Journal Watch
IEEE Transactions on Communication, Oct 2013

Mishfad S V

SPC Lab, IISc

December 21, 2013

- Considers time-frequency doubly-selective channel
- Time selective due to doppler shift (introduces ICI)
- Proposes a novel channel estimation scheme based on distributed compressive sensing (DCS) theory
- Takes advantage of the basis expansion model (BEM) and the channel sparsity in the delay domain
- Two significant challenges
  1. Existence of ICI (Inter Carrier Interference)
  2. Jointly sparse vectors should share a common measurement matrix

- Solution
  - Employs the complex exponential functions (CE-BEM) and designs a novel sparse pilot pattern
  - Distributes BEM coefficient vectors in a special manner : ICI-free structure and a common measurement matrix
- Advantages of the proposed scheme
  - High accuracy as well as high spectral efficiency
  - Avoids additional iterative operations, required by CS to combat the large Doppler shift (due to jointly sparse BEM coefficient vectors and the ICI-free structure)
  - Outperforms the conventional schemes with a much smaller number of pilot subcarriers

- Heterogeneous network + Han-Kobayashi
- Proposes an amplitude-space sharing strategy among the macro-cell user and pico-cell users
  - Different users occupy different levels in the signal amplitude space
  - Different layers of signal and interference are separable at each receiver
- Employs Han-Kobayashi coding and derives the optimal transmit powers allocated to the private and common information
- Developed a simplified transmission scheme for the network with one macro-cell and multiple pico-cells
- Optimized the transmit powers to maximize the network sum-rate

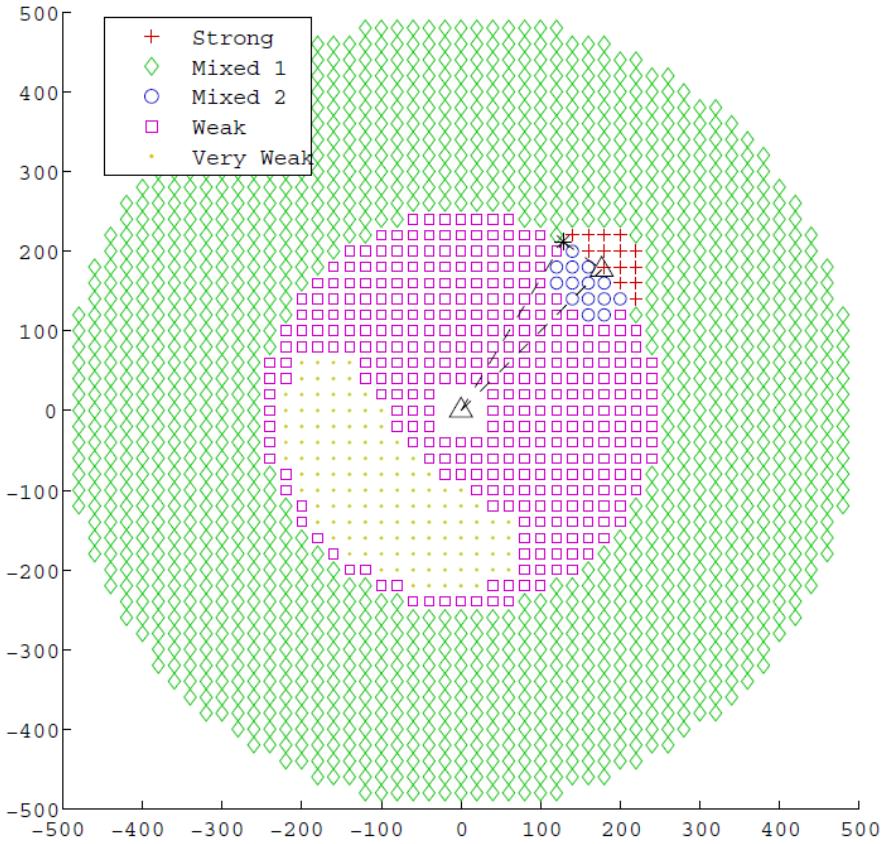

Figure: Various interference scenarios in downlink, depending on the locations of the macro-user

- Proposes near optimal algorithms for spectrum sharing
- Tries to minimize the total transmit power of secondary systems through beamforming and power allocation
- Interference to PUs should be below a certain threshold
- Secondary users should satisfy certain Quality-of-Service (QoS) constraint
- Centralized algorithm
  - Requires CSI of all the secondary links
  - Practically difficult!
- Distributed algorithm decomposes the joint optimization problem into two sub-problems:
  1. Transmit power allocation with the QoS constraint for the secondary systems
  2. Distributed beamforming with the interference constraint for the primary systems

- Experimental study of distributed Opportunistic Spectrum Access (OSA) implementation
- Detailed comparison of the performance of practical and theoretical OSA approaches
- Implemented on WARP board
- Shows that certain approaches can achieve significant performance improvement compared to theoretically-optimal approaches
- Payoff : more outages to the primary licensed networks (within the permissible bounds)

Other papers

- A Bayesian Algorithm for Joint Symbol Timing Synchronization and Channel Estimation in Two-Way Relay Networks
- Iterative Decoding of Iterative Clipped and Filtered OFDM Signal
- On the Impact of Routing Strategies on the Interference of Ad Hoc Wireless Networks
- Performance Analysis of Distributed Raptor Codes in Wireless Sensor Networks
- Coded Path Protection: Efficient Conversion of Sharing to Coding
- Estimation of Communications Channels Using Discrete Wavelet Transform-Based Deconvolution
- Partially Coherent Constellation Design and Bit-Mapping with Coding for Correlated Fading Channels