AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
CAIRO-EGYPT
Electronics and Communications Engineering Department

Enhancement of OFDM Communication System using Coding Techniques

A Thesis
Submitted in Partial Fulfillment for the Requirements of the Degree of Master of Science in Electronics and Communications Engineering

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STATEMENT

This thesis 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 thesis was carried out by the author at the Electronics and Communications Engineering Department, Ain Shams University.

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

Name : Marwa Abdelfatah Abdeltwab Ali

Signature:

Date:

To My Sister Wafaa,

To My Father,

To My Mother,

To My Husband

I present to you this thesis.

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

Marwa Abdelfatah Abdeltwab Ali

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Master of Science thesis

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Key words: OFDM, Rayleigh Fading Channel, Channel Coding, Reed Solomon Code, Convolutional Code, Concatenated Code, Interleaver.

Modern mobile communication systems based on increasing number of users, serving them with high transmission data rate and reducing channel error probability. Orthogonal frequency division multiplexing “OFDM” is a technique that satisfies these requirements. This technique provides efficient use of bandwidth and medium robustness against wireless channel noise.

Channel coding techniques is applied to OFDM systems in order to improve its robustness against wireless channel noise. As coded OFDM system adapted all modern communication system needs, so it is nominated as an essential part in 4G mobile communication system.

The main objective of this thesis is to enhance the performance of the OFDM systems using different channel coding techniques. Block codes and convolutional codes are the two main types of channel coding techniques. Moreover the concatenated code is a channel coding technique that combines two or more

coding types to provide better channel performance of the communication system.

A matlab simulation is implemented to simulate the proposed coded OFDM system. This implemented system faces two different channel models: AWGN and Rayleigh fading channel models.

This thesis discusses the main important points that listed below:

- An overview about the OFDM technique and the different channel models.
- An overview about the channel coding techniques, then a various types of codes has been discussed.
- The simulation start by evaluating the performance of conventional OFDM system, then show the effect of different channel coding techniques, as Reed Solomon code, convolutional code and concatenated code, in the performance of the OFDM system.
- The simulation also shows the performance of the concatenated coding with the Doppler Effect.
- Finally, the simulation tests the effect of the different channel coding techniques on the PAPR value of the OFDM communication system.

Dedication

I would like to dedicate this thesis to my parents and my husband, Osama Samir, who have been an inspiration throughout my life and who have been supportive for all I have achieved. I wish dedicate this thesis to my sisters (Suzan, Wafaa, Eman, Aya and Sara), my son and daughter (Ebrahim and Mariam) and my father in law and mother in law for their support and encouragement.

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Marwa Abdelfatah Abdeltwab

Table of contents