

Performance Evaluation of Space-Time Block Code With Constellation Rearrangement

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In wireless communication fading of channels is a serious cause of the received degraded signals. Orthogonal transmitter diversity such as time diversity and frequency diversity is quite simple to implement and, with optimum signal combining, can take full advantage of fading multipath channels. Receive diversity techniques like maximal ratio combining (MRC) have been popular means of introducing multiple antennas into communication systems. Space-Time Block Codes (STBC) that represent transmit diversity also exhibit similar complexity and performance as MRC. In this paper, we evaluated the performance of constellation rearrangement (CoRe), when used in conjunction with STBC coding is observed to improve the bit error rate of quadrature-amplitude modulation (QAM). CoRe is the process of finding a good bit to symbol mapping for each transmitting antenna, without changing the modulation level. A number of CoRe schemes have been proposed in the literature based on uniform QAM constellation. The objective of CoRe is to maximize the minimum squared Euclidean distance between different branches of the transmitter diversity scheme with the help of optimized constellation. The novelty of this work lies in the fact that instead of searching for an optimal constellation for each transmit antenna through an exhaustive search, we propose a constellation rearrangement scheme which is saved in a table in transmitter and receiver for each antenna. Maximum likelihood (ML) detector has been used in the receiver which shows significant reduction in BER for increased values of E_b/N_0 .

Keywords: Constellation Rearrangement (CoRe), Maximal Ratio Combining (MRC), Orthogonal transmit diversity, Rayleigh fading, Space time block code (STBC).

1. F. B-Jahromi, M. Ali Pourmina, M. Ali Masnadi-Shirazi, "Concatenation of Space-Time Block Codes with Constellation Rearrangement," *Arab Journal of Science, Engineering* 38:2703–2712 DOI 10.1007/s13369-012-0527-4, 2013.
2. S. M. Alamouti, "A simple transmit diversity technique for wireless communications," *IEEE Journal on Selected Areas in Communications*, vol. 16, pp. 1451-1458, 1998.
3. Christian Wengerter, A.G.E. Von Elbwart, Eiko Seidel, M.G. Velez, "Advanced Hybrid ARQ Technique Employing a Signal Constellation Rearrangement." *In: Proceedings of 56th IEEE Vehicular Technology Conference (VTC), Vancouver*, pp. 2002–2006, 2002