Conference Watch

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Sanjeev G.
SPC Lab,
Dept. of ECE, IISc.

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Basis Pursuit in Sensor Networks

Joo F. C. Mota, Joo M. F. Xavier, Pedro M. Q. Aguiar, and Markus Pschel
CMU, Instituto Superior Tcnico, Lisbon, Portugal, and ETH Zurich, Switzerland

- Propose a distributed algorithm to solve BP. "Distributed" is visualized through sensor networks.
- Superior over the existing methods (posing BP as an LP, BPDN, etc.).
- Assumptions and model : Φ is full rank, the sensor network is connected and its topology does not vary with time, The measurement matrix and the vector are partitioned and every node has access to only a part of it.
- Flow: 1) Construct the corres. LPP. 2) Partition Φ and y and construct a new problem. 3) Construct a dual of this problem. 4) Deduce some properties of the dual function and use Nesterov's method to construct the algorithm.

Periodic CRB for Non-Bayesian Parameter Estimation

Tirza Routtenberg and Joseph Tabrikian
Ben-Gurion University of the Negev, Israel

- Defines "periodic" unbiasedness and PCRB for estimation of a periodic parameter and discusses their advantages.
- Unbiasedness is defined through Lehmann-unbiasedness, and PCRB is derived over the mean squared periodic error (MSPE) or the modulo-T-MSE with a set of "regularity conditions".
- Properties: 1) PCRB(θ) $\leq$ CRB(θ), $\forall\ \theta$. 2) PCRB (on MSPE) coincides with CRB (on MSE) for a mean-biased estimator with a bias b(θ) derived. 3) CRB for periodic problems derived earlier are valid only at high SNR, whereas PCRB is valid at all SNR.

BEP Walls for Collaborative Spectrum Sensing

Sachin Chaudhari, Jarmo Lunden, Visa Koivunen
Aalto University School of Science and Technology, Finland

- N identical sensors perform spectrum sensing and send their decisions to the FC through an erroneous channel, that may cause bit errors. FC uses K out of N rule.
- For a constraint $P_F \leq \alpha$ at the FC, it is shown that $p_f \leq \frac{\mathcal{B}^{-1}(K-1,N,1-\alpha)-p_b}{1-2p_b} \Rightarrow p_b \leq \mathcal{B}^{-1}(K-1,N,1-\alpha)$.
- Similarly, putting a constraint $P_M \leq \beta$ at the FC, $p_m \leq \frac{1-\mathcal{B}^{-1}(K-1,N,\beta)-p_b}{1-2p_b} \Rightarrow p_b \leq 1-\mathcal{B}^{-1}(K-1,N,\beta)$.
- If p_b is in and around the lower bounds, then it is impossible to meet the miss-detection/false alarm at the sensors even when SNR $\rightarrow \infty$. This is called the BEP wall phenomenon.
- However, the BEP wall (p_b values) are too low to be of any practical importance.

Ordering for Energy Efficient Estimation and Optimization in Sensor Networks

Rick S. Blum
Lehigh University

- System with N sensors where each calculate $L_k(\theta)$, $k = 1, \cdots, N$ and the overall optimization for θ is $\widehat{\theta} = \arg\max_\theta \sum_{k=1}^{N} L_k(\theta)$.
- Let $\theta = \{\theta_i, i = 1, \cdots, Q\}$. Generally, this scheme would require NQ transmissions to a FC.
- By ordering the transmissions from each node, the number of total transmissions to the FC to estimate θ is saved on average.
- Also, for N "sufficiently well designed" sensors, the average save approaches 100% $\left(= \frac{Q-1}{Q} \times 100\right)$ as $N, Q \to \infty$.

More...

- Look Ahead Orthogonal Matching Pursuit, Saikat Chatterjee, Dennis Sundman, Mikael Skoglund, KTH - Royal Institute of Technology, Sweden.
- The Rotational LASSO, Alexander Lorbert, Peter J. Ramadge, Princeton.
- Compressive Sensing meets Game Theory, Sina Jafarpour, Robert E. Schapire, and Volkan Cevher, Princeton and EPFL.
- When to add another dimension when communicating over MIMO channels, S. Goparaju, A. R. Calderbank, W. R. Carson, M. R. D. Rodrigues and F. Perez-Cruz, Princeton, University of Porto, University Carlos III in Madrid.
- Interference Alignment in MIMO cellular Networks, Binnan Zhuang, Randall A. Berry, and Michael L. Honig, Northwestern University