Journal Watch: IEEE Transactions on Vehicular Technology

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05th Nov 2011

Optimizing Voting Rule for Cooperative Spectrum Sensing Through Learning Automata

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- A Cognitive Radio Network with a Base Station and N Secondary Users (SU)
- Decision fusion - "k out of N" rule
- Goal: Find optimum k to maximize the average throughput ($\bar{T}$) of the SUs
- Large $\bar{T}$ needs a large k, that results in low detection probabilities and missed detections
- Propose maximizing the revenue function, that considers penalty on SUs, coexistence of PU and SU alongwith $\bar{T}$ and derive an optimum k

- In practice, false alarm and detection probabilities of SUs may differ or may not be known, they propose to use finite action set learning automata to find optimum k.
- Learns optimal action through repeated interaction with the environment
- Convergence and stability analysis of the proposed algorithm

Cognitive Radio Transmission Strategies Exploiting the Primary-Link Adaptivity

Zhaoyang Zhang, Haiyan Luo, Jianmin Zhang, Wei Wang, and Guanding Yu

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- Goal: To do rate and power adaptation at secondary by exploiting primary adaptability such that spectrum opportunity is fully used by maintaining the spectral efficiency and average Packet error requirement (PER) of primary
- Initial works: assumed primary operates at fixed rate with constant power
- Later works: consider primary adaptability, but assume complete primary link information
- This work considers either 1) no information, 2) partial instantaneous information a) transmit mode or b) SINR

- System model: A Primary user pair and a Secondary user pair are considered
- AMC Transmission model: Both Primary and Secondary transmitters employ AMC based on link SINR
- Training phase: PU transmitter operates at fixed power but does rate adaptation, during training phase both PU and SU estimate link SINR, and choose their transmission modes appropriately for data transmission phase
- Formulate three optimization problems based on primary link information
  - no primary link information: only rate adaptation
  - partial information: both rate and power adaptation

Semiblind Sparse Channel Estimation for MIMO-OFDM Systems

Feng Wan, Wei-Ping Zhu, and M. N. S. Swamy
Concordia University, Canada

- MIMO OFDM Channel Estimation techniques 1) training based 2) blind 3) semi-blind
- Current blind/semi-blind algorithms use second order statistics that need a large number of OFDM symbols (not suitable for fast varying channels)
- These techniques do not exploit sparsity of the wireless channel when the delay spread is large but the number of significant taps is few
- Sparse channel Estimation methods
    - Detect position of most significant taps (MSTs)
    - Exploit position info. to estimate channel

- To find accurate MSTs need large number of pilots
- Very little work on blind MST detection and blind sparse channel estimation
- Contributions
    - Blind algorithm by analyzing second order statistics of received signal to find a constraint on sparse channel vector w.r.t MSTs
    - A training based sparse LS criterion to estimate channel

Near-Optimal Channel Estimation for OFDM in Fast-Fading Channels

Ping Wan, Student Member, Michael McGuire,and Xiaodai Dong
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- Standard approach for OFDM channel estimation: Pilot-symbol aided Modulation
- For fast fading channel, the number of unknown CSI parameters are more than the number of received samples
- Basis Expansion Model: channel gain is modeled as weighted sum of basis functions
- To improve data rate: Joint CE and data detection are used
- Current Joint CE/data detection: cost of required detection techniques increases with order of modulation and fading rate

- Proposes a low complexity joint CE/symbol detection for fast fading envt. subject to low pilot to data ratio
- Contributions
  - BEM coefficients are estimated for a transmission block containing multiple OFDM blocks
  - Evolution of BEM coefficients is modeled as multivariate AR process - Kalman filter is used
  - The data is detected and decoded based on this initial channel estimate. Then decision directed CE is used to find CE. This is done till convergence.
  - Extrinsic Information Transfer Chart analysis (EXIT) to show near optimality to ideal CSI case

- Cognitive Radio Networking and Communications: An Overview
- Resource Allocation and Partner Selection for Cooperative Multicarrier Systems
- Lowering the SNR Wall for Energy Detection Using Cross-Correlation
- Dual-Observation Time-Division Spectrum Sensing for Cognitive Radios