S5 – Technical Session VI: Broadband Wireless and Sensory Network

OFDM and Its Application to 4G

Xiaodong Wang
Electrical Engineering Department, Columbia University
717 Schapiro CEPSR, 500 West 120th Street, New York, NY 10027, U.S.A.
wangx@ee.columbia.edu

ABSTRACT

Orthogonal frequency-division multiplexing (OFDM) is a bandwidth-efficient signaling scheme for wideband digital communications. The main difference between frequency division multiplexing (FDM) and OFDM is that in OFDM, the spectrum of the individual carriers mutually overlap. Nevertheless, the OFDM carriers exhibit orthogonality on a symbol interval if they are spaced in frequency exactly at the reciprocal of the symbol interval, which can be accomplished by utilizing the discrete Fourier transform (DFT). With the development of modern digital signal processing technology, OFDM has become practical to implement and has been proposed as an efficient modulation scheme for applications ranging from modems, digital audio broadcast, to next-generation high-speed wireless data communications. For example, the high-speed wireless LAN standard IEEE 802.11a is based on OFDM.

We discuss receiver design for OFDM systems signaling through unknown frequency-selective fading channels. In particular, we focus on the design of turbo receivers in a number of OFDM systems, including an OFDM system with frequency offset, a space-time block coded OFDM system, and a space-time coded OFDM system based on low-density parity-check (LDPC) codes.

BIOGRAPHY

Dr. Xiaodong Wang received the B.S. degree in Electrical Engineering and Applied Mathematics (with the highest honor) from Shanghai Jiao Tong University, Shanghai, China, in 1992; the M.S. degree in Electrical and Computer Engineering from Purdue University in 1995; and the Ph.D. degree in Electrical Engineering from Princeton University in 1998. From July 1998 to December 2001, he was on the faculty of the Department of Electrical Engineering, Texas A&M University. In January 2002, he joined the faculty of the Department of Electrical Engineering, Columbia University.

Dr. Wang's research interests fall in the general areas of computing, signal processing and communications. He has worked in the areas of digital communications, digital signal processing, parallel and distributed computing, nanoelectronics and bioinformatics, and has published extensively in these areas. Among his publications is a recent book entitled *Wireless Communication Systems: Advanced Techniques for Signal Reception*, published by Prentice Hall, Upper Saddle River, in 2003. His current research interests include wireless communications, Monte Carlo-based statistical signal processing, and genomic signal processing. Dr. Wang received the 1999 NSF CAREER Award, and the 2001 IEEE Communications Society and Information Theory Society Joint Paper Award. He currently serves as an Associate Editor for the *IEEE Transactions on Communications*, the *IEEE Transactions on Wireless Communications*, the *IEEE Transactions on Signal Processing*, and the *IEEE Transactions on Information Theory*.