



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



Linear Physical-layer Network Coding for Fading Two-way Relay Channels: Design Criterion and Performances

by

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The Chinese University of Hong Kong

Abstract

Physical-layer network coding (PNC) can potentially boost the throughput or reliability of a multi-user wireless communication network, such as a two-way relay channel. In a realistic fading channel environment, however, the amplitude variation and carrier phase asynchrony effects may limit the performance of a PNC scheme. Therefore, one key challenge is how to efficiently tackle these effects in designing a high-performance PNC scheme. In this talk, I will introduce a technique, referred to as linear PNC, to address the amplitude variation and carrier phase asynchrony problems in a realistic Rayleigh fading two-way relay channel. The main feature is that the relay will select a “good” pair of integer coefficients, according to the fading channel realization, and compute the associated linearly network-coded message. In particular, the integer coefficients are carefully selected so that the error probability at the relay is minimized. A “minimum set distance maximization” design criterion for the linear PNC scheme is developed. For the high SNR regime, a parametrical solution that meets this criterion is derived. The average error-probability performance of the linear PNC scheme over a Rayleigh fading two-way relay channel is analyzed, and a high-SNR closed-form result is derived. The result shows that the designed linear PNC scheme asymptotically achieves the interference-free error probability lower bound. In addition, the linear PNC scheme significantly outperforms existing schemes, e.g., with complete decoding and conventional PNC.

Biography

Tom (Tao) YANG received B.Sc. degree in electronic engineering in 2003 from Beijing University of Aeronautics and Astronautics (Beihang University), Beijing, China. He received Master by research and Ph. D degrees in electrical engineering from the University of New South Wales, Sydney, Australia, in 2006 and 2010, respectively. He is currently a Research Fellow in the Wireless and Networking Technologies Laboratory (WNTL) at Commonwealth Scientific and Industrial Research Organization (CSIRO), Sydney, Australia. His research expertise and interests include multi-user and MIMO communications, error-control coding, iterative signal processing and decoding, physical-layer network coding and network information theory. He was the recipient of Australian Postgraduate Award (APA), NICTA research project award (NRPA) and Supplementary Engineering Award (SEA).

****ALL ARE WELCOME ****

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