The Chinese University of Hong Kong

Shun Hing Institute of Advanced Engineering

Distinguished Lecture Series 2008

Space-Time Coding for Cooperative Communications

by

Professor Xiang-Gen Xia

Dept of Electrical and Computer Engineering

University of Delaware, USA

Date: 21 July 2008, Monday

Time: 2:00 p.m. – 3:30 p.m.

Venue: SHIAE Conference Room
Room 702, 7/F, William M.W. Mong Engg., CUHK

Abstracts

When wired modems had been well developed in the last century, wireless modems have more challenges, such as interference and fading. They are just in the beginning stage, such as IEEE 802.11 and 802.16. To overcome interference and fading, there are two current ways. One is to use multiple transmit/receive antennas (MIMO) and the other is to use cooperative communications. Space-time coding is used to achieve the spatial diversity for both techniques. One major difference, however, for these two techniques is the synchronization that may be a problem for cooperative communications but not for MIMO systems. While all space-time codes for MIMO systems can be directly applied to cooperative communications in the synchronization case, new space-time coding schemes are needed for asynchronous cooperative communication systems to achieve spatial diversity. In this talk, we first discuss some of this background. We then present a new family of space-time coding schemes that achieve full spatial diversity for asynchronous cooperative systems, which is obtained by constructing shift-full-rank matrices (SFR). We then present systematic constructions of SFR matrices. Finally we show that these codes have simplified decoding methods, MMSE-DFE, that still achieve full spatial diversity.

Biography of the Speaker

Xiang-Gen Xia received his B.S. degree in mathematics from Nanjing Normal University, Nanjing, China, and his M.S. degree in mathematics from Nankai University, Tianjin, China, and his Ph.D. degree in Electrical Engineering from the University of Southern California, Los Angeles, in 1983, 1986, and 1992, respectively.

He was a Senior/Research Staff Member at Hughes Research Laboratories, Malibu, California, during 1995-1996. In September 1996, he joined the Department of Electrical and Computer Engineering, University of Delaware, Newark, Delaware, where he is the Charles Black Evans Professor. He was a Visiting Professor at the Chinese University of Hong Kong during 2002-2003, where he is an Adjunct Professor. Before 1995, he held visiting positions in a few institutions. His current research interests include space-time coding, MIMO and OFDM systems, and SAR and ISAR imaging. Dr. Xia has over 170 refereed journal articles published and accepted, and 7 U.S. patents awarded and is the author of the book Modulated Coding for Intersymbol Interference Channels (New York, Marcel Dekker, 2000).

Dr. Xia received the National Science Foundation (NSF) Faculty Early Career Development (CAREER) Program Award in 1997, the Office of Naval Research (ONR) Young Investigator Award in 1998, and the Outstanding Overseas Young Investigator Award from the National Nature Science Foundation of China in 2001. He also received the Outstanding Junior Faculty Award of the Engineering School of the University of Delaware in 2001. He is currently an Associate Editor of the IEEE Transactions on Wireless Communications, the IEEE Transactions on Vehicular Technology, the Journal of Communications (JCM), and the Journal of Communications and Networks (JCN), and Signal Processing (EURASIP). He was a guest editor of Space-Time Coding and Its Applications in the EURASIP Journal of Applied Signal Processing in 2002. He served as an Associate Editor of the IEEE Signal Processing Letters during 2003 to 2008, the IEEE Transactions on Signal Processing during 1996 to 2003, the IEEE Transactions on Mobile Computing during 2001 to 2004, and the EURASIP Journal of Applied Signal Processing during 2001 to 2004. He is Technical Committee Chair of the Signal Processing Symp. in Globecom 2007 in Washington, D.C., and the General Co-Chair of ICASSP 2005 in Philadelphia.

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**** Light refreshment will be served after the lecture on 7/F ****