IEEE SCV Signal Processing Society

Date: Feb 13th 2006
Title: Distributed Wireless Communication: A Shannon-Theoretic Perspective on Fading Multihop Networks
Speaker: Sumeet Sandhu, PhD & Ozgur Oyman, PhD, Communications Technology Lab, Intel

Location: National Semiconductor Credit Union Building (Building 31), 955 Kifer Rd., Sunnyvale (Near the intersection of Lawrence and Central Expressway);
Coordinates: N37deg 22.464' W122deg 00.272' (WGS84);
http://maps.yahoo.com/maps_result?ed=Lz2FO.p_0TpVKFWBuA124OtTr9dn&csz=Sunnyvale%2C+CA&country=us
Directions: Take 101 to Lawrence Expressway. Head south on Lawrence to Kifer (past Central). Turn right on Kifer. Go 0.5 miles on Kifer and turn right into the Credit Union parking lot. Entrance is on the back side of the building.

Time: 6:30pm: Fast Food & drinks ($1 Donation Recommended towards Refreshments)
7:00pm: Announcement
7:05pm: Talks starts

Abstract:

Distributed communication is an advanced wireless technology that allows cooperative communication by ensembles of wireless devices. Devices located close to the source cooperate by re-encoding and forwarding packets, and devices located close to the destination cooperate by sharing received packets. Such cooperation provides diversity gains against wireless channel impairments such as fading, shadowing and path-loss. It improves performance over and beyond what is possible with traditional point-to-point links in a flexible manner by harvesting diversity in the network.

The simplest form of cooperation is a multi-hop network where nodes cooperate by forwarding packets one at a time. We consider a fading multihop network with a single active source-destination pair connected via multiple hops over a row of intermediate relays. We use Shannon-theoretic tools to analyze the tradeoff between energy efficiency and spectral efficiency (known as the power-bandwidth tradeoff) for a simple communication protocol based on time-division decode and forward relaying. It is commonly believed that communication over multiple hops suffers in fading channels due to the worst link limitation. In contrast, our results indicate that hopping can significantly improve the outage behavior over slow-fading networks and stabilize links against random channel fluctuations. We prove that there exists an optimal number of hops that minimizes the end-to-end outage probability. Finally, we provide numerical performance comparisons based on realistic channel models. The talk also covers a more advanced form of cooperation known as virtual MIMO, and it's advantages as well as distributed communication protocols.

Biography:

Sumeet Sandhu, PhD is the Principal Investigator for a Strategic Research Project on "Distributed Communication" in the Corporate Technology Group at Intel Corporation in Santa Clara. Sumeet holds a PhD from Stanford University and a BS and MS from the Massachusetts Institute of Technology. She held positions at Iospan Wireless, Sprint Corporation, Hughes Research Laboratories and Bell Laboratories prior to Intel. She was one of the initiators of MIMO-OFDM research at Intel, and invented a space-frequency bit interleaver for multiple spatial streams that is expected to be a key mandatory portion of the upcoming 802.11n standard.

Ozgur Oyman, PhD is a research scientist in the Corporate Technology Group at Intel Corporation in Santa Clara. He holds M.S. (2002) and Ph.D. (2005) degrees from Stanford University and a B.S. (2000) degree from Cornell University. He was a visiting researcher at the Communication Theory Group within the Swiss Federal Institute of Technology (ETH Zurich) in 2003. His prior work experience includes internships at Qualcomm (2001) and Beceem Communications (2004).