Joint Cochannel Interference Cancellation
And Channel Shortening with
Space-Time Processing

Roopsha Samanta
EE 381K-14
05 March, 2003
Introduction

- Cellular systems
  - Cochannel Interference (CCI)
- Frequency-selective Rayleigh fading channels
  - Intersymbol Interference (ISI)
- Motivation
  - Maximize SINR
  - Reduce complexity of receiver
Background

- Separate CCI cancellation and ISI equalization
- Complexity of Viterbi equalizer \(\sim\) length of channel impulse response
- Joint CCI cancellation and channel shortening ??
Key paper # 1
[Liang, Chen and Paulraj, 1997]
Key paper # 2
[Melsa, Younce and Rohrs, 1996]

- Channel shortening for DMT transceivers
- Design time-domain FIR filter, given
  - Original channel impulse response
  - Desired length of impulse response, $\nu$
  - Filter length
- Shortening-signal-to-noise-ratio (SSNR)
  
  $$SSNR = \frac{\text{Energy in largest } \nu \text{ consecutive samples}}{\text{Energy in remaining samples}}$$
Key paper # 3
[Tkacenko and Vidyanathan, 2002]

- MIMO channel shortening equalizers
  - Noise autocorrelation sequence required
  - Trade-off between SINR and SSNR