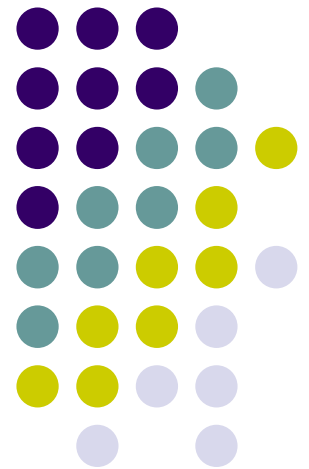
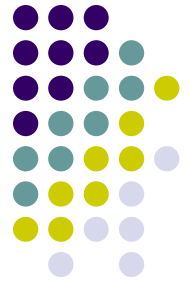


Jl. Watch on Trans. of Information Theory Apr 2011

T. Ganesan
SPC Lab
9-Apr-2011



Deterministic Construction of Binary, Bipolar, and Ternary Compressed Sensing Matrices



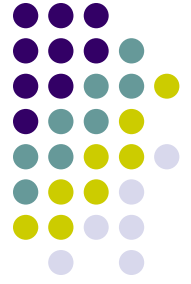
Author(s): A. Amini and F.Marvasti, Sharif Institute of Tech, Tehran

Problem Addressed:

- Construction of RIP satisfying matrices deterministically using known binary codes.

Key Points:

- Deterministic CS matrices can be tested for RIP.
- Other deterministic matrices proposed are Vandermande and complex valued chirp matrices. They have issues as n (dimension) increases.
- RM codes were used to construct CS matrices, but lack guarantee on RIP order like the chirp matrices.
- A connection between orthogonal optical codes and binary CS matrices is established. Tight upper bounds for the no. of columns in CS is given.
- Used BCH codes to construct CS matrices and ensures certain RIP order. Use cyclic property to reduce the reconstruction complexity.
- Combined binary and bipolar matrices to generated ternary matrices.
- Shows better reconstruction SNR and recovery percentage as function of sparsity factor.



Performance of Statistical Tests for Single-Source Detection Using Random Matrix Theory

Author(s): P. Bianchi (CNRS), M. Debbah(Supelec), M. Maida (Univ.Paris-Sud), and J. Najim (CNRS)

Problem Addressed:

- Design of Statistical test for detecting a source via sensors, where the noise variance and channel between source and sensors are unknown.

Key Points:

- Uses Random matrix theory to bound the ratio of Maximum eigenvalue to the trace of matrix (prev. approach is based on condition number)
- The unknown parameters are replaced by ML estimated values and GLRT detector is designed.
- For large N, K , expressions for the threshold, GLRT test and error exponents are determined.
- Closed form expression for the GLR is provided, based on the ratio of max eigenvalue and sum of eigenvalues.
- GLRT reduces to ratio of max eigenvalue and trace of sample covariance matrix.

Generalized Sequential Slotted Amplify and Forward Strategy in Cooperative Communications



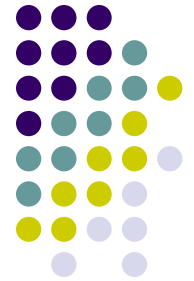
Author(s): H. Ning, C. Ling, and K. K. Leung, (Imperial College, London)

Problem Addressed:

- Design of generalized sequential slotted amplify & forward scheme for single-antenna cooperative network.

Key Points:

- DMT is analyzed for 3 scenarios: cooperative multi-relay channel (CMR), cooperative MAC (CMC) and cooperative broadcast channel (CBC).
 - DMT outer bound is proven to be achievable in each of the cases.
- Sequential Slotted AF (SSAF): Relays transmit the previously received messages in a pre-assigned slot. This is asymptotically optimal (prior art)
- CBC-DDF: CBC-Dynamic Decode and Forward is sub-optimal in high multiplexing gain scenario.(prior art)
- The optimality of a strategy is defined as the ratio of DMT-outer bound and achievable inner bound.
- Aim to find a strategy which is universally optimal in all three: CMR,CBC and CMC.



Estimation in Gaussian Noise: Properties of the Minimum Mean-Square Error

- **Author(s)** D.Guo (Northwestern Univ), Y. Wu (Princeton Univ), S. Shamai (Technion-Israel) and S. Verdú, (Princeton Univ)

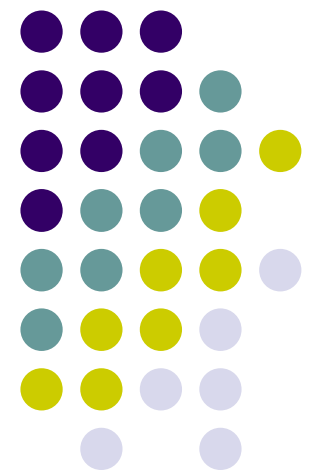
Problem Addressed:

- MMSE estimation of a random variable from its observations corrupted by Gaussian noise.

Key Points:

- MMSE is a function of SNR and distribution of the random variable.
 - It is shown that MMSE is concave in input distribution.
 - For the given input distribution, MMSE is analytic (infinitely differentiable) at all SNR points.
- Expressions for first three derivatives of MMSE wrt SNR are derived.
- Uses these results to prove that Gaussian input achieves the secrecy capacity of Gaussian wire-tap channel and entropy power inequality.
- Several key properties of MMSE estimators (previously known as well new) are given.
- Well written paper.

Backup





Other Interesting papers

- **Finite Dimensional Statistical Inference**
 - Derives series expansion of eigenvalue distribution for non-central Wishart distribution and correlated zero-mean Wishart distributions.
- **Wireless Network Information Flow: A Deterministic Approach**
 - Computes the maximum rate achievable in a src-relay-dest network.
- **Living at the Edge: A Large Deviations Approach to the Outage MIMO Capacity**
 - A large deviation approach to compute outage in MIMO channels.
- **Diversity-Multiplexing Tradeoff of Double Scattering MIMO Channels**
 - Double scattering reduces diversity and mux gain. New DMT trade-off derived.
- **The Secrecy Capacity Region of the Gaussian MIMO Multi-Receiver Wiretap Channel**
 - Derives secrecy capacity of Gaussian wiretap MIMO channel with multiple-users
- **Graph-Based Decoding in the Presence of ISI**
 - Uses graph representation of ISI channels and iterative message passing algm to decode.
- **A New Method of Matrix Spectral Factorization**
 - A new algm to compute approximate spectral factor of given PD matrix is proposed.