

在跳時PAM超寬頻通信系統中之盲蔽式適應性信號接收

李冠逸、武維疆

E-mail: 9607571@mail.dyu.edu.tw

摘要

在本篇論文，我們在超寬頻通信系統中設計盲蔽式適應性行動接收機(不須要training sequences和其他用戶的跳時碼)。我們推導出minimum-output-energy (MOE)接收機的架構，再利用此架構發展出盲蔽式適應性接收機。此外，盲蔽式通道估計藉由選擇適當的限制條件，使得目標使用者的訊號能夠被接收到。我們根據接收機最小的輸出功率使其最大化的方式來完成盲蔽式適應性通道估計。而通道估計的參數是為了決定行動接收機的權重向量。我們根據Minimum Power Distortionlessly Response(MPDR)、Linear Constraints Minimum Power(LCMP)，以及gradient search演算法，來設計盲蔽式適應性MOE接收機以及盲蔽式通道估計。模擬結果顯示出盲蔽式適應性接收機的效能能夠收斂至接近於理想的batch-mode MOE接收機。另外也能證明出有效抵抗near-far的問題。

關鍵詞：超寬頻；跳時；minimum-output-energy (MOE)；盲蔽式；適應性；Minimum Power Distortionlessly Response(MPDR)；Linear Constraints Minimum Power(LCMP)

目錄

封面內頁 簽名頁 授權書	iii	中文摘要	iii
. iv 英文摘要	iv	v 誌謝	v
. vi 目錄	vi	vii 圖目錄	vii
. ix 表目錄	ix	x 第一章 緒論	x
. 1 1.1 研究動機	1	1.2 研究方法	1
. 2 1.3 內容大綱	2	3 第二章 UWB通訊系統	4
2.1 簡介	4	2.1.1 UWB的優點	4
UWB和其他通訊技術的比較	7	2.1.3 UWB的應用	13
的定義	15	2.3 脈波調變	17
波形	19	2.3.1 脈波	17
. 22	22	2.3.2 Time-Hopping PAM調變方式	19
第三章 適應性訊號處理介紹	23	2.4 多重路徑	22
beamforming演算法	23	3 第三章 適應性訊號處理介紹	23
Gradient search介紹	29	3.1 MPDR	23
鏈跳時超寬頻系統之盲蔽式適應性接收機設計	36	3.2 LCMP演算法	26
4.1 簡介	36	3.3	38
4.2 信號模型	36	3.4 利用gradient search演算LCMP	34
4.3 盲蔽式行動台接收機設計	39	第四章 下	36
式MOE接收機設計	41	4.1 簡介	36
演算法之盲蔽式MOE接收機設計	47	4.2 信號模型	36
4.4 盲蔽式通道估計演算法	44	4.3 盲蔽	39
4.6 數值分析和效能評估	55	4.3.1 盲蔽	39
5 第五章 結	64	4.4 盲蔽式通道估計演算法	44
64 參考文獻	66	4.5 適應性	47
. 69	66	4.6 數值分析和效能評估	55
附錄A	66	5 第五章 結	64
附錄B	70	64 參考文獻	66
.	69 69	66
.	69	附錄B	70

參考文獻

- [1] K. S. Gilhousen, I. M. Jacobs, R. Padovani, and L. A. Weaver, "Increased capacity using CDMA for mobile satellite communications," IEEE Trans. Select. Areas Commun., vol. 8, pp. 503-514, May 1990.
- [2] K. S. Gilhousen, I. M. Jacobs, R. Padovani, A. J. Viterbi, and L. A. Weaver, "On the capacity of a cellular CDMA system," IEEE Trans. Veh. Technol., vol. 40, no. 2, pp. 303-312, May 1991.
- [3] M. Z. Win, R. A. Scholtz, "Impulse radio: How it works," IEEE Commun. Letters, vol. 2, pp. 36-38, Feb. 1998.
- [4] M. Z. Win, R. A. Scholtz, "Ultra-Wide Bandwidth Time-Hopping Spread-Spectrum Impulse Radio for Wireless Multiple-Access Communications," IEEE Trans. Commun., vol. 48, no. 4, Apr. 2000.
- [5] Fernando Ramirez-Mireles, "Performance of ultra wideband SSMA using time hopping and M-ary PPM," IEEE Journal on Select. Areas in Commun., vol. 19, pp. 1186-1196, June 2001.
- [6] M. Z. Win and R. A. Scholtz, "Characterization of ultra-wide bandwidth wireless indoor channels: a communication-theoretic view," IEEE

Journal on Select. Area in Commun., pp. 1613-1627, vol. 20, no. 9, Dec. 2002.

