A List Decoding Approach to Woven Block Codes

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Аннотация The authors propose a novel method of decoding a variant of serially concatenated convolutional codes, i.e. woven block codes. The method utilizes list decoding of the component codes that helps improving coding gain.
The computer simulation of the proposed decoding algorithm are presented in the paper.

1 Introduction

Evolution of mobile communications requires improving coding gain and achieving new goals along with keeping complexity of the proposed codecs low enough.

There are a number of code constructions that are essentially concatenated codes that make use of convolutional constituent codes. Turbo codes found their wide adoption due to their low encoding complexity, moderate decoding complexity and good error correction performance in the region of low SNR. For example, they are used in standard for Long-Term Evolution mobile networks [14]. The negative side of the turbo codes is their bad code distance that leads to error floors: the distance of turbo codes always grows sublinearly [2, 6].

Woven convolutional codes were introduced in 1997 [11]. Their distance properties and encoder design are studied in [10] and their error rates and decoder design are studied in [13]. Unlike turbo codes, there exist woven codes whose distance grows linearly with the number of fixed constituent codes [4].

In this paper we discuss a construction that can be viewed as an extension of the construction proposed in [17].

In this paper we propose a decoding algorithm for the woven block code construction (also known as serially-concatenated convolutional code, SCCC). This decoding algorithm extends the classical iterative decoding of the SCCC by using additional step of decoding the component code to a list using a modified BCJR [1] algorithm.

This work is organized as follows. In section 2 we describe the proposed code construction by defining its encoding process. Section 3 is devoted to describing a way of list decoding the component codes. In section 4 we present the decoding algorithm of the woven code construction that uses the aforementioned of list decoding the component codes. In section 5 we present the results of the computer simulation of the proposed decoding algorithm and compare it to the original one.

2 Woven Block Codes

3 List decoding approach for component codes

4 The proposed WBC decoder

5 Computer Simulation

6 Conclusions

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