数学与系统科学研究院

计算数学所学术报告

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报告题目：

Robust Multi-Group Multicast Beamforming in Cognitive Radio Networks: Fractional Semidefinite Relaxation and Approximation Analysis

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Abstract:

Consider a cognitive radio (CR) network, in which a secondary base station with multiple antennae wishes to broadcast separate information streams to different groups of single-antenna secondary users (SUs) (i.e., multi-group multicast (MM)) without causing excessive interference to the single-antenna primary users (PUs). As is common in CR networks, the secondary base station does not necessarily know the precise channel state information (CSI) of the PUs and SUs. In this talk, we consider robust transmit designs for the above scenario, where we assume that the CSI error vectors lie in balls of prescribed radii, and our goal is to design the beamformers so that the worst-case minimum quality-of-service received among all the SUs is maximized. Departing from the traditional transmit beamforming scheme, we propose a transmit beamformed Alamouti space-time code scheme for the above task. We show that the traditional scheme and the proposed scheme can be reformulated as a rank-1 and rank-2 constrained robust fractional semidefinite program (SDP), respectively. This implies that the performance of the proposed scheme will be at least as good as that of the traditional scheme. Moreover, by relaxing the rank constraints, we obtain a robust fractional SDP, which can be shown to be efficiently solvable. Finally, we establish approximation guarantees of the robust fractional SDP with respect to its rank-constrained counterparts, thereby rigorously quantifying the improvement of the proposed scheme over the traditional scheme. Our results unify and generalize those in the literature and, to the best of our knowledge, give the first provable bounds on the performance of beamforming schemes in a general MM-CR system.

欢迎大家参加！