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- Energy-Efficient Communication via Feedback

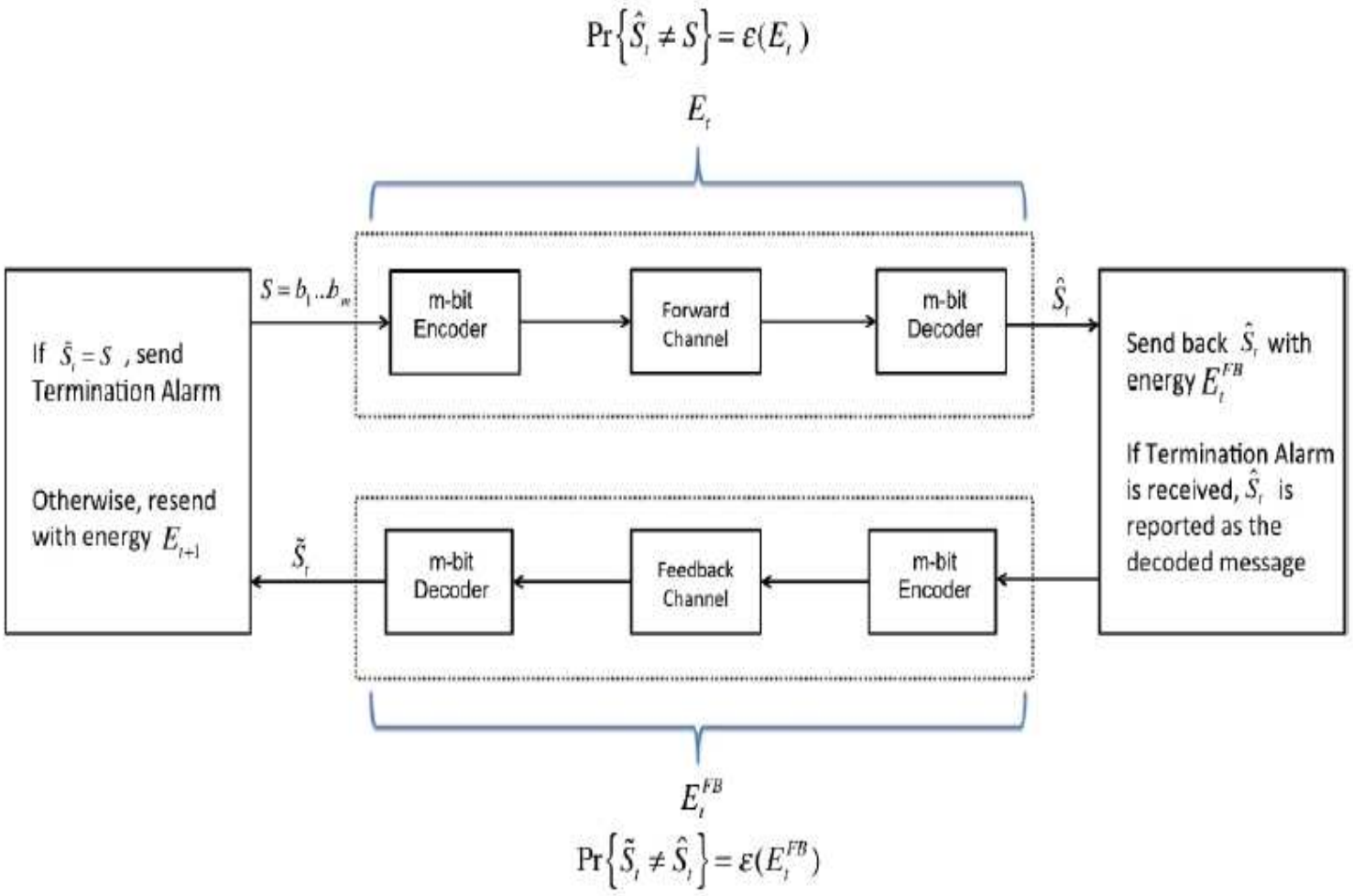
Authors: R. Mirghaderi and A. Goldsmith

Affiliations: Department of Electrical Engineering, Stanford University, Stanford USA.

Objective is to study the impact of feedback under a scenario where:

- Total energy budget is limited,
- Delay is constrained,
- Feedback link is noisy, and
- Feedback energy consumption is counted toward the total energy.

