Computer Science > Information Theory

Distributed Robust Multi-Cell Coordinated Beamforming with Imperfect CSI: An ADMM Approach

Chao Shen, Tsung-Hui Chang, Kun-Yu Wang, Zhengding Qiu, Chong-Yung Chi

(Submitted on 5 Jul 2011)

Multi-cell coordinated beamforming (MCBF), where multiple base stations (BSs) collaborate with each other in the beamforming design for mitigating the inter-cell interference, has been a subject drawing great attention recently. Most MCBF designs assume perfect channel state information (CSI) of mobile stations (MSs); however CSI errors are inevitable at the BSs in practice. Assuming elliptically bounded CSI errors, this paper studies the robust MCBF design problem that minimizes the weighted sum power of BSs subject to worst-case signal-to-interference-plus-noise ratio (SINR) constraints on the MSs. Our goal is to devise a distributed optimization method that can obtain the worst-case robust beamforming solutions in a decentralized fashion, with only local CSI used at each BS and little backhaul signaling for message exchange between BSs. However, the considered problem is difficult to handle even in the centralized form. We first propose an efficient approximation method in the centralized form, based on the semidefinite relaxation (SDR) technique. To obtain the robust beamforming solution in a decentralized fashion, we further propose a distributed robust MCBF algorithm, using a distributed convex optimization technique known as alternating direction method of multipliers (ADMM). We analytically show the convergence of the proposed distributed robust MCBF algorithm to the optimal centralized solution and its better bandwidth efficiency in backhaul signaling over the existing dual decomposition based algorithms. Simulation results are presented to examine the effectiveness of the proposed SDR method and the distributed robust MCBF algorithm.

Subjects: **Information Theory (cs.IT)**
Cite as: **arXiv:1107.2018 [cs.IT]**
(or **arXiv:1107.2018v1 [cs.IT]** for this version)

Submission history

From: Kunyu Wang [view email]
[v1] Tue, 5 Jul 2011 01:32:15 GMT (6454kb)

Which authors of this paper are endorsers?