Journal Watch
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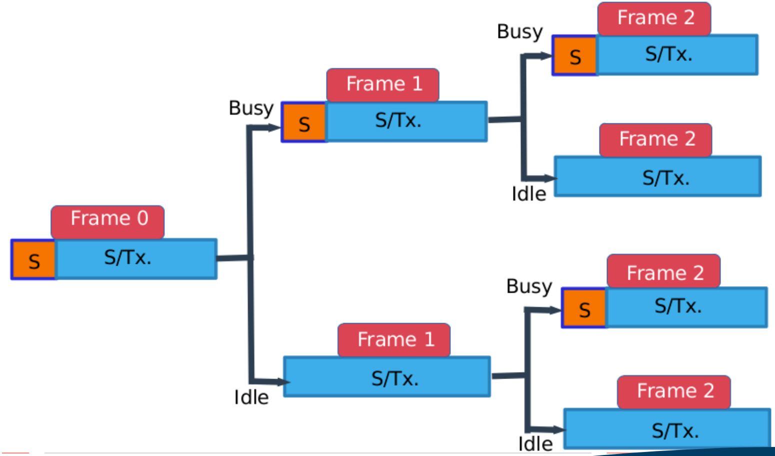
Simultaneous Sensing and Transmission for Cognitive Radios With Imperfect Signal Cancellation

Christos Politis, Sina Maleki, Christos G. Tsinos, Konstantinos P. Liolis, Symeon Chatzinotas, and Bjorn Ottersten

Simultaneous Sensing and Tx. for CRs

- **Conventional CR**: "listen-before-talk"
- **Proposed scheme**: simultaneous spectrum sensing + data tx.



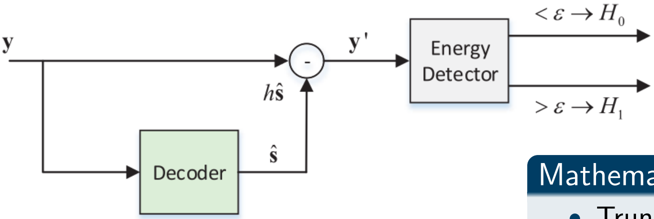
Simultaneous Sensing and Tx. for CRs

Detection hypothesis:

PU is idle, $\mathcal{H}_0 : \boldsymbol{y} = h\boldsymbol{s} + \boldsymbol{w}$

PU is active, $\mathcal{H}_1 : \boldsymbol{y} = \boldsymbol{x}_p + h\boldsymbol{s} + \boldsymbol{w}$

h - known scalar flat fading channel bw SUs



- P_{FA} for BPSK and QPSK SU modulation
- Approximated P_{FA} for SU with M-QAM
- Prob. of detection when $\boldsymbol{x}_p \sim \mathcal{N}(\prime, \sigma^2_{\mathrm{PU}})$

Mathematical Tools:

- Truncated central and non-central χ^2- dist.
- Central limit theorem

Joint Channel Estimation and Impulsive Noise Mitigation in Underwater Acoustic OFDM Communication Systems

Peng Chen, Yue Rong, Sven Nordholm, Zhiqiang He, and Alexander J. Duncan

Joint Channel Estimation and Impulsive Noise Mitigation in UA OFDM

System Model

$$\boldsymbol{r}_f = \boldsymbol{D}\boldsymbol{F}\boldsymbol{h} + \boldsymbol{F}\boldsymbol{v} + \boldsymbol{F}\boldsymbol{w}$$

- $\boldsymbol{r}_f$: Received signal in frequency domain
- $\boldsymbol{D}$: Diagonal matrix with OFDM symbol vector along diagonal
- $\boldsymbol{F}$: DFT matrix
- $\boldsymbol{h}$: Channel response
- $\boldsymbol{v}$: Impulsive noise
- $\boldsymbol{w}$: Non-impulsive noise samples

- Clipping-blanking and Doppler algorithm is used to estimate and compensate the frequency offset
- **Central Idea:** Exploit sparsity in $\boldsymbol{h}$ and $\boldsymbol{v}$

Joint Channel Estimation and Impulsive Noise Mitigation in UA OFDM

Algo. 1 Pilot subcarriers based impulsive noise cancellation

- Recovery long sparse vector obtained by concatenating $\boldsymbol{h}$ and $\boldsymbol{v}$
- OMP based recovery

