AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics Engineering and Electrical Communications

Channel Estimation In Massive MIMO Network

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

by

Emad Farouk Ibrahim Ibrahim

Master of Science in Electrical Engineering

(Electronics Engineering and Electrical Communications)

Faculty of Engineering, Ain Shams University, 2018

Supervised By

Prof. Salwa Elramly

Dr. Mona Zakaria

Dr. Michael Ibrahim

Cairo-(2018)

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Examiners' Committee

Name and Affiliation	**Signature**
Prof. Salwa Elramly Electronics and Communications Engineering Ain Shams University	
Prof. Hebat-Allah Mostafa Mourad Electronics and Communications Engineering Cairo University	
Dr. Hussien Abdel Atty Elsayed Electronics and Communications Engineering Ain Shams University	

Statement

This thesis is submitted as a partial fulfillment of Master of Science in Electrical Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

Student name: Emad Farouk Ibrahim Ibrahim

Signature

……...…….

Researcher Data

Name: Emad Farouk Ibrahim Ibrahim

Date of birth: 10/10/1990

Place of birth: Cairo, Egypt

Last academic degree: B.Sc. in Electrical Engineering

Field of specialization: Electronics and Electrical Communications Engineering

University issued the degree: Ain Shams University

Date of issued degree: June 2013

Current job: Teaching assistant at Faculty of Engineering, Ain Shams University.

Acknowledgement

All my thanks to Allah, to the successful completion of this work.

I express my deepest gratitude and thanks to Prof. Salwa Elramly, Electronics and Communications Department, Ain Shams University, for her continuous supervision support and actually she is behind all analytical, technical and even spiritual actions throughout this work. Without her encouragement, the thesis could not reach this level.

Thanks are also due to Dr. Mona Zakaria & Dr. Michael Ibrahim, Electronics and Communications Department, Ain Shams University, for their understanding, patience, encouragement, besides, overcoming any obstacles that might interfere with the research.

Many thanks for my father, mother, sister and brother for their great hearts which take care of me all these years.

Thesis Summary

This thesis discusses channel estimation process in wireless communications systems; our main concerns are on channel estimation techniques based on the superimposed pilots, because these techniques increase the spectral efficiency of the communication systems compared to traditional techniques that are usually based on pilot signals transmission. Our main contribution in this thesis are as follows: firstly, we introduce a joint channel estimation algorithm for single-input-single-output (SISO) time domain synchronous-orthogonal frequency division multiplexing (TDS-OFDM) system based on superimposed pilots transmission. Secondly, we introduce a new channel estimation algorithm based on superimposed pilots for the spatial multiplexing multiple-inputs-multiple-outputs (MIMO) OFDM systems. Finally, we propose a channel estimation algorithm for multiuser massive MIMO system based on superimposed pilots then we modify it for sparse channel estimation with the aid of compressive sensing techniques, particularly the orthogonal matching pursuit algorithm.

The thesis is divided into six chapters as listed below:

Chapter 1:

This chapter gives a brief introduction to the objectives, major contribution and organization of the thesis. Also, it gives a review on the wireless communications channel, OFDM systems and channel estimation in OFDM system.

Chapter 2:

This chapter introduces a channel estimation algorithm for TDS-OFDM system based on the use of particular type of superimposed pilots wherein no

mutual interference between superimposed pilots signals and data signals to improve the channel estimation accuracy.

Chapter 3:

This chapter presents a review on the MIMO wireless communications systems and the benefits of employing the transmitter and/or the receiver with multiple antennas. Also, it gives a review on detection algorithms for MIMO systems.

Chapter 4:

This chapter introduces a channel estimation algorithm for spatial multiplexing MIMO-OFDM systems based on the use of particular type of superimposed pilots wherein no mutual interference between superimposed pilots signals and data signals.

Chapter 5:

This chapter introduces a review on multiuser massive MIMO systems then it proposes a channel estimation algorithm for multiuser massive MIMO based on superimposed pilot signal transmission after that it modifies the proposed algorithm for sparse channel estimation.

Chapter 6:

This chapter gives the conclusion of this thesis and introduces some suggestions for the future work.

Keywords: Channel Estimation, massive MIMO, Superimposed pilot, compressive sensing.

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