Time-Variant Channel Prediction for Interference Alignment with Limited Feedback

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Abstract:

We propose a novel limited feedback algorithm for single-input single-output (SISO) interference alignment in time-variant channels. The feedback algorithm enables reduced-rank channel prediction to compensate for the channel estimation error due to time selectivity and feedback delay. An upper bound for the rate loss caused by feedback quantization and channel prediction is derived. We characterize the scaling of the required number of feedback bits in order to decouple the rate loss due to channel quantization from the transmit power. Based on our derived upper bound, we develop a dimension switching algorithm which is able to find the best tradeoff between quantization error and prediction error. Simulation resu lts show that a rate gain over the traditional non-predictive feedback strategy can be secured and a 60% higher rate is achieved at 20dB signal-to-noise ratio.