Parallel Wireless Communication with Antenna Arrays

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Wireless radio communication is impaired by i) signal fading due to destructive addition of multiple reflected paths in the propagation medium, and by ii) co-channel interference arising from the necessity to reuse the wireless spectrum in different geographical areas. The increasing requirements on data rate and quality of service for wireless communications systems, combined with the fact that wireless spectrum is a scarce and very expensive resource, necessitates the development of radically new techniques to increase spectrum efficiency and to improve link reliability.

During the last 5 years the use of multiple antennas at both ends of a wireless radio link has been recognized to yield significant improvements in terms of spectral efficiency and link reliability. The corresponding technology is known as multiple-input multiple-output (MIMO) wireless communication and yields "spatial" bandwidth (for free) through oversampling of the spatial propagation channel. The extent to which MIMO gains can be realized in practice depends critically on the wireless propagation channel, antenna design and signal processing algorithms employed in the transmitter and the receiver of the wireless system.

In this talk, we will give a brief review of the (short) history of MIMO communications, followed by an overview of the basic principles and show experimental results of a real-time MIMO testbed achieving four-fold increase in data rate compared to state-of-the art wireless local area networks (WLANs).