Journal watch
IEEE Transactions on Signal Processing - June-July 2011 issue

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Title: A Diffusion Approach to Network Localization
Authors: Yosi Keller and Yaniv Gur
Affiliations: School of Engineering, Bar Ilan University, Israel and University of Utah

- Problem: to estimate the position of nodes in a network given partial and corrupted distance measurements and a small subset of anchor nodes.
- The distance measurement model: $d_{ij} = d_{ij}^0(1 + f)$, where $f \sim \mathcal{N}(0, \sigma_n^2)$.
- Due to the sensing range constraint, the inter-distance vector is sparse. Existing methods use ℓ_1 based penalty functions.
- In this work, the problem is solved by formulating it as a regression problem over adaptive bases known as the diffusion bases.
- Network is modeled as a graph and diffusion maps embedding is computed.

Title: From Sparse Signals to Sparse Residuals for Robust Sensing
Authors: Vassilis Kekatos and Georgios B. Giannakis
Affiliation: University of Minnesota.

- Robust Sensing: Recovering information from the maximum number of dependable sensors while specifying the unreliable ones
- Relate this problem to compressed sensing although the signals are not sparse but the residuals are sparse
- Propose 4 schemes: first scheme is a convex relaxation of the original problem expressed as a second-order cone program, second scheme is obtained by replacing the initial objective function with a concave one. Other 2 cases pertain to the noisy case.
- Robust sensing capabilities of all schemes are verified by simulated tests.

Title: MIMO Interference Alignment Over Correlated Channels With Imperfect CSI

Authors: Behrang Nosrat-Makouei, Jeffrey G. Andrews and Robert W. Heath, Jr.

Affiliation: The University of Texas at Austin, Austin

- Provides an approximate closed-form signal-to-interference-plus-noise-ratio (SINR) expression for IA over multiple-input-multiple-output (MIMO) channels with imperfect channel state information and transmit antenna correlation.
- Linear processing at the transmitters and zero-forcing receivers, random matrix theory tools are utilized to derive an approximation for the postprocessing SINR distribution of each stream
- SINR distribution: allows easy calculation of sum rate and symbol error rate, realistic comparison of IA with other transmission techniques.
- Contribution: 1. Shown that ZF receiver results in parallel single-input-single-output Rayleigh channels. 2. An arbitrary Kronecker-modeled transmit correlation is used and its effect is shown on the received SNR distribution. 3. Effect of imperfect CSI (Gauss-Markov model) on the received SNR is shown
- IA is compared with spatial multiplexing and beamforming and it is shown that IA may not be optimal for some performance criteria

Title: Compressive Sensing Signal Reconstruction by Weighted Median Regression Estimates.
Authors: Jose L. Paredes and Gonzalo R. Arce
Affiliations: Universidad de Los Andes, Venezuela and University of Delaware, Newark

- Propose a simple and robust algorithm for compressive sensing (CS) signal reconstruction based on the weighted median (WM) operator
- Approach addresses the reconstruction problem by solving a ℓ_0-regularized least absolute deviation regression problem with a tunable regularization parameter
- Claim: WM operator followed by a hard threshold operator, adds the desired robustness to the estimation of the sparse signal
- Performance of the proposed approach compared with the CS reconstruction algorithms: shows that proposed approach achieves a better performance for different noise distributions, especially as the distribution tails become heavier

Other relevant papers

- A Useful Performance Metric for Compressed Channel Sensing - Matthew Sharp and Anna Scaglione (Cornell University)
- Estimating Time-Varying Sparse Signals Under Communication Constraints - Manohar Shamaiah and Haris Vikalo (University of Texas at Austin)
- Optimal Channel Training in Uplink Network MIMO Systems - Jakob Hoydis, Mari Kobayashi and Mrouane Debbah (Suplec, France)
- Multiuser Downlink Beamforming in Multicell Wireless Systems: A Game Theoretical Approach - Duy H. N. Nguyen and Tho Le-Ngoc (McGill University,Montreal)
- Aliasing-Free Wideband Beamforming Using Sparse Signal Representation - Zijian Tang, Gerrit Blacquire, and Geert Leus (Delft University of Technology, Netherlands)