Algo. 2 Data-aided joint channel estimation and impulsive noise cancellation

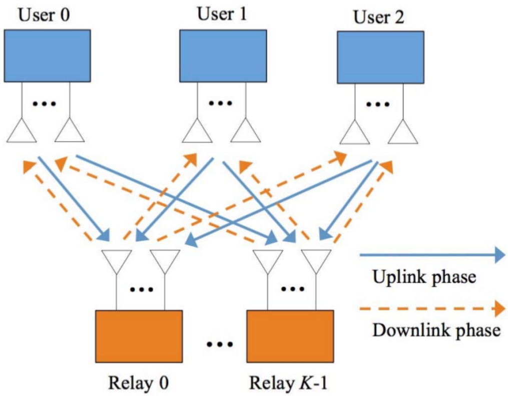
Step 1: Estimate $\boldsymbol{h}$ and $\boldsymbol{v}$ using Algo. 1
Step 2: Estimate data symbols $\boldsymbol{D}$ using estimates of $\boldsymbol{h}$ and $\boldsymbol{v}$
Step 3: Re-estimate $\boldsymbol{h}$ and $\boldsymbol{v}$ using Algo. 1 and estimate of $\boldsymbol{D}$

Numerical results using real data collected during a UA communication experiment conducted in the estuary of the Swan River, WA, Australia

On the Degrees of Freedom of the Symmetric Multi-Relay MIMO Y Channel

Tian Ding, Xiaojun Yuan, and Soung Chang Liew

On the DoF of the Symmetric Multi-Relay



- 3 user nodes
- M antennas/user
- K relay nodes
- N antennas/relay
- Pairwise data exchange
- Half-duplex mode
- CSI is globally known

- Assumption: Symmetric DoF for all user pairs: $d_{i,j} = d$
- Design parameters: **linear** user precoders and post-processors, and relay precoders

On the DoF of the Symmetric Multi-Relay MIMO Y Channel

- Constraints: Signal space alignment and interference neutralization
- Analysis of the solvability of the system

For $K \geq 2$, the optimal DoF is achieved for
$$(M/N) \in \left[0, \max\{(\sqrt{3K}/3), 1\}\right) \cup \left[((3K + (9K^2 - 12K)^{1/2})/6), \infty\right)$$

M: antennas/user
K: relay nodes
N: antennas/relay

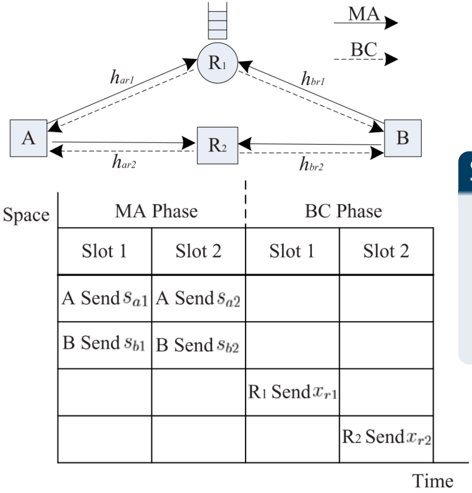
Mathematical Tools

- Random matrix theory
- A new technique to solve linear matrix equations with rank constraints

Performance Analysis for Two-Way Network-Coded Dual-Relay Networks With Stochastic Energy Harvesting

Wei Li, Meng-Lin Ku, Yan Chen, K. J. Ray Liu, and Shihua Zhu

Performance Analysis for Two-Way Network-Coded Dual-Relay N/ws With EH



- R_1: EH with a finite-sized battery
- Quasi-static Rayleigh flat fading

Space-Time Tx. Protocol

1. Sources tx. at fixed power
2. Relays follow AF protocol
3. Sources decode other symbol by removing self interference

- **Goal:** Optimal tx. power of R_1 to minimize pair-wise error prob.

Performance Analysis for Two-Way Network-Coded Dual-Relay N/ws With EH

MDP optimization framework

- State:
  - EH state: Gaussian mixture hidden Markov chain
  - Relays battery state: Quantized in units of energy quanta
  - Fading channels state: finite-state Markov model
- Action: EH relay's transmission power
- Reward function: Contribution to the PEP by the EH relay conditioned on preset relay actions and fading channel states
- Utility function: Expected long-term total discounted reward
- Algorithm: Value iteration

- Results on structure of the optimal solution
- Performance analysis: expected PEP and asymptotic approx. of PEP (high SNR)

Other Papers

- **Enhancing Multiuser MIMO Through Opportunistic D2D Cooperation**
  - Can Karakus and Suhas Diggavi
- **Joint Scheduling and Transmission Power Control in Wireless Ad Hoc Networks**
  - Kamal Rahimi Malekshan and Weihua Zhuang
- **Spectrum Allocation and Power Control for Non-Orthogonal Multiple Access in HetNets**
  - Jingjing Zhao, Yuanwei Liu, Kok Keong Chai, Arumugam Nallanathan, Yue Chen, and Zhu Han
- **Utility Maximization for Two-Way AF Relaying Under Rate Outage Constraints**
  - Chang-Lin Chen and Che Lin