



THE CHINESE UNIVERSITY OF HONG KONG
 Institute of Network Coding
 and
 Department of Information Engineering
Seminar



**Linear Precoding and Iterative MMSE Detection, and
 Eigen-Direction Alignment Aided Physical-Layer Network Coding,
 for MIMO Channels**

by

Dr. Xiaojun Yuan (袁晓军博士)
Department of Electronic Engineering
City University of Hong Kong

Date : 9 March 2011 (Wednesday)

Time : 10:00 -11 :00 am

**Venue : Room 833, Ho Sin Hang Engineering Building
 The Chinese University of Hong Kong**

Part I: Linear Precoding and Iterative MMSE Detection for MIMO Channels with and without CSIT

Abstract

We consider efficient transmission over multiple-input multiple-output (MIMO) channels. Our proposed scheme involves linear-precoding (LP) at the transmitter and iterative linear minimum mean-square error (ILMMSE) detection at the receiver. We establish an area theorem to evaluate the achievable rate of the proposed scheme. We show that, in the case of perfect channel state information at transmitter (CSIT), a properly designed LP-ILMMSE scheme can achieve the water-filling capacities of MIMO channels. We also show that, in the case of no CSIT, the proposed scheme can perform close to the outage channel capacity.

Part II: Eigen-Direction Alignment Aided Physical-Layer Network Coding for MIMO Two-Way Relay Channels

Abstract

We propose a joint channel coding and physical layer network coding (CPNC) scheme for multiple-input multiple-output (MIMO) two-way relay channels (TWRCs). At the heart of the scheme lies a key technique referred to as eigen-direction alignment (EDA) precoding. This technique efficiently creates multiple aligned parallel channels, which facilitates the deployment of multi-stream CPNC. Our analysis shows that the achievable rate of the scheme can approach the capacity upper bound in the median to high signal-to-noise (SNR) region when $n_T > n_R$, where n_T and n_R denote the number of antennas of each user and that of relay, respectively. The gap to the capacity upper bound diminishes as n_T/n_R increases. Numerical results demonstrate that the proposed scheme tremendously outperforms other existing schemes.

Biography

Dr. Yuan received the B.S. degree in electronic and information systems from Shanghai Jiaotong University in 2000, the M.S. degree in circuit and systems from Fudan University in 2003, and the Ph.D. degree in electrical engineering from the City University of Hong Kong in 2008. Since 2009, he has been a research fellow at the Department of Electronic Engineering, the City University of Hong Kong. During 2009.2-2009.8 and 2010.1-2010.7, he was working as a visiting scholar at the University of Hawaii at Manoa. His research interests include coding and coded modulation techniques, multiple-input multiple-output (MIMO) and orthogonal frequency-division multiplexing (OFDM) systems, and network information theory. He has published about 30 refereed papers in the world-leading journals and conferences in the related areas. He is now a member of IEEE.

****ALL ARE WELCOME ****

Host: Professor Raymond W.H. Yeung (Tel: 2609-8375, Email: whyeung@ie.cuhk.edu.hk)

Enquiries: Information Engineering Dept., CUHK (Tel.: 2609-8388)