Journal Watch: IEEE Transactions on Information Theory, Vol. 58, No. 2, Feb. 2012

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17 March, 2012

Communications

- MIMO ARQ With Multibit Feedback: Outage Analysis

  Authors: Khoa D. Nguyen, Lars K. Rasmussen, A. Guillen i Fabregas, and Nick Letzepis

  Affiliations: University of South Australia, Australia, KTH Royal Institute of Technology and Universitat Pompeu Fabra, Barcelona, Spain.

- Studies the asymptotic outage performance of INR-ARQ[1] transmission over MIMO block-fading channels with discrete input constellations
- System Model
  - Each ARQ round is transmitted over B AWGN blocks of J channel uses
  - In the INR-ARQ scheme, the receiver attempts to decode at round l based on received signals collected in rounds $1, 2, \ldots, l$

[1] Incremental Redundancy Automatic Repeat Request

- Contributions
  - A fixed-rate transmission over the MIMO block-fading channel is considered. It is shown that the outage diversity is given by the Singleton bound
  - The rate-diversity tradeoff of the MIMO ARQ system with multibit feedback under long-term power constraints is derived
  - It is shown that a finite number of feedback bits is sufficient to achieve the maximal outage diversity
  - A practically feasible feedback-and-power-adaptive rule is proposed

Communications

- On Degrees of Freedom Region of MIMO Networks Without Channel State Information at Transmitters

Authors: Chiachi Huang, Syed Ali Jafar, Shlomo Shamai, Sriram Vishwanath

Affiliations: Yuan Ze University, Taiwan, University of California, Irvine, Technion-Israel Institute of Technology, Israel and University of Texas, Austin

- Objective: To explore the effect of the absence of channel state information for MIMO networks
- Assumptions:
  - Channel: Rayleigh fading that is i.i.d. across antennas, users and time slots
  - Perfect CSIR and no CSIT
- MIMO Networks:
  - 2-user MIMO broadcast channel
  - 2-user MIMO interference channel

- Contributions
  - DOF region of a 2-user MIMO BC with M transmit antennas, N_1 and N_2 receive antennas is characterized
  - Achievable scheme: time division scheme between the two users
  - Outer bound derived for 2-user MIMO BC is extended to 2-user MIMO IC
  - Loss is more severe when transmitters carry more antennas than receivers whereas loss is less severe when receiver carry more antennas than transmitters
  - For a special case of 2-user MIMO BC the capacity region is established

Communication networks

- Random Access: An Information-Theoretic Perspective

Authors: Paolo Minero, Massimo Franceschetti, and David N. C. Tse,

Affiliations: University of Notre Dame, Notre Dame, USA, University of California, San Diego, USA and University of California, Berkeley, USA

- A random access system is analyzed from information theoretic perspective
- Initially, a two-sender random access system is considered
- Active users encode data into two streams
  - high priority
  - low priority
- two channel models: deterministic and AWGN channel
- Achievable scheme (AWGN channel): combines time-sharing and Gaussian superposition coding

- A k-sender random-access system is considered
- The communication problem is cast into an equivalent information theoretic network with multiple Tx and Rx
- Assumptions:
  - Users are active with same probability p, independently of each other
  - Subject to same received power constraint
- Maximum achievable expected sum rate is characterized
- Depending on p, encoding rate is varied

Sparse signal recovery

- Rank Awareness in Joint Sparse Recovery

Authors: Mike E. Davies and Yonina C. Eldar

Affiliations: Institute for Digital Communication, Edinburgh University,U.K. and Technion-Israel Institute of Technology, Israel

- To recover a set of jointly sparse multichannel vectors from incomplete measurements
- MMV sparse recovery problem: Given $\mathbf{Y} \in R^{m \times l}$ and $\phi \in R^{m \times n}$ with $m < n$ find

$$\hat{\mathbf{X}} = \arg\min_{\mathbf{X}} |\mathrm{Supp}(X)| \text{ s.t. } \phi\mathbf{X} = \mathbf{Y}$$

- A necessary and sufficient condition for the measurements to uniquely determine the jointly sparse matrix is obtained
- Rank of $\mathbf{X}$ is exploited in order to improve MMV recovery results

Other papers

- S. Rini, D. Tuninetti, and N. Devroye: Inner and Outer Bounds for the Gaussian Cognitive Interference Channel and New Capacity Results
- H.-F. Lu: Remarks on Diversity-Multiplexing Tradeoffs for Multiple-Access and Point-to-Point MIMO Channels
- A. Host-Madsen, M. Uppal, and Z. Xiong: On Outage Capacity in the Low Power Regime
- M. P. Friedlander, H. Mansour, R. Saab, and O. Yilmaz: Recovering Compressively Sampled Signals Using Partial Support Information