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Ashok Bandi

SPC Lab, IISc

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- **Secure Green Communication via Untrusted Two-Way Relaying: A Physical Layer Approach**

  Authors: D. Wang, B. Bai, W. Chen, and Z. Han

Goal: To maximize the ratio of the secrecy rate to the total power consumption by jointly optimizing power allocation to all nodes subjected to maximum power and minimum rate constraints

System Model :

(1) half duplex communication,all devices are equipped with single antenna, full CSI at Tx's, and no direct link

(2) Semi trusted cooperation between relays: service leve trust but untrusted at data level

Objective :

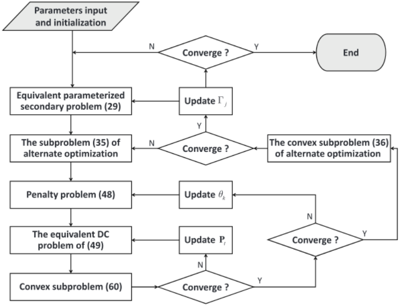
$$\max_{\mathbf{Q},\mathbf{P}} \ \boldsymbol{\Gamma}(\mathbf{Q},\mathbf{P})$$

$$s.t. \begin{cases} 0 \le P_A \le P_A^{max} \\ 0 \le P_B \le P_B^{max} \\ 0 \le P_{R_i}(\mathbf{Q},\mathbf{P}) \le P_{R_i}^{max}, \ \ i \ \epsilon \ \boldsymbol{\Omega} \\ R_{AB} \ (\mathbf{Q},\mathbf{P}) \ge R_0 \\ R_{BA} \ (\mathbf{Q},\mathbf{P}) \ge R_0 \end{cases}$$

Transformations:

- parametric programming:
  $$\max_{(\mathbf{Q},\mathbf{P})\epsilon\mathbb{D}} \ R(\mathbf{Q},\mathbf{P}) - \boldsymbol{\Gamma} P(\mathbf{Q},\mathbf{P})$$
- uses fractional programming algorithm and alternate minimization to solve the above objective function
- Uses penalty function method to include non convex constraints into objective function and solves it using DC programming.

Solution:



- **Scheduling and Resource Allocation in Downlink Multiuser MIMO-OFDMA Systems**

  Authors: Guillem Femenias, and Felip Riera-Palou

- **Goal**: To provide channel aware- and queue aware scheduling and resource allocation for BD based MU-MIMO-OFDMA wireless networks
- **System model**: Downlink multiuser MIMO-OFDMA system
- **Contribution**: Based on the availability of PHY layer CSI and DLC layer QSI, an optimal design framework for MU-MIMO is introduced to integrate BD-based precoding design, multiuser/multimode selection, and power/sub-band allocation polices considering different scheduling polices
- **Problem formulation**:

$$\max_{\mathbf{P} \epsilon \mathcal{P}} \sum_{b=1}^{N_b} \sum_{g=1}^{G_b} \sum_{m \epsilon M_{b,g}} \sum_{s=1}^{S_{b,g,m}} w_m N_{sc} \rho_{b,g,m,s}$$

$$subject\,to \sum_{b=1}^{N_b} \sum_{g=1}^{G_b} \sum_{m \epsilon M_{b,g}} \sum_{s=1}^{S_{b,g,m}} P_{b,g,m,s} \leq P_T$$

Solves the above problem for two cases.

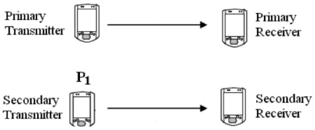
- Adaptive power allocation policy:
  $\max_{\mathbf{P} \epsilon \mathcal{P}} \sum_{b=1}^{N_b} \sum_{g=1}^{G_b} \sum_{m \epsilon M_{b,g}} \sum_{s=1}^{S_{b,g,m}} w_m N_{sc} \rho_{b,g,m,s} + \mu \left(P_T - \sum_{b=1}^{N_b} \sum_{g=1}^{G_b} \sum_{m \epsilon M_{b,g}} \sum_{s=1}^{S_{b,g,m}} P_{b,g,m,s} \right)$
- Uniform power allocation policy: The total power P_T is uniformly distributed across N_b sub-bands

- **How to Increase Energy Efficiency in Cognitive Radio Networks**

  Authors: Mohammad Robat Mili, Leila Musavian,Khairi Ashour Hamdi, Farokh Marvasti

Goal: To improve energy efficiency while maximizing ergodic capacity and minimizing average transmission power of secondary user network and limiting interference on primary user network

System Model :



Problem formulation:

- **Multi Objective Problem:**

$$\min_{P1} \mathbb{E}\left[P1(g1, h1, f1)\right]$$

$$\max_{P1} \mathbb{E}\left[\, ln(1 + SINR)\right]$$

$$s.t. \quad \min_{P1} \mathbb{E}\left[P1(g1, h1, f1)f1\right] \leq Q_{average}$$

Transforming to SOP:

$$\min_{P1} \mathbb{E}\left[P1(g1, h1, f1)\right]$$

$$s.t. \; \mathbb{E}\left[\, ln(1 + SINR)\right] \geq R_{average}$$

$$s.t. \quad \min_{P1} \mathbb{E}\left[P1(g1, h1, f1)f1\right] \leq Q_{average}$$

Considered the following cases:

- **Case 1**: Solves the above SOP using Lagrangian approach with λ_s, λ_p as dual variables of constraints
- **Case 2**: Since having indirect channel gain at secondary transmitter is difficult, replaces that with average channel gain
- **Case 3**: Considers imperfect CSI
- **Case 4**: Extended it to multiple secondary and primary links, and solves using augmented Lagrangian

Some interesting papers:

- How to Increase Energy Efficiency in Cognitive Radio Networks... M. Robat Mili, L. Musavian, K. A. Hamdi, and F. Marvasti
- Link-State Optimized Decode-Forward Transmission for Two-Way Relaying... L. Pinals and M. Vu
- Relay-Based Spectrum Sharing With Secondary Users Powered by Wireless Energy Harvesting... C. Zhai, J. Liu, and L. Zheng
- Transmit Antenna Selection for Multiple-Input Multiple-Output Spatial Modulation Systems... P. Yang, Y. Xiao, Y. L. Guan, S. Li, and L. Hanzo
- User Association and Interference Management in Massive MIMO HetNets... Q. Ye, O. Y. Bursalioglu, H. C. Papadopoulos, C. Caramanis, and J. G. Andrews
- Efficient Charging of Access Limited Wireless Underground Sensor Networks... S. Kisseleff, X. Chen, I. F. Akyildiz, and W. H. Gerstacker