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Improved Upper Bounds on the ML Performance of Turbo Codes for Interleaved Rician Fading Channels, with Comparison to Iterative Decoding

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Abstract

The ensemble performance of ML decoded turbo codes using coherent BPSK signaling on fully interleaved (memoryless) Rician fading channels is considered, where the ensemble is generated by a uniform choice of the interleaver. The improved bound proposed here is advantageous over the ubiquitous union bound, and it is especially pronounced in the rate region exceeding the cutoff rate (where the performance of turbo codes is most appealing but the union bounds become useless). The upper bounds are compared to simulation results of the Log-MAP iterative decoding algorithm for various degrees of space diversity, demonstrating good match. Hence the improved bounds here can be used also as a fast technique to approximately assess the performance of efficient iterative decoding.