Design of Blind Adaptive Mobile Receiver in MC-CDMA Communication Systems

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ABSTRACT

This paper deals with the design of blind (without exploiting training sequences and undesired users ’ signature sequences) adaptive mobile receiver in downlink multicarrier CDMA (MC-CDMA) system. We first derive the batch mode constrained minimum-output-energy (MOE) receiver. Furthermore, a blind channel estimator is deduced by choosing appropriate constraints to ensure no desired signal cancellation. To reduce the computation load, we propose a blind adaptive channel estimator, which is designed to meet the criterion of maximizing the minimum possible MOE receiver ’ s output energy. The estimated channel parameters are employed to determine the weight vector at the mobile station (MS) receiver. The proposed algorithm are based on recursive-least-squares (RLS) and generalized sidelobe canceller (GSC) as well as gradient search adaptation rule. Simulation results demonstrate that the performance of the proposed blind adaptive mobile receiver converge to the optimum batch-mode MOE receiver. Moreover, the algorithm are verified to be robust to near-far problem.

Keywords : MC-CDMA ; minimum-output-energy ; recursive-least-squares ; blind ; adaptive ; generalized-sidelobe-canceller

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REFERENCES

[1] R. Prasad, OFDM for Wireless Multimedia Communications, Chapter8, Artech House Publishers, 2000 [2] N. Yee, J-P. Linnartz and G. Fettweis, “ Multicarrier CDMA in indoor wireless radio networks ” Proc. of IEEE PIMRC ’ 93, Yokohama, Japan, Sept. 1993, pp. 109-113.

[3] S. Kondo and L. B. Milstein, “ Performance of multicarrier DS-CDMA systems ” IEEE Trans. Communications, vol. 44, no.2, pp. 238-246, Feb. 1996.

[4] V. M. DaSilva and E. S. Sousa, “ Performance of orthogonal CDMA codes for quasi-synchronous communication systems ” Proc. of IEEE ICUPC ’ 93, Ottawa, Canada, Oct. 1993, pp. 995-999.

[5] T. S. Rappaport, Wireless Communications: Principles and Practice, Prentice Hall, Upper Saddle River, NJ, 1996.

[6] M. L. Honig, U. Madhow, and S. Verdu, “ Blind adaptive multiuser detection ” IEEE Trans. on Information Theory, vol. 41, no. 4, pp. 944-996, July 1995 [7] H. L. Van Tree, Optimum Array Processing, John Wiley & Sons, Inc., 2002.

[8] Simon Haykin, Adaptive Filter Theory, 4th edition Prentice-Hall, Inc. 2002.
[9] S. Hara and R. Prasad, “ Design and performance of multicarrier CDMA system in frequency-selective Rayleigh fading channels ” IEEE Trans. Veh. Technol., vol. 48, pp. 1584-1594, Sept. 1999.
[10] John R. Treichler, C.Richard Johnson, JR.Michael G.Larimore, Theory and Design of Adaptive Filters.Prentice-Hall, Inc. 2001.
[11] Andrew J. Viterbi, “ CDMA principles of spread spectrum communication, ” Addison Wesley, 1995 [12] Olufumilola Awoniyi, ” multicarrier modulation code division multiple access, ” wireless communication class project,Stanford University [13] N. Yee, J.-P. Linnartz, and G. Fettweis, “ Multi-carrier CDMA in indoor wireless radio networks, ” in Proc. IEEE PIMRC ’ 93, Sept. 1993, pp.109 – 113.
[14] K. Fazel and L. Papke, “ On the performance of convolutionally-coded CDMA/OFDM for mobile communication system, ” in Proc. IEEE PIMRC ’ 93, Sept. 1993, pp. 468 – 472.
[15] A. Chouly, A. Brajal, and S. Jourdan, “ Orthogonal multicarrier techniques applied to direct sequence spread spectrum CDMA systems, ” in Proc. IEEE GLOBECOM ’ 93, Nov. 1993, pp. 1723 – 1728.
[16] B. Sklar, Digital communications : fundamentals and applications, 2th ed , Chapter15,Prentice-Hall International,inc.2001.
[17] H. Bogucka, “ Transmission and reception of the multicarrier CDMA signals in the 3rd generation mobile communication system ” ICPWC ’ 96, pp. 319-322.
[18] H. Liu, Signal Processing Applications in CDMA Communications, Chapter 5, Artech House Publishers, 2000.
[19] L. Hanzo, M. Munster, B.J. Choi and T. Keller , OFDM and MC-CDMA for broadband multi-user communications, Wlans and broadcasting,Chapter8, IEEE Press,2003 [20] L. Hanzo , L-L. Yang , E-L. Kuan and K. Yen , Single and Multi-carrier DS-CDMA,Chapter19, John Wiley & Sons, Inc. 2003.
[21] S.K. Mitra , Digital Signal Processing , 3th ed , Chapter3, Mc.GRAW.Hill,2006 [22] Shinsuke Hara, Ramjee Prasad, “ Design and Performance of Multicarrier CDMA System in Frequency-Selective Rayleigh Fading Channel, ” IEEE Transactions on Vehicular Technology,
[23] Zhiqiang Wu, Carl R. Nassar and Suihua Lu, “ Maximum Likelihood Combining for MC-CDMA, ” IEEE Vehicular Technology Conference (VTC2002), pp. 1293-1297, May ,2002