Optimum Co-Design for Spectrum Sharing Between Matrix Completion Based MIMO Radars and a MIMO Communication System

Spectrum sharing enables radar and communication systems to share the spectrum efficiently by minimizing mutual interference. Recently proposed multiple input multiple output radars based on sparse sensing and matrix completion (MIMOMC), in addition to reducing communication bandwidth and power as compared to MIMO radars, offer a significant advantage for spectrum sharing. The advantage stems from the way the sampling scheme at the radar receivers modulates the interference channel from the communication system transmitters, rendering it symbol dependent and reducing its row space. This makes it easier for the communication system to design its waveforms in an adaptive fashion so that it minimizes the interference to the radar subject to meeting rate and power constraints. Two methods are proposed. First, based on the knowledge of the radar sampling scheme, the communication system transmit covariance matrix is designed to minimize the effective interference power (EIP) to the radar receiver, while maintaining certain average capacity and transmit power for the communication system. Second, a joint design of the communication transmit covariance matrix and the MIMO-MC radar sampling scheme is proposed, which achieves even further EIP reduction.