



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



**Cross Layer Design for Network Coding over  
 Fading Channels**

By

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**Date : 13 July 2011 (Wednesday)**  
**Time : 2:30 - 3:30 pm**  
**Venue : Room 833, Ho Sin Hang Engineering Building**  
**The Chinese University of Hong Kong**

Abstract

In this talk, we first review some backgrounds of network coding and introduce some key topics on the recent advancements of network coding. Then we shall focus on the cross layer design by using the three-node relay network and its two variants: Optimal beam-forming design for MISO system, and Distributed space time cooperation over butterfly network. We observe that the difference between the two hop channels would have important effect on the network coding gain. In order to reduce the effect between the two hop channels, we propose two different opportunistic network coding methods based on the channel side information by formulating optimal problems and obtain a considerable coding gain. Later on, we consider the beam-forming design for dual-cast system with MISO techniques and present an optimal design category with consideration of the channel estimation error. It has been proved that our developed beam-forming method has a certain SNR gain over the traditional method. Finally, we consider another variant of three-node relay network, the butterfly network with two sources and two destinations as well as one relay. Based on the distributed space time cooperation, we propose a cooperation-based opportunistic network coding, and get some improvements in terms of total throughput, time delay, outage probability, etc., compared to the two well known methods: traditional four time transmission method, and traditional opportunistic network coding method.

Biography

Dr. Pingyi Fan received the B.S and M.S. degrees from the Department of Mathematics of Hebei University in 1985 and Nankai University in 1990 respectively, and received his Ph.D degree from the Department of Electronic Engineering, Tsinghua University, Beijing, China in 1994. He is a professor of department of EE of Tsinghua University currently. From August 1997 to March 1998, he visited Hong Kong University of Science and Technology as a Research Associate. From May 1998 to October 1999, he visited University of Delaware, USA, as a research fellow. In March 2005, he visited NICT of Japan as a visiting Professor. From June 2005 to September 2010, he visited Hong Kong University of Science and Technology for many times. He was promoted as full Professor at Tsinghua University in 2002.

Dr. Fan is a senior member of IEEE and an overseas member of IEICE. He has participated in organizing many international conferences including as TPC co-Chair of IEEE International Conference on Wireless Communications, Networking and Information Security (WCNIS 2010), and TPC member of IEEE ICC, Globecom, WCNC, VTC, NetCod, etc. He has served as an editor of IEEE Transactions on Wireless Communications, Interscience International Journal of Ad Hoc and Ubiquitous Computing, and Wiley Journal of Wireless Communication and Mobile Computing. He is also a reviewer of more than 24 international Journals including 15 IEEE Journals and 6 European Journals. He has published more than 200 technical papers in the field of wireless communications and got more than 20 innovation patents in China and the USA. He received some academic awards, including the IEEE WCNC'08 Best Paper Award, ACM IWCMC'10 Best Paper Award and IEEE ComSoc Excellent Editor Award for IEEE Transactions on Wireless Communications in 2009. His main research interests include B3G technology in wireless communications such as MIMO, OFDM, Multicarrier CDMA, Space Time Coding, LDPC design, Network Coding, Network Information Theory, Cross Layer Design, etc.

**\*\*ALL ARE WELCOME \*\***

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