

Advances in Coordinated Multi-Cell Multi-User MIMO Systems

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Tutorial

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Abstract:

In this tutorial, we first discuss multiuser MIMO (MU-MIMO) antenna techniques in a point-to-point single-cellular environment. We explain how multi-user scheduling techniques can exploit the degree of freedom in the user domain to enhance the coverage and capacity of MIMO systems simultaneously. Next, we extend our scope to the point-to-multipoint MU-MIMO broadcast systems with an emphasis on discussing the limited feedback issue and beamforming design techniques for MU-MIMO broadcast systems. Then, we will explain how the MU-MIMO broadcast techniques can be applied to improve performance of the multi-cellular MIMO systems in an interference-limited environment. Last, we will introduce the state of art coordinated multipoint transmission (CoMP) techniques in 3GPP LTE-advanced or called the collaborative MIMO (Co-MIMO) techniques in IEEE 802.16m WiMAX, and conclude this tutorial by discussing the open issues in this field.

Bio:

Li-Chun Wang (M'96 – SM'06 – F'11) received the B.S. degree from National Chiao Tung University, Taiwan, R. O. C. in 1986, the M.S. degree from National Taiwan University in 1988, and the Ms. Sci. and Ph. D. degrees from the Georgia Institute of Technology, Atlanta, in 1995, and 1996, respectively, all in electrical engineering.

From 1990 to 1992, he was with the Telecommunications Laboratories of the Ministry of

Transportations and Communications in Taiwan (currently the Telecom Labs of Chunghwa Telecom Co.). In 1995, he was affiliated with Bell Northern Research of Northern Telecom, Inc., Richardson, TX. From 1996 to 2000, he was with AT&T Laboratories, where he was a Senior Technical Staff Member in the Wireless Communications Research Department. In August 2000, he has joined the Department of Electrical Engineering of National Chiao Tung University in Taiwan and has been promoted to the full professor since 2005. His current research interests are in the areas of radio resource management and cross-layer optimization techniques for wireless systems, heterogeneous wireless network design, and cloud computing for mobile applications.

He was elected to the IEEE Fellow grade in 2011 for his contributions in cellular architectures and radio resource management in wireless networks. Dr. Wang was a co-recipient (with Gordon L. Stuber and Chin-Tau Lea) of the 1997 IEEE Jack Neubauer Best Paper Award for his paper "Architecture Design Frequency Planning, and Performance Analysis for a Microcell/Macrocell Overlaying System," IEEE Transactions on Vehicular Technology, vol. 46, no. 4, pp. 836-848, 1997. He has published over 180 journal and international conference papers. He served as an Associate Editor for the IEEE Trans. on Wireless Communications from 2001 to 2005, the Guest Editor of Special Issue on "Mobile Computing and Networking" for IEEE Journal on Selected Areas in Communications in 2005 and on "Radio Resource Management and Protocol Engineering in Future IEEE Broadband Networks" for IEEE Wireless Communications Magazine in 2006. He is holding nine US patents.

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