Journal Watch - IEEE Transactions on Wireless Communication (April)

ANUP APREM

SPC Lab
ECE Department
Indian Institute of Science, Bangalore

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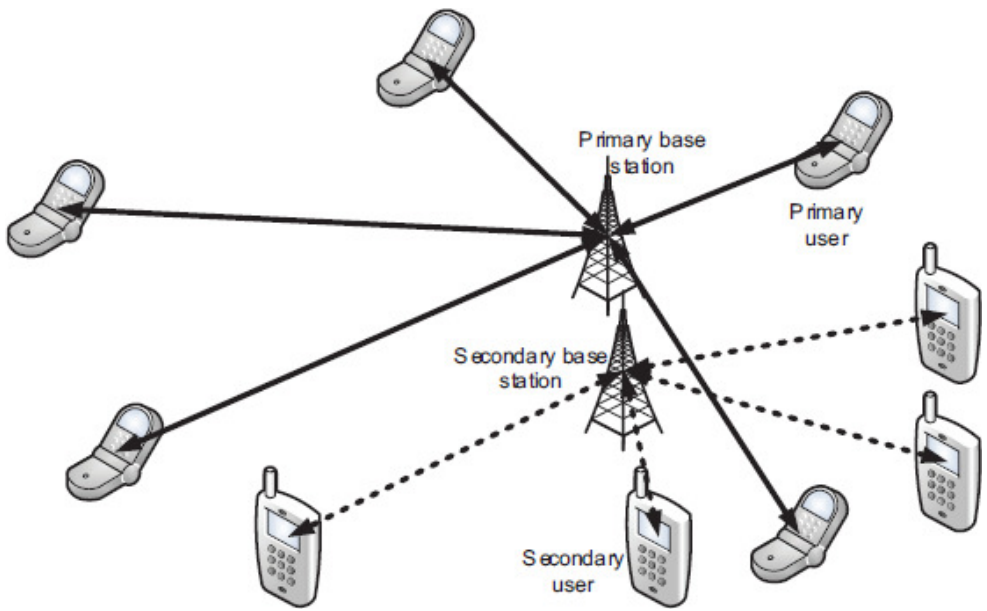
Paper 1

Delay Sensitive Communications over Cognitive Radio Networks

Feng Wang, Jianwei Huang, Yuping Zhao
Department of Information Engineering
Chinese University of Hong Kong

Delay Sensitive Communications over Cognitive Radio Networks I

- Joint Admission Control and Channel Allocation to support delay-sensitive real-time secondary unlicensed communication



- Assumptions: Central Controller for admission control and channel allocation.
- Primary channels: Markovian ON-OFF.

Delay Sensitive Communications over Cognitive Radio Networks II

- Objective: Minimize the accumulated delay of SU.
  - Accumulative Delay: Total Delay after SU is admitted into the system.
- Problem cast as an Markov Decision Process (MDP) and solution obtained using Dynamic Programming.
  - Solution not in closed form.
- Suboptimal Control
  - Threshold based admission control.
  - Largest delay first strategy for channel allocation.
  - Improved using Approximate Dynamic Programming (ADP) algorithm called Rollout algorithm.
  - Simulation shows heuristic control performs close to optimal.

Paper 2

MISO Broadcast Channels with Delayed Finite-Rate Feedback: Predict or Observe?

Jiaming Xu, Jeffrey G. Andrews
University of Texas, Austin

Syed A. Jafar
University of California, Irvine

MISO Broadcast Channels with Delayed Finite-Rate Feedback: Predict or Observe? I

- Broadcast Channel with M transmit antenna and $K \geq M$ users.
- Optimal multiplexing gain with perfect CSIT and CSIR is M.
- Real CSIT estimates are delayed and noisy.
- Maddah-Ali-Tse (MAT) scheme attains a multiplexing gain of $\frac{K}{\log K}$, even for outdated (perfect) CSI.

