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Sum Rate Maximization for Non-Regenerative MIMO Relay Networks

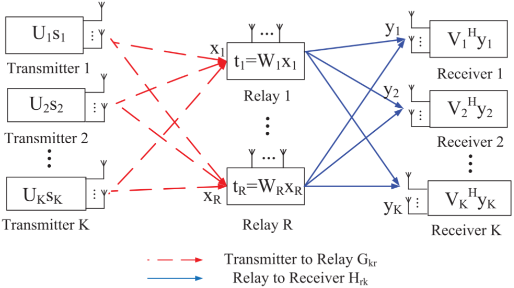
Cong Sun, Eduard Axel Jorswieck and Ya-xiang Yuan

Goal: maximize sum-rate

Design parameters:

1. Precoding matrix $\{U_k\}$
2. Relay AF matrix $\{W_r\}$
3. Decoding matrix $\{V_k\}$

Constraints: User & relay power



$$\text{Received signal} = \text{Desired signal} + \sum_{\text{Tx}} \text{Interference} + \sum_{\text{Relays}} \text{Noise}$$

Sum Rate Maximization for Non-Regenerative MIMO Relay Networks

$$\text{Received signal} = \text{Desired signal} + \sum_{\text{Tx}} \text{Interference} + \sum_{\text{Relays}} \text{Noise}$$

- **Idea:** Sum-rate $\leq 0.5 \log(1 + \text{TSTINR})$
  $\implies$ maximize total signal to total interference $+$ noise ratio
- **Solution:** alternating direction algorithm
- Algorithm modification to transmit multiple data stream

Optimization tools

Nonconvex quadratic constrained quadratic programming:

- Feasible shrinkage method to obtain a good initialization
- Apply the nonconvex sequential quadratic programming method to achieve the KKT point

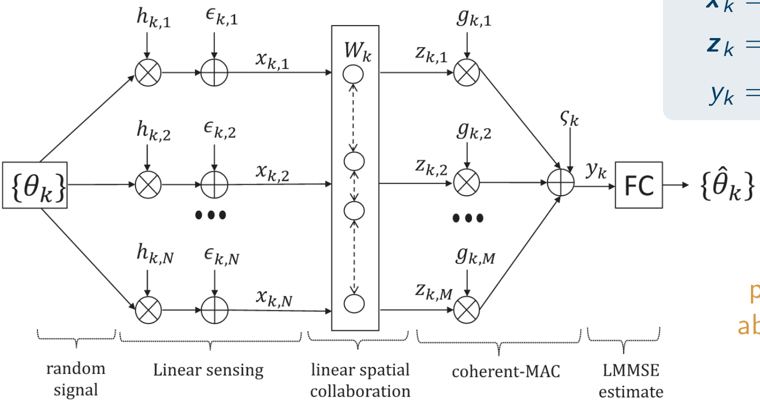
DOLPHInDictionary Learning for Phase Retrieval

Andreas M. Tillmann, Yonina C. Eldar and Julien Mairal

- **Observations:** $\boldsymbol{Y} = |\mathcal{F}(\boldsymbol{X})| + \boldsymbol{N}$
  - $\mathcal{F}(\cdot) : [0,1]^{N_1 \times N_2} \to \mathbb{C}^{M_1 \times M_2}$ linear operator
- **Goal:** Learn a dictionary $\boldsymbol{D} \in \mathbb{R}^{s \times n}$ such that $\boldsymbol{x}^i = \boldsymbol{D}\boldsymbol{a}^i$
  - $\boldsymbol{x}^i$ a vector of patch of $\boldsymbol{X}$ of size s.
  - $\boldsymbol{a}$ is sparse
- **Optimization:** $\min_{\boldsymbol{X},\boldsymbol{D},\boldsymbol{A}} \{$observation fit error + model fit error + sparsity of $\boldsymbol{A}\}$ subject to $\boldsymbol{X} \in [0,1]^{N_1 \times N_2}$ and $\|\boldsymbol{d}_j\| \leq 1$
- **Solution:** alternating minimization
- **Tools used:**
  1. Projected gradient descent
  2. Block-coordinate descent
  3. Iterative shrinkage-thresholding algorithm (ISTA)

Optimized Sensor Collaboration for Estimation of Temporally Correlated Parameters

Sijia Liu, Swarnendu Kar, Makan Fardad and Pramod K. Varshney



$$\mathbf{x}_k = \mathbf{h}_k \theta_k + \boldsymbol{\epsilon}_k$$
$$\mathbf{z}_k = \mathbf{W}_k \mathbf{x}_k$$
$$y_k = \mathbf{g}_k^T \mathbf{z}_k + \zeta_k$$

prior knowledge about parameter correlations

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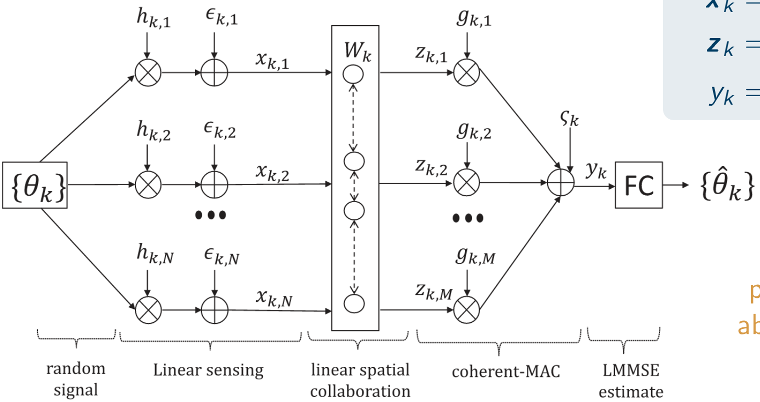

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prior knowledge about parameter correlations

Estimate $\boldsymbol{\theta} \in \mathbb{R}^K$ from $\boldsymbol{y} \in \mathbb{R}^K$

Optimized Sensor Collaboration for Estimation of Temporally Correlated Parameters

- **Optimization problem:**

$$\begin{aligned}\min_{\mathbf{w}_m} \quad & \text{MSE in estimation} \\ \text{s.t.} \quad & \mathbb{E}\|z_m\|^2 \leq E_m, \forall m\end{aligned}$$

- **Formulation:** semidefinite program with a rank-one constraint
- **Solution:** penalty convex-concave procedure
- **Implementation:** alternating direction method of multiplier

A Structured Sparse Plus Structured Low-Rank Framework for Subspace Clustering and Completion

Chun-Guang Li and René Vidal

- Columns of X are drawn from union of k low-dim. subspaces
- **Observations:** a subset of the entries of an unknown matrix X
- **Goal:** find the missing entries of X

Alternate between the two step:

- **Sparse Subspace Clustering:** Perform subspace clustering on the completed data
- **Low-rank matrix completion:** Find a low rank matrix for each subspace independently

- **Optimization tools:** Linearized alternating direction method of multipliers combined with spectral clustering

Other Papers

- **Joint Beam Selection and Power Allocation for Multiple Target Tracking in Netted Colocated MIMO Radar System**
  - J. Yan, H. Liu, W. Pu, S. Zhou, Z. Liu, and Z. Bao
- **The Complex Parameter Rao Test**
  - S. Kay and Z. Zhu
- **Sequential Likelihood Ratio Test for Cognitive Radios**
  - J. Renard, L. Lampe, and F. Horlin
- **Power Management for Cooperative Localization: A Game Theoretical Approach**
  - Junting Chen, Yuan Shen, Vincent K. N. Lau and Moe Z. Win