System Model



- Contributions
  - Given a constraint on total system energy consumed on both links of system, optimal achievable error probabilities are characterized
  - Effectiveness of using feedback is analyzed and found to be dependent on
    - Energy consumption model
    - Total energy
  - Under a linearly exponential error probability in terms of consumed energy, the use of feedback
    - significantly increase the energy efficiency for large values of available energy,
    - strictly sub-optimal if the energy budget is below a certain threshold.
  - Opposite result is true for the super-exponential models.

- Resource Allocation for OFDMA Cognitive Radios Under Channel Uncertainity

Authors: S. J. Kim, N. Y. Soltani, and G. B. Giannakis

Affiliations: Dept of ECE, University of Minnesota.

- System model
  - OFDMA Cognitive radio (CR) network operating in a spectrum underlay set-up
  - CR base station (CR-BS) transmits to a set of CR mobile stations (CR-MS)
  - CR-BS allocating resources to K CR-MSs(users) employing OFDMA using N subcarriers
  - Channels between CR-BS and CR-MSs are perfectly known
  - Channel estimate between CR-BS and primary user(PU) contains uncertainty.
  - Strict interference constraint to protect PU.
- Problem : Resource allocation to maximize the weighted sum-rate with a constraint on: PU interference and transmit power

- Novel Features of the Work
  - Combining *Lagrangian relaxation* and *Robust optimization* to tackle the OFDMA RA problem for CR under channel uncertainty.
  - Finite alphabet constellations are used along with above mentioned tools.
- Result : Proposed algorithm can efficiently find the near-optimal power loading and subcarrier assignment.

- Multiple Access and Data Reconstruction in Wireless Sensor Networks Based on Compressed Sensing

Authors: T. Xue, X. Dong, and Yi Shi

Affiliations: Department of Electrical and Computer Engineering, University of Victoria, Victoria

- System model
  - N sensor nodes reporting to a single receiver
  - Receiver contains M_r antennas.
  - Each antenna has M_c degrees of freedom
  - Nodes report to receiver periodically
  - Duration of one reporting

$$T_f < \text{coherence time of natural phenomena}$$

  - No. of active sensors in one time frame follows a Binomial distribution with parameters N and λ
- Goal:
  - To develop a CS based MAC scheme.
  - Study the impact of communication SNR on CS based reconstruction.

- Results
  - $l_2 -$ norm upper bound of reconstruction error decreases as $O(SNR^{-1})$
  - Increasing SNR positively affects the throughput performance of CS based MAC schemes.
  - CS based schemes able to accommodate more simultaneous transmissions.

- Joint Back-Pressure Power Control and Interference Cancelation in Wireless Multi-Hop Networks

Authors: Balasubramanian Gopalakrishnan and Nicholas D. Sidiropoulos

Affiliations: Department of Electrical and Computer Engineering, University of Minnesota, Minneapolis

- Motivation
  - Strong interferer can be preferable to weaker one if it is strong enough to be reliably decoded.
  - Interference cancellation (IC) with power control can boost throughput and reduce delay at network layer
- Back Pressure Power Control(BPPC)
  - BPPC is a cross layer network optimization policy
  - Uses power control at PHY layer to facilitate efficient routing at network layer

- System model
  - Wireless multi-hop network with N nodes
  - Time-slotted system
  - In each time slot, all nodes except node N are allowed to transmit data to all nodes other than node 1.
  - Node 1 is source node, while, node N is destination.
- Aim
  - To transmit data in such a way that the throughput from the source to destination is maximized

- Joint BPPC-IC Problem
  - NP-hard problem
  - Approximate solutions are proposed based on
    - Successive geometric programming approximations
    - Weighted MMSE formulation.
- Results
  - Two usually yield similar throughput and delay
  - latter is typically much faster than the former

- Ali A. Nasir, X. Zhou, S. Durrani and R. A. Kennedy: Relaying Protocols for Wireless Energy harvesting and Information Processing
- A. M. Arafa, K. G. Seddik, A. K. Sultan, T. ElBatt and El-Sherif: A Feedback-soft sensing- based Access Scheme For Cognitive Radio Networks.
- M. Khandaker and Yue Rong: Precoding Design for MIMO Relay Multicasting
- M. Khoshkholgh, K. Navaie and H. Yanikomerroglu: Interference Management in Underlay Spectrum Sharing Using Indirect Power Control Signalling