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Performance Analysis of Cognitive Radio Systems under QoS Constraints and Channel Uncertainty,
Sami Akin and Mustafa Cenk Gursoy

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- Jointly considering the channel sensing and estimation.
- Provide a framework through which the performance of cognitive transmissions can be analyzed in the presence of **uncertainty caused by errors** in sensing and estimation.
- Identifying a state-transition model for cognitive transmission by modeling the primary user activity as a two state Markov process.
- Determining the **Effective Capacity** of cognitive transmissions and obtain the maximum throughput under the QoS constraints and channel uncertainty.
- Numarical analysis of power and rate allocation strategies and idetifying the maximum throughput as the function of P_{FA}, P_{MD} and training power.

Spectrum Leasing via Cooperative Opportunistic Routing Techniques
Davide Chiarotto, Osvaldo Simeone and Michele Zorzi

- **Spectrum Leasing:** A method of co-existance of SU along with PU, where PU is **NOT** oblivious to the presence of SU.

- A licensed multihoc network with a set of unlicenced nodes is considered.
- Co-existance is regulated via a spectrum leasing mechanism that is based on the cooperation and opportunistic routing.
- In each transmission block, the next hop is decided based on the channel conditions in the previous transmission.
- Depending on the channel conditions, sometimes the secondary nodes provide the next hop in return of the spectrum leasing provided by the primary.
- Different Multiplexing techniques are considered for both Primary and Secondary traffic at Secondary namely Orthogonal Multiplexing and Superposition Coding.

- Secondary nodes enforce Quality-of-Service requirements in terms of rate and reliability when deciding whether or not to cooperate.

- Four policies are proposed to span different operating points in the trade off between gains in throughput and overall energy expenditure for the Primary Network.

- Analysed assuming linear geometry and quasi - static Rayleigh fading statistics using Markov Chain Tools.

- The optimality in terms of both throughput and primary energy consumption of superposition coding over all possible multiplexing strategies, for the given routing techniques, is proved.

Relay Scheduling for Cooperative Communications in Sensor Networks with Energy Harvesting
Huijiang Li, Neeraj Jaggi and Biplab Sikdar

- **Problem Addressed:** "Given an estimate of the current network state, should a source transmit its data directly to the destination or use a relay to help with the transmission? "

- A time slotted source-relay-destination system is considered where a sensor has an option of another sensor to help with its transmission to the destination.

- At any given instant of time, the problem interest is for the source to determine transmit data on it's own or cooperatively with relay to in order to maximize the long term ratio of data successfully delivered to the total data generated.

- **Case 1** A Fully Oservable System $=>$ Markov Decision Process (MDP)

- **Case 2** A Partially Observable System $=>$ Partially Observable Markov Decision Process (POMDP).

- It's shown that POMDP can be decomposed to MDP.
- A theoritical upper bound on an arbitary scheduler is proposed.

Hybrid Full-Duplex/Half-Duplex Relaying with Transmit Power Adaptation,
Taneli Riihonen, Stefan Wernern and Risto Wichman

- Central Factor in the design of Relay System: Chocie between Full Duplex and Half Duplex relaying modes.
- **HD:** Two orthogonal time slots for Tx and Rx
- **FD:** Suffers with significant self - interference.
- The evident objective of the mode switching is to maximize the spectral efficiency.
- In terms of instantaneous and average spectral efficiency, "Hybrid FD/HD Relaying" is specified.
- Self - interference in FD can be mitigated by spatially separated Tx and Rx antennas.
- The study rationalizes the trade off between FD and HD modes on the basis of residual self interference remaining after the use of any cancellation schemes.

- In many cases neither of mode is an obvious choice and premature mode decision leads to inefficient sptectrum utilization. Hence Hybrid FD/HD Relay schemes are introduced, which decide based on either instantaneous or statistical CSI
- Optimum Instatneous and long-term power adaptation techniques are developed to reduce the recidual self interference.
- It is demonstrated that FD and hybrid FD/HD modes offer great potential for increasing spectral efficiency w.r.t. the conventional HD mode.
- Techniques are applicable to both AF and DF Relay schemes.

Other Papers of Interest I

- **Capacity Analysis and Call Admission Control in Distributed Cognitive Radio Networks**, Subodha Gunawardena and Weihua Zhuang.

- **Belief Propagation based Cooperative Compressed Spectrum Sensing in Wideband Cognitive Radio Networks**, Zhenghao Zhang, Zhu Han, Husheng Li, Depeng Yang, and Changxing Pei

- **Adaptive Power Loading for OFDM-Based Cognitive Radio Systems with Statistical Interference Constraint**, Gaurav Bansal, Md. Jahangir Hossain, and Vijay K. Bhargava

- **Distributed Cooperative Precoding with SINR-Based Co-Channel User Grouping for Enhanced Cell Edge Performance**, J. Vinosh Babu James and Bhaskar Ramamurthi

Other Papers of Interest II

- **MIMO Gaussian Bidirectional Broadcast Channels with Common Messages**, Rafael F. Wyrembelski, Tobias J. Oechtering, and Holger Boche

- **Beamforming Capacity Optimization for MISO Systems with Both Mean and Covariance Feedback**, Efstathios Vagenas, Georgios S. Paschos, and Stavros A. Kotsopoulos.