ICWS Seminar Series

WIRELESS CHANNEL UNCERTAINTY IN RELAY-ASSISTED COMMUNICATION AND DISTRIBUTED DETECTION SYSTEMS

Professor Azadeh Vosoughi
Dept. of Electrical & Computer Eng.
University of Rochester

Monday, October 10, 2011
141 Coordinated Science Lab/4:00 p.m.

Abstract: One of the main challenges in wireless communications is coping with channel uncertainty. Dealing with this uncertainty, and the limitations it imposes, is tightly related to the specific system and its application. In this talk, we consider two systems, namely a wireless bi-directional relay-assisted communication system and a wireless distributed detection system. We study the impacts of channel uncertainty on the performance limits of these two systems and investigate optimal transceiver designs that minimize these impacts.

For the bi-directional relay-assisted communications we consider a training-based system, in which receivers learn the channels via employing dedicated pilot symbols. Assuming Gaussian inputs and block Rayleigh fading channel model, we study the trade-off between the accuracy and the bandwidth/energy costs of channel estimation and explore optimal transmit resource allocation, subject to network power constraint. We consider Cramer-Rao lower bound for channel estimation, sum-rate and outage probability bounds as the performance metrics.

Next, we discuss the effects of channel uncertainty on the design and performance of a wireless distributed detection system that is tasked with solving a binary hypothesis testing problem. We consider systems with training-based and blind channel estimation and coherent/non-coherent receptions. We investigate the optimal data fusion rules that maximize the overall system detection reliability and error exponent. Furthermore, we present and compare several detection and data fusion designs that exploit diversity to combat channel uncertainty and enhance system performance.

Biography: Azadeh Vosoughi is Wilmot Assistant Professor in the Department of Electrical and Computer Engineering at the University of Rochester. She received her BS degree from Sharif University of Technology, Tehran, Iran, in 1997, her MS degree from Worcester Polytechnic Institute, Worcester, MA, in 2001, and her PhD degree from Cornell University, Ithaca, NY, in 2006, all in Electrical Engineering. Her research interests lie in the areas of wireless relay-assisted communications, distributed detection and estimation, and distributed source coding and compression. She was the recipient of the Furth award in 2006 and was appointed as Wilmot Assistant Professor in 2009 at the University of Rochester. Dr. Vosoughi received the NSF CAREER award in 2011 for her research on the integration of signal processing and communications for distributed detection systems.