西安电子科技大学学报 2013, 40(1) 123-128+176 DOI: 10.3969/j.issn.1001-2400.2013.01.022 ISSN: 1001-2400 CN: 61-1076/TN

研究论文

粒子滤波盲均衡译码联合算法

李浩;王润亮;彭华

(信息工程大学 信息工程学院，河南 郑州 450002)

摘要：

粒子滤波在解决信道盲辨识和盲均衡问题上具有收敛快、抗深衰信道等优势．在粒子滤波盲均衡算法的基础上，依据卷积码的马氏性特点进行建模，提出了一种直接对信息序列做重要性采样的粒子滤波盲均衡和卷积码译码联合算法．同时，提出了噪声功率递推计算的方法，并将其应用于联合算法中噪声功率参数的自适应调整．仿真结果表明，相比分离算法，联合算法的收敛性能和误码率性能都有明显提高，而自适应调整功率参数的算法则降低了运算复杂度．

关键词： 粒子滤波 信道盲辨识 盲均衡 联合盲均衡译码

Particle filter algorithm for joint blind equalization and decoding

LI Hao;WANG Runliang;PENG Hua

(Inst. of Info. Eng., Info. Eng. Univ., Zhengzhou 450002， China)

Abstract:

Particle filtering (PF) is particularly useful in dealing with the blind channel identification and blind equalization for its fast convergence and its outstanding performance of resisting multiple-path fading channels. Considering the Markov chain property of convolutional codes, the signal model is modified and a particle filter algorithm for joint blind equalization and decoding of convolutional code is introduced which samples the information sequence directly instead of the coded sequence. An iterative method to approximate the noise power is proposed, which is applied to the joint algorithm to adjust the parameter of noise power adaptively. The proposed algorithm is simulated. The simulation result shows that the convergence of the joint algorithm is faster and the bit error rate (BER) is lower that of the separate algorithm. And the adaptive adjustment algorithm reduces the computational complexity.

Keywords: particle filtering blind channel identification blind equalization joint blind equalization and decoding

收稿日期 2011-09-13 修回日期 网络版发布日期

DOI: 10.3969/j.issn.1001-2400.2013.01.022

基金项目:

国家自然科学基金资助项目(61072046)

通讯作者: 李浩

作者简介: 李浩(1986-)，男，信息工程大学博士研究生，E-mail: leo.lihao@163.com.

作者Email: leo.lihao@163.com

参考文献：

［1］ Clapp T, Godsill S J. Bayesian Blind Deconvolution for Mobile Communications［C/OL］. ［2011-07-07］. http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=668635&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%

3D668635.
［2］ Miguez J, Bugallo M F. Blind Equalization by Sequential Importance Sampling ［C］//2002 IEEE International Symposium on Circuits and Systems. Scottsdale: IEEE, 2002: 845-848.
［3］ Djuric P, Etar M. Particle Filtering ［J］. IEEE Signal Processing Magazine, 2003, 20(5): 19-38.
［4］ 王磊, 刘郁林. 基于粒子滤波器的盲辨识和盲均衡新方法 ［J］. 通信学报, 2006, 27(10): 132-136.
Wang Lei, Liu Yulin. Novel Blind Identification and Equalization New Method Based on Particle Filter ［J］. Journal on Communications, 2006, 27(10): 132-136.
［5］ Bordin J C J, Baccala L A. Partilce Filter Algorithms for Joint Blind Equalization/Decoding of Convolutianally Coded Signals ［C］//Proc of ICASSP. Philadelphia: IEEE, 2005: 497-500.
［6］ Bordin J C J, Bruno M G S. A Rao-Blackwellized Particle Filter for Blind Equalization of Frequency-selective Channels with Unknown Order and Noise Variance ［C］//Proc of ICASSP. Honolulu: IEEE, 2007: 1273-1276.
［7］ Bordin J C J, Bruno M G S. Particle Filters for Joint Blind Equalization and Decoding in Frequency-selective Channels ［J］. IEEE Trans on Signal Processing, 2008, 56(6): 2395-2405.
［8］ Kreutz-Delagado K, Isukapalli Y. Use of the Newton Method for Blind Adaptive Equalization Based on the Constant Modulus Alforithm ［J］. IEEE Trans on Signal Processing, 2008, 56(8): 3983-3995.
［9］ Gazzah H. SOS-Based Blind Channel Equalization with Quadratic Complexity ［J］. IEEE Trans on Signal Processing, 2011, 59(2): 837-841.
［10］ Paajarvi P, Leblanc J. Blind Linear Equalization of PPM Signals Using Third-Order Moments ［J］. IEEE Trans on Wireless Communications, 2010, 9(4): 1298-1302.
［11］ 陈东华, 仇洪冰. 一种新的适用于OFDM系统的时变信道估计与均衡方案 ［J］. 西安电子科技大学学报, 2010, 37(6): 999-1004.
Chen Donghua, Qiu Hongbing. Novel Estimation and Equalization of Time-variant Channels for OFDM System ［J］. Journal of Xidian University, 2010, 37(6): 999-1004.
［12］ Vural C, Cetinel G. Blind Equalization of Single-input Single-output Fir Channels for Chaotic Communication Systems ［J］. Digital Signal Processing, 2010, 20(1): 201-211.
［13］ Guimaraes A, Ait-El-Fquih B, Desbouvries F. A Fixed-lag Particle Smoother for Blind SISO Equalization of Time-varying Channels ［J］. IEEE Trans on Wireless Communications, 2010, 9(2): 512-516.
［14］ Nguyen H, Levy B C. The Expectation-Maximization Viterbi Algorithm for Blind Adaptive Channel Equalization ［J］. IEEE Trans on Commucications, 2005, 53(10): 1671-1678.
［15］ Hosseini I, Mahdaviani K, Taheri O, et al. Noniterative Joint Channel Equalization and Decoding Based on State Extended Viterbi Algorithm ［C］//Proc of ICC. Beijing: IEEE, 2008: 5092-5097.
［16］ Barembruch S. A Comparison of Approximate Viterbi Techniques and Particle Filtering for Data Estimation in Digital Communications［C］//Proc of ICASSP. Dallas: IEEE, 2010: 3826-3829.

本刊中的类似文章

1．王书朋1;2;姬红兵1.基于空间颜色模型的目标跟踪方法[J]. 西安电子科技大学学报, 2007,34(7): 76-79
2．武斌；李鹏.一种新的红外弱小目标检测前跟踪算法[J]. 西安电子科技大学学报, 2011,38(3): 107-113
3．马春华;冯大政.利用子空间算法实现一类盲均衡的方法[J]. 西安电子科技大学学报, 2005,32(5): 716-719
4．辛云宏1;王保平2;杨万海3.基于序贯重要采样算法的被动单站机动目标跟踪[J]. 西安电子科技大学学报, 2005,32(5): 820-824
5．吴兆平;朱凯然;苏涛;卢锦.采用改进粒子滤波的雷达扩展目标检测前跟踪[J]. 西安电子科技大学学报, 2011,38(2): 99-104