AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
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Electronics and Communications Engineering Department

INNER CHANNEL CODEC FOR DVB-T

A thesis
Submitted in partial fulfillment of the requirement of the
MASTER OF SCIENCE in
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STATEMENT

This dissertation is submitted to Ain-Shams University in partial fulfillment for degree of Master of Science in Electronics and Communication Engineering.

The work included in this dissertation was carried out by the author at the Electronics and Communications Engineering Department, Ain Shams University.

No part of this dissertation has been submitted for a degree or a qualification at any other university or institute.

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Date: 12 / 3 / 2018

To My Father,

My Mother,

My Sister,

My Husband,

& My little Farida

I present to you this dissertation.

May I by this, express my deepest gratitude and love

Thanks

Without you, I could not have reached this successful step in my life

Abstract

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Inner channel codec for DVB-T

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Digital video broadcasting terrestrial (DVB-T) is the name of the terrestrial transmission system developed by the DVB Project. DVB-T is running in many countries all over the world.

In communication systems, error correcting codes are used in detection and correction of the transmitted data errors. Convolutional encoding with Viterbi decoding used in the DVB-T system is a powerful process for forward error correction. Convolution code is a sort of error correcting code in which (k-bits) information symbol is to be encoded to (n-bits) data where (n>k).

To decode the output data from the inner convolution encoder, a Viterbi decoder is used at the receiver. In 1967, Andrew J. Viterbi resolved and suggested the Viterbi decoding algorithm. It is vastly used as a decoding way for convolutional codes. This algorithm uses trellis structure, which is traced back for decoding the received information. Also, it performs maximum likely hood detection on data that is coded by the convolutional encoder. Viterbi decoding uses trellis diagram to get the output data that is most likely similar to the input sequence coming from the encoder. However, it reduces the complexity by using trellis structure.

At market, almost Viterbi decoders are intellectual property (IP) core with an effective algorithm in the decoding of only one convolutional encoded sequence that is in some way expensive. In addition, the cost for the convolutional encoder and Viterbi decoder are expensive for a specified design because of the patent issue. Therefore, to obtain

convolutional encoder and Viterbi decoder on a field programmable gate array (FPGA) board is so demanding.

This thesis describes the design and implementation of inner convolutional encoder and a soft Viterbi decoder with inner interleaver/de-interleaver of standard DVB-T system (that are essential blocks in digital communication systems) with a constrained length of 7 and a code rate of 2/3, using Xilinx ISE (Integrated Software Environment) design suite 12.4 and comparing their results with that of the IPcore built-in design on Xilinx ISE design Suite 12.4 program.

The designed channel convolutional encoder and Viterbi decoder follow European Standard ETSI EN 300 744 for digital terrestrial television. Verification of the design is accomplished by loopback and by comparison with the corresponding Xilinx core. Utilization and timing reports of implemented device on Vertex 6 are included.

Key words:

Channel Coding; Convolutional Coding (Inner Coding); DVB-T; Inner Interleaver; Inner deinterleaver; Viterbi decoder.

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Dedication

I would like to dedicate this dissertation to my father ***Mohamed Hussein Mousa****, my mother* ***Manal Kassab*** *who have been an inspiration throughout my whole life and who have been supportive for all I have achieved. I also dedicate this dissertation to my sister* ***Nada Mohamed*** *for her great effort, help and support, and my Husband* ***Mohamed Hesham*** *and my daughter* ***Farida*** *for their great support and encouragement.*

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