The University of New South Wales

Faculty of Engineering

School of Electrical Engineering & Telecom

Invited Talk

Cognitive MIMO Systems: Theory and Practice

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Date: 20 April 2010, Tuesday
Time: 11:00 a.m. – 12:00 noon
Venue: G3, Electrical Engineering Building

Abstract

In this talk, we study the role of multi-antenna or multiple-input multiple-output (MIMO) technology for opportunistic transmission of the secondary users in a cognitive radio network to efficiently reuse the spectrum allocated to an existing primary radio network. We characterize the fundamental tradeoff for the design of secondary MIMO transmission between maximizing the secondary network throughput and minimizing the interference to the coexisting primary network. First, we consider the ideal case with the perfect channel state information (CSI) from the secondary transmitters to primary receivers, and establish a mathematical model for optimizing the secondary MIMO transmission to maximize the secondary channel capacity subject to a set of interference power (also know as interference temperature) constraints for protecting the primary users. We develop solutions for the formulated problems via applying various convex optimization techniques. Second, we consider the practical case where the CSI from the secondary transmitter to primary receiver is not known a priori at the secondary transmitter. We propose two novel schemes for implementing cognitive MIMO transmission, where the secondary transmitter obtains the required CSI to the primary receiver by either periodically observing the primary transmission or via a collaborative limited feedback from the primary receiver. Last, we show that the developed results for the design of cognitive MIMO systems also shed lights on the optimal design of other MIMO communication systems bearing similar interference management requirements. By applying a new principle so-called "active interference temperature control", we resolve design optimization problems for the multi-antenna secrecy communication system and the cooperative multi-cell multi-antenna communication system.

Biography

Rui Zhang received the B.Eng and M.Eng degrees in electrical and computer engineering from National University of Singapore (NUS) in 2000 and 2001, respectively, and the Ph.D degree in electrical engineering from Stanford University, California, USA, in 2007. He is now a Senior Research Fellow with Institute for Infocomm Research (I2R), Singapore. He also holds an Assistant Professorship position with the Department of Electrical and Computer Engineering, NUS. He has authored/co-authored more than 100 refereed international journal and conference papers. He was the co-recipient of the Best Paper Award from IEEE PIMRC 2005. He was a Guest-Editor of EURASIP Journal on Applied Signal Processing, special issue on Advanced Signal Processing for Cognitive Radio Networks. He has served for various IEEE conferences as technical program committee (TPC) member and organizing committee member. His current research interests include cognitive radio, cooperative communication, and multiuser MIMO communication.

*** * * * *** **ALL ARE WELCOME** *** * * * *** **For ENQUIRIES: Dr. Wei Zhang (Ph: 9385 4033)**