Journal Watch:

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- **Single-RF Spatial Modulation Relying on Finite-Rate Phase-Only Feedback: Design and Analysis**

  Authors: Mishfad Shaikh Veedu, Chandra R. Murthy, Lajos Hanzo

- Spatial Modulation: Information conveyed by the specific index of the transmit antenna in addition to the information transmitted from the multiple antennas.
- Transmission Scheme
  - Phase Compensation: To cancel the phase shift introduced by the channel.
  - Deterministic Constellation Rotation: To increase the minimum distance of the constellation at the receiver.
- System Model

$$\mathbf{y} = \sqrt{\rho}\mathbf{h}\mathbf{x} + \mathbf{z} \tag{1}$$

  where $\mathbf{x} = \mathbf{W}\mathbf{s}$ and $\mathbf{s} = [0, \ldots, s_l^i, \ldots, 0]^T$, $\mathbf{h} = [h_1, \ldots, h_{n_t}]$, $\mathbf{z} = \mathcal{CN}(0, 1)$ and ρ is the SNR.
- $\mathbf{W} = \mathrm{diag}(\mathbf{w})$ is the phase compensation matrix

Contributions

- Spatial Modulation with Finite Rate Feedback:
  - Performance analysis of SM-MISO systems with Q-CSIT.
  - Performance metric: Difference between the probability of error with Q-CSIT and with perfect CSIT.
  - Analysis shows that the performance metric decreases with the SNR as $1/\rho^2$ at high SNRs.
  - Performance metric is inversely proportional to 2^{2B}, where B is the number of bits used for quantization.
- Rotational Symmetry-based Phase Compensation:
  - New phase compensation scheme proposed which reduces the required number of feedback bits, based on the rotational symmetry of the signal constellation.
  - Sufficient to derotate the channel to the nearest modulo-$(2\pi/M)$ phase angle. Feedback rate decreases for a given accuracy of quantization by $\log_2(M)$

- **Uplink Achievable Rate and Power Allocation in Cooperative LTE-Advanced Networks**

  Authors: Xiaoxia Zhang, Xuemin (Sherman) Shen, Liang-Liang Xie

Goal

- To derive the achievable rates of the SC-FDMA system with ZF & MMSE equalization, based on the joint superposition coding for cooperative relaying.
- To propose optimal power allocation schemes among subcarriers at both UE and RS to maximize the overall system throughput.

System Model

- Multiple UEs, one eNB, one RS. Each UE broadcasts its transmission signals to both its affiliated eNB and the RS.
- Joint Superposition Coding: UE transmits the current transmission symbol and the previous instant's transmission symbol. RS decodes the current transmission symbol and retransmits it to the eNB.
- Perfect CSI knowledge assumed. eNB allocates the subcarriers to the users based on the CSI and feeds them back to the UE and RS for subcarrier mapping and power allocation.

Contributions

- Design of ZF and MMSE equalizers at both RS and eNB, taking into account the cooperative relay channels.
- Achievable rates of the SC-FDMA relay system for both ZF and MMSE equalizers are derived.
- Based on the achievable rate of the SC-FDMA relay system, transmission power allocation schemes were derived to maximize the cooperation gain and the overall throughput of the system.
- Two step approach to solve the power allocation problem:
  - Maximizing the achievable rate of a single user through power allocation among its assigned subcarriers at both UE and RS, assuming a fixed power constraint at the RS for the user.
  - RS distributes its total available transmission power among all users to maximize the overall throughput.

- **Energy-Spectral Efficiency Tradeoff in Cognitive Radion Networks**

  Authors: Wensheng Zhang, Cheng-Xiang Wang,
  Di Chen and Hailiang Xiong

Contributions

- Proposed a general framework to evaluate the tradeoff between EE and SE in CRNs. Proposed framework is discussed in three typical CRN paradigms: UCRN, OCRN & ICRN.
- Optimal EE is deduced in the closed form expression as the function of SE for varying CRNs.

General Coexistence Model between PU Systems and CRNs:

- TV system with a large-scale signal, a wireless microphone system with small-scale signal, and three kinds of CRNs.
- No interinterference among the three CRNs.
- Spectral Efficiency $\eta_s = \frac{R}{B}$, Energy Efficiency $\eta_e = \frac{R}{P}$.

EE-SE Tradeoff in Cognitive Radio Networks

- SE-EE relation for UCRNs is written as

$$\eta_e = \frac{\eta_s}{P_c/B + \left(2^{\eta_s} - 1\right) N_0/G_t} \tag{2}$$

  where P_c is the circuit power, B is the bandwidth, N_0 is the noise spectral density, and G_t is the total channel gain.
- Minimum and maximum SE are determined by the transmit power constraints. Based on these constraints, the interval of SE can be determined.
- Based on the SE interval obtained, the optimal EE can be obtained using (2).
- Similar approaches used for obtaining optimal EE for OCRNs and ICRNs.

Other Interesting Papers

- Antenna Selection Strategies for MIMO-OFDM Wireless Systems: An Energy Efficiency Perspective.
- Stackelberg Bayesian Game for Power Allocation in Two-Tier Networks.
- Throughput Optimization in Multichannel Cognitive Radios With Hard-Deadline Constraints.
- Energy EfficiencyYSpectral Efficiency Tradeoff: A Multiobjective Optimization Approach.
- Performance Evaluation of Cyclostationary-Based Cooperative Sensing Using Field Measurements.
- Antenna Beam Pattern Modulation With Lattice-Reduction-Aided Detection.