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Performance Analysis of Serially Concatenated STTC with Convolutional Code Using Simple SOVA

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Abstract

In this work, we study the iterative decoding of serially concatenated scheme of space-time trellis code (STTC) with outer convolutional code using the soft output viterbi algorithm (SOVA). At the transmitter, the space-time architecture is serially concatenated with a simple outer convolutional code. For the iterative decoding, the soft output of STTC should be passed to the outer covolutional decoder and vice versa. We propose the modified simple SOVA which obtain soft output in simple form. With the availability of extrinsic information at the receiver delivered by the simple SOVA, it is now possible to perform iterative decoding and the simulation results show the improved performance.

I. INTRODUCTION

In recent years, the goal of providing high speed wireless data services has generated a great amount of interest among the communication research community. Recent information theoretic results have demonstrated that the capacity of the system in the presence of Rayleigh fading improves significantly with the use of multiple transmit and receive antennas [1,2]. Thus, specific coding schemes, called space-time codes (STC), have been designed to approach these capacities by exploiting the available spatial diversity. Several space-time coding approaches have been proposed. Among these, space-time trellis codes (STTCs) [3] can achieve a full spatial diversity gain at a fixed number of transmit antennas and a coding gain.

Also, the introduction of iteratively-decodable concatenated code, especially turbo codes [4], has attracted lots of attentions by its excellent performance when employing iterative decoding. The soft output decoding algorithm should be used for the iterative decoding and the maximum *a posteriori* (MAP) algorithm, Max-Log-Map and the soft output viterbi algorithm (SOVA[5]) which is modified version of viterbi algorithm (VA) are the most prominent soft decoding algorithm. The SOVA is actually a suboptimal MAP algorithm equivalent to the Max-Log-MAP algorithm [6] in binary case.

For non-binary codes, the complexity of MAP algorithm is overwhelming and the simplified suboptimal algorithm with desirable small performance degradation is badly needed. In that case, SOVA can be used and the BER performance can be improved by exchanging information between the two decoders in concatenated system.

In this paper, we improve the performance of STTC through iterative decoding using modified simple non-binary SOVA. The rest of the paper is organized as follows. Section II gives an overview on STTCs. In

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