

在超寬頻無線隨意網路中使用陣列天線

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摘要

超寬頻(UWB)無線電(IR)吸引人的特性如提供隨意網路(ad hoc network)的多重存取很好的適應性。本篇論文我們著力在發展以中央存取控制(MAC)為基礎的TH-UWB無線隨意網路系統,並且更進一步地增加空間複用(spatial reuse)和系統的效能,本篇論文所考慮的存取模式結合了TH-UWB和分空間多重存取(SDMA)技術,許多設計的參數廣泛的被用來分析系統的效能來符合(滿足)服務品質的需求。

關鍵詞: 隨意網路、服務品質、中央存取控制、超寬頻Beamforming、跳時超寬頻。

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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]FCC, " Revision of Part 15 of the Commission ' s Rules Regarding Ultra-Wideband Transmission System, " First Report and Order, ET Docket pp.98-153, Feb. 2002.
- [11]C. Fowler, J. Entzminger, J. Vorum, " Report: Assessment of Ultra-Wideband Technology, " OSD/DARPA Ultra-Wideband Rader Review Panel, R-6280, 1990.
- [12]Gian Mario Maggio, " An introduction to UWB, " CWC/UCSD & STMicroelectronics, Dec. 2002.
- [13]M. Ghavami, Ultra wideband signals and systems in communication engineering, John Wiley & Sons, Inc., 2004.
- [14]M. Z. Win and R. A. Scholtz, " On the robustness of ultra-wide bandwidth signals in dense multipath environments, " IEEE Commun. Lett., vol. 2, pp. 51-53, Feb. 1998.
- [15]R. Fisher et al., " DS-UWB Physical Layer Submission to 802.15 Task Group 3a, " IEEE 802.15-04/0137r3, Motorola, Inc. et al., Jul. 2004.
- [16]A. Batra et al., " Multi-band OFDM Physical Layer Proposal, " IEEE 802.15-03/267r6, Texas Instruments et al., Sept. 2003.
- [17]A. Batra et al., " MultiBand OFDM Physical Layer Proposal for IEEE 802.15 Task Group 3a " MBOA-SIG, Sept. 2004.
- [18]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.
- [19]M. Ghavami, Ultra wideband signals and systems in communication engineering, John Wiley & Sons, Inc., 2004.
- [20]Gian Mario Maggio, An introduction to UWB, CWC/UCSD & STMicroelectronics, December, 2002.
- [21]M. L. Welborn, " System considerations for ultra-wideband wireless networks, " IEEE Radio and Wireless Conference, pp. 5-8, 2001.
- [22]R. A. Scholtz, " Multiple access with time-hopping impulse modulation, " Proc. MILCOM ' 93, vol. 2, pp. 447-450, 1993.
- [23] C. E. Perkins, Ad Hoc Networking. Addison Wesley Professional, December 2000.
- [24] M. Ilyas, ed., The Handbook of Ad hoc Wireless Networks. CRC Press, December 2002.
- [25]M. Z. Win and R. A. Scholtz, " Ultra wide bandwidth time-hopping spread-spectrum Impulse Radio for wireless multiple access communications " IEEE Trans. on Communications, vol.48, no.4, pp. 679-691, April 2000.
- [26] R. A. Horn and C. R. Johnson, Matrix analysis, Chap. 6, Cambridge University press 1985.