- [7] V. Lottici, A. D'Andrea, and U. Mengali, "Channel estimation for ultra-wideband communications," IEEE Journal on Select. Areas in Commun., pp. 1638-1645, vol. 20, no. 9, Dec. 2002.
- [8] D. C. Laney, G. M. Maggio, F. Lehmann, and L. Larson, "Multiple access for UWB impulse radio with pseudochaotic time hopping," IEEE Journal on Select. Areas in Commun., pp. 1692-1700, vol. 20, no. 9, Dec. 2002.
- [9] D. Porcino, W. Hirt, "Ultra-wideband radio technology: potential and challenges ahead," IEEE Rail Conference, pp. 201-204, no. 6-8, April. 2004.
- [10] M. Ghavami, Ultra wideband signals and systems in communication engineering, John Wiley & Sons, Inc., 2004.
- [11] 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.
- [12] J. Foerster, E. Green, S. Somayazulu, and D. Leeper, "Ultra-Wideband Technology for Short- or Medium-Range Wireless Communications," Intel technology Journal, Q2, pp. 1-11, 2001.
- [13] Ian Oppermann, Matti Hamalainen, and Jari Linatti, UWB Theory and Applications, John Wiley & Sons, Inc., 2004.
- [14] FCC, "Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission System," First Report and Order, ET Docket, pp. 98-153, February 2002.
- [15] Gian Mario Maggio, An introduction to UWB, CWC/UCSD & STMicroelectronics, December, 2002.
- [16] M. L. Welborn, "System considerations for ultra-wideband wireless networks," IEEE Radio and Wireless Conference, pp. 5-8, 2001.
- [17] R. A. Scholtz, "Multiple access with time-hopping impulse modulation," Proc. MILCOM '93, vol. 2, pp. 447-450, 1993.
- [18] R. C. Johnson, "Introduction to Adaptive Array," IEEE of proceedings, vol. 70, Issue 2, pp. 205-206, February 1982.
- [19] Bin Hu, Lie-Liang Yang, and Lajos Hanzo, "Performance of the Smart Antenna Aided Multicarrier DS-CDMA Uplink," Vehicular Technology Conference, vol. 1, 26-29, pp. 191-195, Sept. 2004.
- [20] H. L. Van Trees, Optimum Array Processing, John Wiley & Sons, Inc., 2002.
- [21] Feng Wu, and Chenyang Yang, "Iterative Algorithms for LCMP Auxiliary-Vectot Filter," IEEE of ICASSP, pp. 625-628, 2003.
- [22] Zhi Tian, Kristine L. Bell, and Harry L. Van Trees, "A Recursive Least Squares Implementation for LCMP Beamforming Under Quadratic Constraint," IEEE Transactions on signal processing, vol. 49, no. 6, June, 2001.
- [23] Simon Haykin, Adaptive Filter Theory, 4th edition Prentice-Hall, Inc. 2002.
- [24] John R. Treichler, C. Richard Johnson, JR. Michael, G. Larimore, Theory and Design of Adaptive Filters, Prentice Hall, Inc., 2001.
- [25] A.A.M. Saleh and R.A. Valenzuela, "A statistical model for indoor multipath propagation" IEEE J. Select. Areas Commun. 1987; 5(2): 128-137.
- [26] A. F. Molisch et al., "A comprehensive standardized model for ultrawideband propagation channels" IEEE Trans. Antenna and Propagation 2006; 54(11): 3151-3165.
- [27] D. Cassioli, M. Z. Win and A. F. Molisch, "The ultra-wide bandwidth indoor channel: from statistical model to simulations" IEEE J. Select. Areas Commun., vol. 20, pp. 1247-1257, Aug. 2002.
- [28] L. C. Wang, W. C. Liu and K. J. Shieh, "On the performance of using multiple transmit and receive antennas in pulse-based ultrawideband systems" IEEE Transactions on Wireless Communications, vol. 4, no.6, pp. 2738-2750, Nov. 2005.
- [29] L. Yang and G. B. Giannakis, "Ultrawideband communications: An idea whose time has come" IEEE Signal Processing Magazine, pp. 26-54, Nov. 2004.
- [30] H. Lee, B. Han, Y. Shin, and S. Im, "Multipath characteristics of impulse radio channels," Proc. Of Vehicular Thchnology Conference Proceedings, Tokyo, pp. 2487-2491, Spring 2000.