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Hybrid Energy Harvesting Wireless Systems: Performance Evaluation and Benchmarking

Shilpa Rao and Neelesh B. Mehta

- Hybrid WSN: *Nc* Conventional and *Ne* EH nodes
- To come up with consistent performance criteria as existing measures are ill suited
- Contributions :
  - *k*-Outage duration
  - *n*-transmission duration
- Analysis for a time slotted H-WSN with star topology.
- To reduce complexity, two hypothetical systems proposed:
  - Single Pooled Battery (SP)
  - Dual Pooled Battery (DP)
- *k*-outage duration of the original system is upper bounded by that of SP and DP systems
- *n*-transmission duration is lower bounded by that of SP and DP systems.
- Numerical results prove that the bounds are tight.

Energy Efficient Downlink Cooperative Transmission With BS and Antenna Switching off

Qian Zhang, Chenyang Yang, Harald Haas, and John S. Thompson

- *B* BSs have *N* antennas each. Jointly serve *M* users.
- Aim : To improve the energy efficiency of the system
- How?

  Adaptively Switching off BSs and antennas
- Problem : To obtain the BS-antenna operation pattern that achieves the maximum EE

Contribution:

- Optimal solution of the dynamic BS-antenna switching scheme
  - Depends upon instantaneous CSI
  - Size of the search space grows exponentially with *B* and *N*.
  - To reduce complexity, an iterative greedy algorithm is proposed.
  - Frequently changing the operation pattern is unacceptable.

- Semi-dynamic switching scheme
  - Operation pattern depends upon average gains
  - Iterative algorithm proposed

Results

- Proposed algorithms performance almost equivalent to exhaustive search
- Semi-dynamic scheme has minor EE loss w.r.t. dynamic scheme.

Multiuser Cognitive Relay Networks: Joint Impact of Direct and Relay Communications

Lisheng Fan, Xianfu Lei, Trung Q. Duong, Rose Qingyang Hu, and Maged Elkashlan

- A Multi-user cognitive relay network
  - N secondary users, M primary destinations , One destination, One relay
  - Moderate shadowing environment : Direct links between nodes.
- Scheduling Policy :
  - MRC done at the destination node.
  - The user with the best SNR is selected .
- Amplify and Forward
  - Closed form expression for a tight lower bound of outage probability
  - Diversity order of N+1
- Decode and Forward
  - Closed form expression for the outage probability
  - Diversity order of N + 1
- AF better than DF in terms of asymptotic outage probability .

Adaptive Modulation and Coding for Interference Alignment With Imperfect CSIT

Mehrdad Taki, Mohsen Rezaee, and Maxime Guillaud

- *K* MIMO links (Nt * Nr)
- Imperfect CSIT

$$H_{ij} = \rho_0 \hat{H}_{ij} + \sqrt{1-\rho_0^2}\, E_{ij}$$

where ρ_0 = correlation b/w true and estimated channel elements

- With perfect CSIT, IA decomposes the interference channel into set of parallel point to point channels.
- Problem : Maximize a weighted sum of the avg. rates while having power and BER constraints.
- Divide the optimization problem into 3 steps:
  - Estimation of SINR for every stream and deriving the statistical properties of the true SINR
  - Average rate for every stream using the average SINR
  - Using resulting avg. rates and the statistics of the current SINR, optimum instantaneous rate can be found for each stream
- This scheme outperforms orthogonal transmission scheme