Smart Antennas for IS-95 CDMA Systems

In this project, we show that space-time adaptive processing (STAP) techniques increase communication capacity in CDMA systems based on the IS-95B standards. We consider the reverse link (mobile to base station) and use multiple antennas at the base station to combat the ISI and MUI problems. The user signals are assumed to be asynchronous and the communication channels are both frequency-selective and fast time-varying.

The second generation IS-95 standard based on CDMA has achieved significant commercial and technological success. Intersymbol interference (ISI) due to multipath propagation and multi-user interference (MUI) exist in most CDMA networks and limit the communication quality and capacity. Therefore, mitigating the ISI and MUI greatly increases the system capacity and improves the communication quality.

We use multiple antennas at the base station and employ space-time adaptive processing techniques to mitigate channel impairments and co-channel interference. The signals from different users are considered to be asynchronous and the channels are assumed to be frequency-selective and rapidly time-varying. The first task is to establish a proper channel model for testing and evaluating existing and newly devised space-time adaptive processing techniques. The channel model is both general and comprehensive.

The second task in this project is to examine the receiver performance under existing space-time adaptive processing techniques. In this report, we include space-time adaptive processing techniques which we believe are most applicable to the underlying situations. The communication capacity improvement from using different techniques is evaluated under the frequency-selective and fast time-varying channel model. The signal structure follows the IS-95 standard.

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