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Venugopalakrishna Y R

SPC Lab, IISc

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Predetermined Power Allocation for Opportunistic Beamforming with Limited Feedback

Hyukjoon Kwon, Edward W. Jang and John M. Cioffi
Stanford University, Stanford, CA

- Multi-user Diversity - In multi-user systems, sum-rate can be maximized by transmitting to a single user who has a peaky channel.

- Opportunistic Beamforming - Random fluctuations is introduced to increase dynamic range of channel fluctuations.

- This paper considers multi-beam opportunistic beamforming with unequal power allocation to maximize the average sum rate.
- Scenario: MISO broadcast channel with M transmit antennas at BS, N Mobile stations (MS) with single antenna, Block fading channel
- Out of N Mobile stations, Choses Best M MSs with Peak SINRs (based on channel statistics) and supports M MSs on M strong beams for multiple transmission periods

Contributions

- Allocate power on M beams to maximize average sum rate subject to a total power constraint
- Optimization problem is non-convex
- Proposes search-based power allocation algorithms
- Instead of instantaneous channel information, it uses channel ergodicity to reallocate power

Sensor Allocation and Quantization Schemes for Multi-Band Cognitive Radio Cooperative Sensing System

Praveen Kaligineedi and Vijay K. Bhargava
The University of British Columbia, Vancouver, Canada

- CR network operating on multiple primary bands (M)
- Out of L CRs, $N = L/M$ CRs are assigned to monitor and use each primary band
- At CR - energy detection and transmit a 1/0 to FC.
- At FC - 'OR' Fusion rule and extend to k out of N fusion rule
- Sensor Assignment and Quantization thresholds
  - Maximize the sum throughput rate of the CR system
  - Maximize the minimum throughput rate available to the CR system among various primary bands.
- Optimization problems turn out to be non-convex
- Propose schemes for sensor assignment and then solve an optimization problem for setting thresholds

Generalized Analysis of a Distributed Energy Efficient Algorithm for Change Detection

Taposh Banerjee, Vinod Sharma, Veeraruna Kavitha, and A. K. JayaPrakasam
UIUC, IISc and Univ. of Avignon

- CUSUM - algorithm for detection of change in underlying distribution
- When distribution of time change is not known CUSUM minimizes the delay in detection time
- L sensors detect change using CUSUM, and synchronously send a 1/0 to FC over MAC
- At FC, CUSUM is performed using the fused observations to detect the change - DualCUSUM

Contributions of this paper

- General optimization problem: min $E\{det.\ delay\}$ under P_{fa} and energy constraints is not yet solved
- Dual CUSUM under P_{fa} and energy constraints has a smaller mean detection delay
- CUSUM requires knowledge of underlying distributions- Use non-parametric DualCUSUM in such a case
- Mathematical analysis to compute P_{fa} and $E\{det.\ delay\}$ for a general DualCUSUM

On the Diversity Gain in MIMO Channels with Joint Rate and Power Control Based on Noisy CSITR

Xiao Juan Zhang, Yi Gong and Khaled Ben Letaief
NTU, Singapore and Hongkong University of Science and Technology

- Point-to-point TDD wireless link with M transmit antennas, N receive antennas ($M \geq N$)
- Block fading with L symbols being transmitted in one block
- Two way training to obtain noisy CSIT $\hat{H}_b$ and noisy CSIR $\hat{H}_f$
- DMT analysis - Rate control schemes that satisfy an average rate constraint $\bar{r}$
  - Case 1 - given only $\hat{H}_b$ propose a rate control scheme and show that achievable diversity gain is infinity
  - Case 2 - given $\hat{H}_b$ and minimum rate constraint r_{min} propose a rate control scheme, and show that DM tradeoff is $(M - r_{min})(N - r_{min})$ for $\bar{r} \in [r_{min}, N]$
- Joint rate and power control based on a previously proposed power control scheme