



Illinois Center for Wireless Systems

ICWS Seminar Series



BIDIRECTIONAL TRAINING AND ESTIMATION IN WIRELESS CHANNELS

Professor Dongning Guo
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Monday, February 27, 2012
4:00 – 5:00 p.m.

141 Coordinated Science Lab

Abstract: Wireless communication is usually bidirectional and channel reciprocity is often given by nature. We study two bidirectional communication problems. In the first problem, two users at the two ends of a channel wish to estimate its (common) state. We show that treating the problem as two separate one-way problems with users sending deterministic pilots is not optimal in general, and that it may be beneficial to adapt the pilots to the received signals. The second problem concerns a multi-antenna cellular system. We propose an uplink-downlink bidirectional training scheme for optimizing beamformers at all stations, which adapt to channel variations and unknown interference. Without explicit estimation and exchange of channel state information, the scheme may reduce the overhead significantly. With sufficient training, the degrees of freedom achieved by the scheme approaches the maximum of multiuser MIMO channels. This is joint work with Prof. Michael Honig and former and current graduate students Mingguang Xu and Fei Teng at Northwestern University.

Biography: Dongning Guo joined the faculty of Northwestern University, Evanston, IL, in 2004, where he is currently an Associate Professor in the Department of Electrical Engineering and Computer Science. He received the B.Eng. degree from the University of Science & Technology of China, the M.Eng. degree from the National University of Singapore, and the M.A. and Ph.D. degrees from Princeton University, Princeton, NJ. He was a R&D Engineer in the Center for Wireless Communications, Singapore, from 1998 to 1999. He has held visiting positions at Norwegian University of Science and Technology in summer 2006 and Chinese University of Hong Kong in 2010-2011. He is an Associate Editor of IEEE Transactions on Information Theory in the area of Shannon Theory. He is a recipient of the National Science Foundation Faculty Early Career Development (CAREER) Award in 2007. He also received the Huber and Suhner Best Student Paper Award in the International Zurich Seminar on Broadband Communications in 2000 and is a co-recipient of the IEEE Marconi Prize Paper Award in Wireless Communications in 2010 (with Y. Zhu and M. Honig). His research interests are in information theory, communications, and networking.

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