



Stackelberg Game for Cognitive Radio Networks with MIMO and Distributed Interference Alignment

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Abstract

Due to the tremendous increase in wireless data traffic, usable radio spectrum is quickly depleted. Cognitive radios (CR) are proposed as a new wireless paradigm for exploiting spectrum opportunities. To enhance the system throughput, Multiple Input and Multiple Output (MIMO) and distributed interference alignment (IA) are proposed. We investigate the problem of spectrum leasing in CR networks, while incorporating these two advanced physical layer technologies. We present a cooperative spectrum leasing scheme for primary and secondary users to balance the tension between data transmission and revenue collection/payment. A Stackelberg game is formulated, where the primary user is the leader and secondary users are followers. With backward induction, we derive the unique Stackelberg Equilibrium, where no player can gain by unilaterally changing strategy, as well as the optimal strategies for primary and secondary users. We find spectrum leasing is always beneficial to enhance the utilities of primary and secondary users. The proposed scheme outperforms a no-spectrum-leasing scheme and a cooperative scheme presented in the literature with considerable gains, which demonstrate the benefits of spectrum leasing and distributed interference alignment and validate the efficacy of the proposed scheme.

Bio

Yi Xu is currently pursuing his Ph.D. degree in the Department of Electrical and Computer Engineering, Auburn University, Auburn, AL, under the supervision of Dr. Shiwen Mao. He received the M.S. degree from Tsinghua University, Beijing, China, in 2010 and the B.S. degree from University of Electronic Science and Technology of China, Chengdu, China, in 2007, both in Electrical Engineering. His research interests include wireless network optimization, game theory, MIMO, OFDM, IDMA and cognitive radio network.

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