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- Asynchronous Capacity per Unit Cost

Authors: V. Chandar, A. Tchamkerten, and D. Tse

Affiliations: MIT Lincoln Laboratory, Lexington, USA, Department of Comm. and Electronics, Telecom ParisTech, France and Department of Electrical Engineering and Computer Sciences, University of California at Berkeley, USA

- Synchronization: important aspect of any communication system
- Problem: What is the fundamental limitation due to the lack of a priori synchrony between the transmitter and the receiver in bursty communication?
- Performance measure
  - Data rate: delay sensitive
  - Capacity per unit cost: constrained in energy
- The data burst arrives at a random symbol time (ν), not known a priori to the receiver

- $\nu \in [0, A]$: known at transmitter and receiver
- Decoder: sequential test (τ, ϕ): τ: stopping time and ϕ: declares the decoding message
- Main result: single-letter characterization of the asynchronous capacity per unit cost
- No cost for idle symbols:

$$(B + \log A) k_{\text{sync}}$$

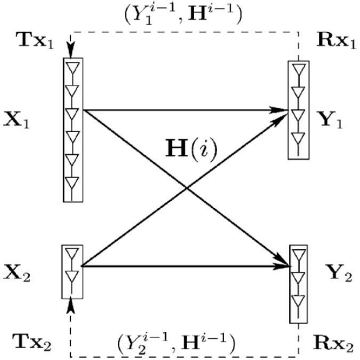
k_{sync}: minimum cost to transmit one bit of information in the synchronous setting

- Degrees of Freedom Region of the MIMO Interference Channel With Output Feedback and Delayed CSIT

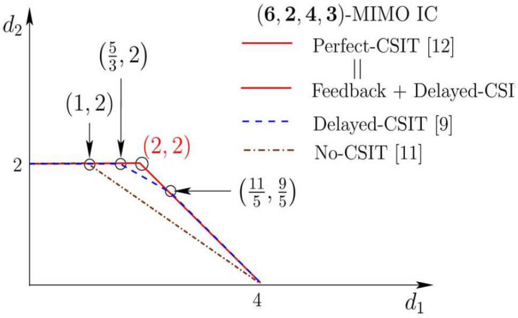
Authors: R. Tandon, S. Mohajer, H. V. Poor, and S. Shamai (Shitz)

Affiliations: Virginia Polytechnic Institute and State University, USA, University of California, Berkeley, USA, Princeton University, Princeton, USA and Technion-Israel Institute of Technology, Israel

- System model
  - 2-user MIMO interference channel (IC) with arbitrary numbers of antennas at each terminal
  - Local output feedback and delayed CSIT
- Goal: characterize the DoF region



- Main result: output feedback and delayed CSIT can strictly enlarge the DoF region as compared to delayed CSIT only
- DoF region with local feedback and delayed CSIT $=$ DoF region with global feedback and delayed CSIT
- Converse: channels to the two receivers need not be statistically equivalent



- Distributed Optimization in an Energy-Constrained Network: Analog Versus Digital Communication Schemes

Authors: A. Razavi, W. Zhang, and Z. Luo

Affiliations: Department of Electrical and Computer Engineering, University of Minnesota, USA and Beijing University of Posts and Telecommunications, China

- Network of n nodes collaborate to minimize a cost function: $f(\mathbf{x})$, where $\mathbf{x} = [x_1, x_2, \ldots, x_n]$
- x_l: a local variable controlled by the node S_l
- Capability of nodes:
  - Can perform local computation
  - Can exchange analog or digital messages with a set of predefined neighbors through orthogonal noisy channels
- Convergence has remained an important issue in such problems

- Objective: impact of communication energy on convergence
- Main results
  - Communication energy required to obtain an ϵ-minimizer of $f(\mathbf{x})$ must grow at least at the rate of $\Omega(1/\epsilon)$
  - Bound is tight when f is convex quadratic
  - Same energy requirement can be reduced to $\mathcal{O}(\log^2 1/\epsilon)$ if a suitable digital communication scheme is used

- Performance Guarantees of the Thresholding Algorithm for the Cosparse Analysis Model

Authors: T. Peleg and M. Elad

Affiliations: Department of Electrical Engineering and Department of Computer Science, Technion-Israel Institute of Technology, Israel

- Cosparse analysis model: signal can be multiplied by an analysis dictionary $\rightarrow$ sparse outcome
- $\Omega \in \mathcal{R}^{p \times d}$: analysis dictionary and rows of Ω constitutes analysis atoms
- Cosparsity: number of zeros in the vector $\Omega \mathbf{x}$
- Problem: Need to recover $\mathbf{x}$ from $\mathbf{y}$

$$\mathbf{y} = \mathbf{x} + \mathbf{e}, \text{ where, } \mathbf{x} \text{ is a cosparse analysis signal}$$

- Performance guarantee of the thresholding algorithm for pursuit problem in the presence of noise
- Pursuit problem

$$\{\hat{\mathbf{x}}, \hat{\Lambda}\} = \arg\min_{\mathbf{x},\Lambda} \ ||\mathbf{x} - \mathbf{y}||_2$$
$$\Omega_\Lambda \mathbf{x} = 0 \text{ and } \mathrm{Rank}(\Omega_\Lambda) = d - r$$

- Algorithm computes $\Omega\mathbf{y}$ and chooses the smallest entries as the estimated cosupport
- Two significant properties of Ω
  - Degree of linear dependencies between sets of rows in Ω: cosparsity level
  - Restricted orthogonal projection property: level of independence between such dependent sets and other rows in Ω