“VLSI Implementation of Decoder Error Correcting in Satellite Concatenation Code in FPGA”

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Abstract—The concatenated code was proposed as a practical method to construct code type with longer codeword length and better error correction performance, and it is a special method that a long code can be consisted of some short codes. Essentially, the concatenated code is the special case of the product code, and the most applied concatenated code is constructed by the two codes. Concatenation codes form a class of error correcting codes that are derived by combining an inner code and an outer code.

I. INTRODUCTION

In practical communication system data or information may get corrupted by noise during transmission. Now a day as demand is continuously increasing for development of reliable telecommunication and wireless systems, it is important to detect and correct errors in the information received over communication channels. Therefore error control coding is important in communication system design for various applications.

Convolution codes are frequently used to correct errors in noisy channels. Using convolution codes together with “Viterbi algorithm” can provide a large coding gain and good performance. It may be noted that errors that Viterbi decoder can’t fix appear at the decoder output in “bursts”, short erroneous blocks. For that reason, convolution codes are often used in pair with Reed Solomon codes. Reed Solomon decoder corrects burst errors. Combination of convolutional code and Reed Solomon is called as concatenated coding. In concatenated coding Reed Solomon as outer code in channel coding and Convolution code as inner codes. [13]

II. BLOCK DIAGRAM

Block diagram consist of three main blocks as follows,

- **Viterbi Decoder:**
  It is the Viterbi Decoder and is used to decode the bits stream that is encoded by the convolutional encoder.

- **Deinterleaver:**
  Interleavers and De-interleavers are designed and used in the context of characteristics of the errors that might occur when the message bits are transmitted through a noisy channel. It is used for burst error correction. It shuffles source symbols across several code words by creating more uniform distribution of errors.
III. RTL SCHEMATIC

- **Viterbi decoder**

![Viterbi decoder schematic](image)

- **RS Decoder**

RS decoder is used as outer decoder. It recovers the original data at its output. The outer code was chosen to be powerful error correcting RS code.

![RS decoder block diagram](image)

The basic concept is to systematically add redundancy to messages at the encoder such that the decoder can successfully recover the messages from the received block possibly corrupted by channel noise. RS decoders can be used to protect digital data against errors occurred and reduce the signal to noise ratio in the transmission process. [1]
REFERENCES


