷达信号处理中的复杂可编程逻辑器件[J]. 西安电子科技大学学报, 2000,27(2): 262-265
8. 张爱华1;水鹏朗2.基于自适应正交滤波器组的去噪新方法[J]. 西安电子科技大学学报, 2004,31(5): 682-687
9. 王溪溪1;曾兴雯2.直扩系统中基于小波包变换的自适应干扰抑制技术[J]. 西安电子科技大学学报, 2005,32(5): 733-736

文章评论

序号	时间	反馈人	邮箱	标题	
1	2009-12-09	cardy ugg	sales@olshoe.com	cardy ugg	BU Hell for fil COI kind
2	2009-12-09	ethoi	eghu@hotmail.com	mbt shoes, mbt trainers	