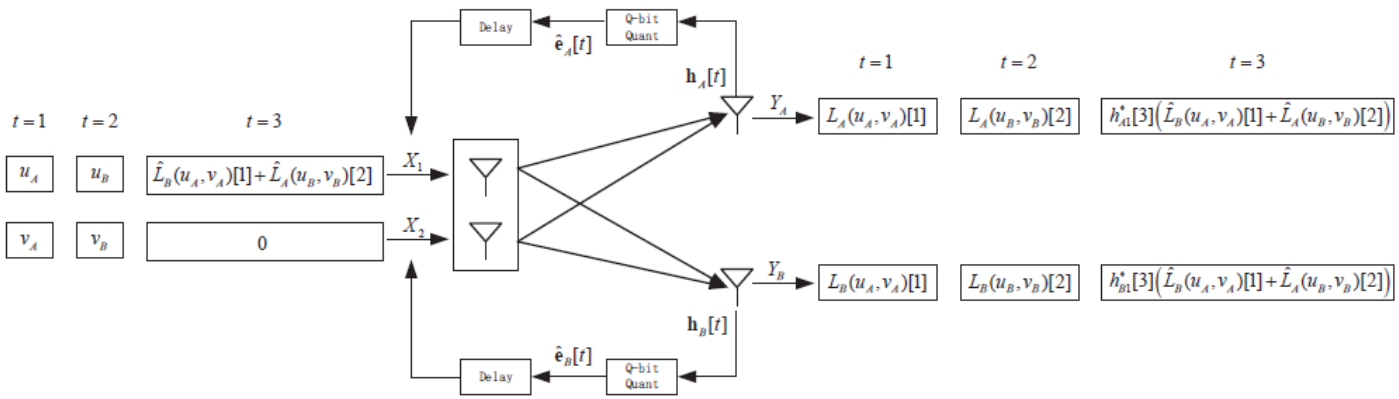


Figure: Block diagram of the MAT scheme with quantization error for K = 2

MISO Broadcast Channels with Delayed Finite-Rate Feedback: Predict or Observe? II

- Contributions of paper
  - Characterize the net DoF provided by MAT scheme considering the finite rate feedback.
  - Comparison to 2 baseline schemes
    - No CSIT single user transmission.
    - Partial CSIT zero forcing (ZF) transmission.
  - Characterize 3 regions of operation based on coherence time and feedback delay.

Paper 3

Cooperative Game in Dynamic Spectrum Access with Unknown Model and Imperfect Sensing

Keqin Liu and Qing Zhao
Department of Electrical and Computer Engineering
University of California, Davis

Cooperative Game in Dynamic Spectrum Access with Unknown Model and Imperfect Sensing

- Distributed secondary users (SU) search for spectrum opportunities without knowledge of primary statistics.
- Each slot the SU chooses a channel to sense, and transmit if the channel is sensed to be idle.
- Sensing is imperfect due to fading.
- Objective: Maximize the long-term throughput of the secondary network under a constraint on the maximum allowable probability of primary collisions.
- Formulated as a decentralized MAB with imperfect observations and multiple players.
- Cooperative Game Framework: Minimize the rate at which system regret grows with time.
- Optimal system regret shown to be logarithmic order with time.
- Proposed an order optimal policy known as Synchronized Learning under Corrupted Data (SLCD)

Paper 4

Non-Orthogonal Opportunistic Beamforming: Performance Analysis and Implementation

Minghua Xia
KAUST

Yik-Chung Wu
University of Hong Kong

Sonia Aissa
University of Quebec

Non-Orthogonal Opportunistic Beamforming: Performance Analysis and Implementation

- Opportunistic Beamforming. N_t orthogonal beams and serves N_t users.
  - Causes large scheduling delay.
  - Average Scheduling Delay $\frac{K \ln K}{N_t}$.
  - Achieves sum-rate capacity.
- Non-orthogonal Beamforming
  - Support more users than $N \geq N_t$.
  - Decreases scheduling delay.
  - Sum-rate decreases due to inter-beam interference.
- Key Question: Characterize how the sum-rate decreases due to interbeam interference.
- Results
  - Analytical form of sum-rate scaling and average scheduling delay.
  - Two methods to construct non-orthogonal beamforming vectors to minimize inter-beam interference.

Other Papers I

- Game Theory in Cognitive Radio
  - **Opportunistic Spectrum Access in Unknown Dynamic Environment: A Game-Theoretic Stochastic Learning Solution**
    Yuhua Xu, Jinlong Wang, Qihui Wu, Alagan Anpalagan, and Yu-Dong Yao
  - **Distributed Power Allocation for Secondary Users in a Cognitive Radio Scenario**
    Taskeen Nadkar, Vinay Thumar, G.P.S. Tej, S.N Merchant, and U.B. Desai
- Distributed Processing over Wireless Networks
  - **Contention-Based Transmission for Decentralized Detection**
    Dianhui Xu and Yingwei Yao
  - **Uniformly Reweighted Belief Propagation for Estimation and Detection in Wireless Networks**
    Henk Wymeersch, Federico Penna, and Vladimir Savic

Other Papers II

- Energy Aware Communication
  - **Dual-Stage Power Management Algorithms for Energy Harvesting Sensors**
    Srinivas Reddy and Chandra R. Murthy
  - **Energy-Aware Network Planning for Wireless Cellular System with Inter-Cell Cooperation**
    Zhisheng Niu, Sheng Zhou, Yao Hua, Qian Zhang, and Dongxu Cao
- Misc. . .
  - **Cross-Layer Design for Proportional Delay Differentiation and Network Utility Maximization in Multi-Hop Wireless Networks**
    Anfu Zhou, Min Liu, Zhongcheng Li, and Eryk Dutkiewicz
  - **Interference and Outage in Poisson Cognitive Networks**
    Chia-han Lee and Martin Haenggi