

Adaptive MIMO OFDM Receivers: Implementation Impairments and Complexity Issues

Dr. Ali H. Sayed

Electrical Engineering Department, UCLA, CA

Friday, April 1st, 3:00 PM, ENS 637

Abstract

High speed communications over broadband wireless channels has emerged as a key feature of future communications systems due in part to the explosive interest in information technology applications, including mobile wearable systems, mobile computing, high-speed internet, and video transmission over wireless channels. Multi-user and multi-antenna communication schemes are being developed in order to enhance data rates and to allow users to share the same physical channel. Broadband multi-antenna OFDM communications has emerged as a leading technology for such high speed wireless networks. OFDM-based physical layers have already been adopted in several standards including IEEE 802.11a, IEEE 802.11g, IEEE 802.11n, IEEE 802.20, and IEEE 802.16.

The performance of OFDM-based receivers in multi-user and multi-antenna communications, however, is generally limited by several sources of distortion that are typical of such environments, including channel fading conditions, inter-symbol interference, inter-user interference, and inter-channel interference. In addition, there are serious implementation impairments that result from analog component imperfections (such as IQ mismatches), and which can significantly degrade the performance of otherwise optimal receivers. These component impairments are difficult to eliminate using analog processing, and they become challenging at higher carrier frequencies and wider bandwidths.

This talk provides an overview of current research on the study and development of efficient adaptive receivers for broadband multi-user OFDM communications using space-time block coded (STBC) transmissions. The receiver algorithms are designed to perform both distortion compensation and data decoding in a joint manner. The receivers are efficient in that they are able to exploit both spatial and data structure in order to reduce computational complexity; they also combat the effects of component imperfections in the digital domain.

Bio

Ali H. Sayed is Professor and Vice-Chairman of Electrical Engineering at UCLA where he directs the Adaptive Systems Laboratory (www.ee.ucla.edu/asl). He has published widely in the areas of adaptive filtering, estimation theory, and signal processing for communications with over 200 articles and 4 books. He is the author of the textbook *Fundamentals of Adaptive Filtering* (Wiley, NY, 2003). He is a Fellow of IEEE and serves as the Editor-in-Chief of the *IEEE Transactions on Signal Processing*. His research has received several recognitions including the 1996 IEEE D. G. Fink Prize, a 2002 Best Paper Award from the IEEE Signal Processing Society, the 2003 Kuwait Prize, and two Best Student Paper Awards at international meetings (1999,2001). He has consulted with industry on different aspects of adaptive filtering, channel equalization, echo cancellation, OFDM receivers, and DSL. He currently serves as a Distinguished Lecturer of the IEEE Signal Processing Society. He is also a member of the Publications and Award Boards of the IEEE Signal Processing Society, and serves as General Chairman of ICASSP 2008.
