Journal Watch: TSP-Sept. 2013

October 12, 2013

Outline

Paper Title: Convergence Speed of a Dynamical System for Sparse Recovery

Authors: Aurele Balavoine, Christopher J. Rosell, Justin Romberg

Affiliations: Georgia Institute of Technology, Atlanta

- Paper studies the convergence rate of a continuous time dynamical system for ℓ_1 minimization: Locally Competitive Algorithm (LCA)
- LCA is a continuous-time system of coupled nonlinear differential equations that settles to a minimizer (1)

$$\hat{\mathbf{a}} = \arg\min_{a} \|\mathbf{y} - \Phi\mathbf{a}\|_2^2 + \lambda\|\mathbf{a}\|_1 \tag{1}$$

- Known Result: LCA converges exponentially fast to the correct solution when submatrices of Φ is well-conditioned
- This paper studies the specific case of sparse recovery: depends on the well-known RIP
- Viewed as a network of nodes which evolve as follows:

$$\tau\dot{u}(t) = -u(t) - (\Phi^T\Phi - I)a(t) + \Phi^T y$$
$$a(t) = T_\lambda(u(t)) \tag{2}$$

Paper Title: CSI Feedback Reduction for MIMO Interference Alignment

Authors: X. Rao, L. Ruan, Vincent Lau

Affiliations: Hong Kong University of Science and Technology

- Novel IA scheme with significantly reduced CSI feedback without affecting DoF performance
- Introduce a novel metric: *Feedback Dimension*: sum dimension of Grassmannian manifolds
- Approach: Feedback essential parts of CSI to achieve the IA interference nulling requirements for all data streams
- Feedback Profile Design, IA feasibility condition, IA precoder/Decorrelator design: challenges addressed using Algebraic Geometry tools
- Based on proposed interference profile design mechanism, closed form tradeoff results between number of data streams, antenna configuration and CSI feedback dimension in symmetric MIMO interference network derived

Paper Title:Wireless Compressive Sensing for Energy Harvesting Sensor Nodes

Authors:G. Yang, Vincent Tan, C. K. Ho, S. Ho, Y. L. Guan

Affiliations: NTU, A-star, Singapore

- Multiple sensors send spatially correlated data to the FC, sensor data is sparse: recovery using CS
- Sensors transmit independently with some probability: sensing matrix not Gaussian
- Inhomogeneity of SNRs: elements of the sensing matrix do not have the same distribution
- Provide theoretical guarantees on the number of measurements for reliable and computationally efficient recovery: RIP holds under reasonable conditions
- Analyze the impact of Inhomogeneity on the k-restricted eigen values of the effective sensing matrix

Paper Title: Oracle-Order Recovery Performance of Greedy Pursuits with Replacements against General Perturbations

Authors: Laming Chen, Y. Gu
Affiliations:Tsinghua University, Beijing

- Recovery performance of greedy pursuits with replacement for sparse recovery analyzed when both the measurements and sensing matrix are perturbed, i.e., $\mathbf{y} = \tilde{\mathbf{y}} + \mathbf{v}$ and $\tilde{\Phi} = \Phi + \Delta$
- Sparse and Compressible signals handled
- Relative error bounds are linear in both the relative perturbations: recovery performance is stable against perturbations
- Error bounds compared with oracle recovery and optimal up to the coefficients

Other Papers

- Optimum Performance Boundaries of OSTBC Based AF-MIMO Relay System With Energy Harvesting Receiver: B. K. Chalise, W.-K. Ma, Y. D. Zhang, H. A. Suraweera, and M. G. Amin
- Learning Non-Linear Functions With Factor Graphs: F. Palmieri
- On the Performance Bound of Sparse Estimation With Sensing Matrix Perturbation: Y. Tang, L. Chen, and Y. Gu
- Belief Condensation Filtering: S. Mazuelas, Y. Shen, and M. Z. Win
- Empirical Likelihood Ratio Test With Distribution Function Constraints: Y. Liu and A. Tewfik

Papers on Arxiv

- A Fast Hadamard Transform for Signals with Sub-linear Sparsity: Robin Scheibler, Saeid Haghighatshoar, Martin Vetterli
- Transmit Beamforming for MIMO Communication Systems with Low Precision ADC at the Receiver: Tapan Shah, Onkar Dabeer
- An Empirical-Bayes Approach to Recovering Linearly Constrained Non-Negative Sparse Signals: Jeremy Vila, Philip Schniter
- Bilinear Generalized Approximate Message Passing: Jason T. Parker, Philip Schniter, Volkan Cevher
- Discrete Sparse Signals: Compressed Sensing by Combining OMP and the Sphere Decoder: Susanne Sparrer, Robert F.H. Fischer