

Coding and Decoding versus Space Diversity for Rayleigh Fading Radio Frequency Channels

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Abstract : The diversity is the usual remedy of the transmitted signal level variations (Fading phenomena) in radio frequency channels. Diversity techniques utilize two or more copies of a signal and combine those signals to combat fading. The basic concept of diversity is to transmit the signal via several independent diversity branches to get independent signal replicas via time - frequency - space - and polarization diversity domains. Coding and decoding processes can be an alternative remedy for fading phenomena, it cannot increase the channel capacity, but it can improve the error performance. In this paper we propose the use of replication decoding with BCH code class, and Viterbi decoding algorithm with convolution coding; as examples of coding and decoding processes. The results are compared to those obtained from two optimized selection space diversity techniques. The performance of Rayleigh fading channel, as the model considered for radio frequency channels, is evaluated for each case. The evaluation results show that the coding and decoding approaches, especially the BCH coding approach with replication decoding scheme, give better performance compared to that of selection space diversity optimization approaches. Also, an approach for combining the coding and decoding diversity as well as the space diversity is considered, the main disadvantage of this approach is its complexity but it yields good performance results.

Keywords : Rayleigh fading, diversity, BCH codes, Replication decoding, convolution coding, viterbi decoding, space diversity

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