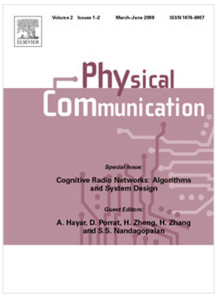

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Decode-and-Forward with Qudrature Spatial Modulation in the Presence of Imperfect Channel Estimation

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Abstract

The performance of quadrature spatial modulation (QSM) multiple-input multiple-output (MIMO) system with cooperative decode and forward (DF) relays is analyzed in this paper. QSM is a new MIMO transmission technique that enhances the overall performance of conventional spatial modulation through exploiting quadrature spatial dimension. A practical scenario is considered where the channel is estimated at the relays and the destination and the impact of channel estimation error is investigated. Two cooperative systems are considered in the study. In the first system, multiple single–antenna DF relays are assumed. Whereas, in the second system, single multiple–antennas DF relay is considered. For both systems, an analytical expression for the pair wise error probability (PEP) is obtained. As well, an asymptotic expression for the PEP at high and pragmatic signal to noise ratio is derived. Derived expressions are used to provide an upper bound on the average bit error ratio. The derived analysis is corroborated through Monte Carlo simulations and results demonstrate a close-match for a wide range of SNR values.

Index Terms

Quadrature spatial modulation, MIMO, cooperative communication, decode and forward, performance analysis, channel estimation.

I. Introduction

Past few years witnessed a tremendous growth in the demand for wireless services and a huge increase in the number of mobile subscribers. Recent CISCO forecasts reveal that global mobile data traffic grows 74 percent in 2015, where it reached 3.7 exabytes per month at the end of 2015 comparing to 2.1 exabytes per month at the end of 2014. Also and in the same forecast, it is reported that mobile data traffic has grown 4,000-fold over the past 10 years and almost 400-million-fold over the past 15 years [1]. As such, mobile operators and researchers are trying their best to develop new transmission technologies, protocols and

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