SVD Iterative Detection of Turbo Coded Multi Element Unitary Matrix Differential Modulation

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ABSTRACT

A new sub-optimal demodulator based on a Singular Value Decomposition (SVD) for estimation of unitary matrices is introduced. Non-coherent communication over the Rayleigh flat fading channel with multiple transmit and receive antenna, where no channel state information (CSI) is available at the receiver is investigated. Codes achieving bit error rate (BER) lower than 10^{-4} at bit energy over the noise spectral density ratio $\left(E_b / N_0 \right)$ of 1.6 to 1.9 dB from code restricted capacity limit and of 3.2 to 65 dB from mutual information upper bound of the capacity attaining Isotropically Random (IR) unitary transmit matrices, were found with coding rates of 1.125 to 5.06 bits per channel use, and different modulation decoding complexities. The codes comprise of a serial concatenation of turbo code and a unitary matrix differential modulation code. The receiver employs the high performance joint iterative decoding of the turbo code and the modulation code. Information theoretic arguments are harnessed to form guidelines for code design and to evaluate performance of the iterative decoder.

Keywords: Unitary matrix differential modulation, SVD, capacity limit, space-time, joint iterative decoding.