Journal Watch

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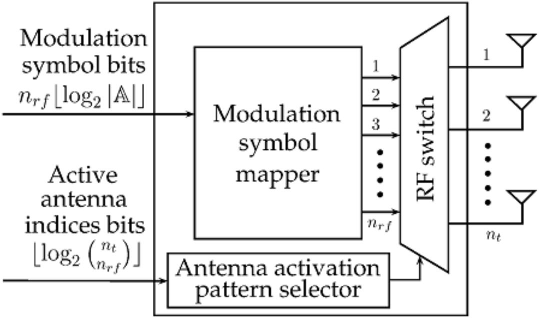
1. Generalized Space-and-Frequency Index Modulation

Authors:Tanumay Datta, Harsha S. Eshwaraiah and A. Chockalingam

Goal: To acheive high Spectral efficiency in Multiantenna wireless system.

1. Generalized spatial Index Modulation (GSIM)



Achievable Rates

$$R_{gsim} = \underbrace{\left\lfloor \log_2 \binom{n_t}{n_{rf}} \right\rfloor}_{\text{Antenna index bits}} + \underbrace{n_{rf} \log_2 M}_{\text{Modulation Symbol bits}} \quad bpcu$$

where,
n_{rf}: No. of RF chains,
n_t : No. of transmit antenna and
M : Size of modulation symbol.

Detection

ML detection,

$$\hat{x} = \underset{x \in U}{\arg\min} \; ||y - Hx||^2$$

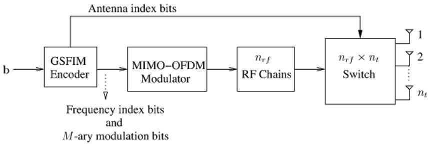
$$U = \{x | x \in A_0^{n_t \times 1}, ||x||_0 = n_{rf}, t^x \in S\}$$

For medium and large values of n_t and n_{rf}, brute-force computation of x becomes computationally prohibitive.

Solution

Low-Complexity Algorithm: Gibbs sampling.

GSFIM



Encodes bits through indexing in both spatial and frequency domains.

2. Optimum Energy- and Spectral-Efficient Transmissions for Delay-Constrained Hybrid ARQ Systems

Authors: Gang Wang, Jingxian Wu and Yahong Rosa Zheng

Goal: To have balanced trade-off between Energy Efficiency (EE) and Spectral Efficiency (SE).

Metric:1 EE, Average energy required to successfully deliver one information bit from a source to its destination

Metric:2 SE defined as the effective data rate per unit bandwidth

Metric:3 SE normalized energy per bit (E_m)

- Delay constrained: Only K retransmissions are allowed
- Coded HARQ with Chase combining
- Practical system parameters are considered.

Optimum Energy distribution to maximize EE

Avg. Energy per information bit,

$$\text{minimize } E_t \text{ w.r.t. } \gamma_1, \gamma_2, \cdots, \gamma_K \geq 0$$

$$\text{s.t.} \sum_{k=1}^{K} \gamma_k \geq -\frac{\gamma_w}{\log(1-\delta)}$$

where $\gamma = [\gamma_1, \cdots, \gamma_K]^T$,

γ_w is a threshold and

γ_b is the Avg. E_b/N_0 at receiver

Optimization problem is solved using Karush-Kuhn-Tucker (KKT) conditions.

Optimum Energy distribution to maximize SE

$$\eta_s = \frac{L_b}{L_b + L_0} \frac{r \log_2 M}{1+\alpha} \sum_{k=1}^{K} \frac{1}{k} exp(-\frac{\gamma_w}{\sum_{j=1}^{k}} \gamma_j) \times \prod_{i=1}^{k=1} \left[1 - exp(-\frac{\gamma_w}{\sum_{j=1}^{k}} \gamma_j) \right]$$

Energy distribution to maximize SE, $\gamma = [\gamma_0, 0, \cdots, 0]$,
The system that maximizes η_s allocates all the energy to the first transmission attempt.

Energy distribution to achieve a balanced tradeoff between EE and SE

$E_m = E_t / \eta_s$,
Metric E_m can be reduced by either decreasing E_t or increasing η_s.

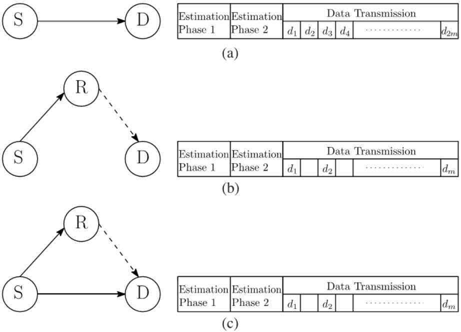
- This optimization problem is solved using Iterative backward sequential calculation algorithm.
- The minimization of E_m provides a balanced tradeoff between EE and SE.
- The E_m-reducing system can increase the SE of with only negligible cost in terms of EE.

3. Opportunistic Energy-Aware Amplify-and-Forward Cooperative Systems With Imperfect CSI.

Authors: Osama Amin, Ebrahim Bedeer, Mohamed Hossam Ahmed, Octavia A. Dobre and Mohamed-Slim Alouini

Goal:To maximize the Energy Efficiency in oppurtunistic cooperative system.

System Model



Channel Estimation

- Disintegrated channel estimation (DCE).
- Cascaded channel estimation (CCE).

Energy Efficiency, $\eta = \frac{\mathcal{S}}{P_T}$

$\eta_{OAF} = max(\eta_{DT}, \eta_{TH}, \eta_{CT})$

$$\max_{P_s} \ \eta_{DT} = \frac{\log_2(1 + \frac{\gamma_{SD} P_s}{\epsilon_{SD} P_s + 1})}{k_s P_s + P_{c,DT} + P_{CE,DT}}$$

$$s.t. \ 0 \leq P_s \leq P_{s,max}$$

Dinkelbach Method:converts the fractional pseudoconcave objective function into a concave function

Other interesting papers:

- Online Precoding for Energy Harvesting Transmitter With Finite-Alphabet Inputs and Statistical CSI.
- Kernel-Based Adaptive Online Reconstruction of Coverage Maps With Side Information.
- Distributed Linear Precoding and User Selection in Coordinated Multicell Systems
- Joint Optimization Methods for Nonconvex Resource Allocation Problems of Decode-and-Forward Relay-Based OFDM Networks.