

Effects of user and spatial diversity on high data rate wireless systems

Rajaraman Parameswaran

Committee Chairman: Dr. Michael Buehrer
Bradley Department of Electrical and Computer Engineering

(ABSTRACT)

A novel design paradigm for wireless data delivery involves use of a scheduler at a base station to schedule users awaiting transmission and send downlink data to these users with all available cell power. This is unlike previous systems that share the available downlink power between users and trade off interference with capacity. The concept is used in 3G wireless standards like 1xEVDO and HSDPA. The scheduler is designed to exploit the peaks in channels seen by different users and transmit data to the user that can support the best rate. In contrast, antenna diversity, where multiple antennas are deployed at the receiver or transmitter; has the effect of improving received signal fidelity by averaging the channel variation.

In this thesis, we evaluate the joint effect of user diversity and antenna diversity for various scheduling algorithms. The system is first studied with a single user to calculate theoretical throughput values. A loaded system is then simulated and throughput trends are plotted for each user. Total system capacity is evaluated in terms of served bytes for various combinations of scheduling algorithm, diversity type and channel quality. Multi-user scheduling diversity is studied using the same system simulation model via Tomlinson Harashima precoding. Results are generated for various cell powers. Single-user and multi-user scheduling cases are compared to understand the pros and cons of each approach.
