COMPRESSED SENSING-BASED RECEIVERS FOR SPATIAL MODULATION-MIMO NOMA SYSTEMS

M. Thuvarakan

(188269T)

Degree of Master of Science

Department of Electronic and Telecommunication Engineering

University of Moratuwa

Sri Lanka

August 2023

Abstract

Spatial modulation (SM) offers a promising solution to the demands of up-and-coming wireless networks. In this thesis, the Generalized Orthogonal Matching Pursuit (gOMP) algorithm is introduced into the receiver of NOMA aided SM-MIMO system to improve processing speed and reduce computational complexity. Furthermore, we present comprehensive analysis of the latest research contributions for NOMA based SM-MIMO system which has considerable attention recently. In addition, we focused our attention on the CS based receivers for NOMA based SM and compared the complexity which contributes performance degradation, with typical ML detectors. Detection of SM can be thought of as a process of sparse reconstruction, due to its an inherent property of sparsity. The sparse signal can be detected by Compressed sensing (CS) algorithm which became competitive alternatives. Some modified CS detection algorithms which showed improved performance compared to the conventional CS based once, have not been adopted in NOMA based SM-MIMO system. We formulate the recovery problem by exploiting the SM-MIMO communication system as downlink power domain NOMA where the base station supports more users in downlink scenario. Also, we deployed a low complexity pairing in this system to increase sum throughput. In addition, we analyzed the behavior of gOMP algorithm at this system. Simulations show that the gOMP detector outperforms conventional CS detection schemes.

Keywords:

Spatial Modulation (SM), Non-Orthogonal Multiple Access (NOMA), Compression Sensing (CS), Generalized Orthogonal Matching Pursuit (gOMP).

Declaration

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

	10.08.2023
----------	----------
Signature Date	Date

The above candidate has carried out research for the Masters thesis under my supervision.

	August 14,2023
----------	----------
Signature of the supervisor	Date

Acknowledgement

This work was carried out during the years 2020-2023 at the Department of Electronic and Telecommunication Engineering, University of Moratuwa. I owe my deepest gratitude to my supervisor Dr. Chandika Wavegedara for the incredible guidance to successfully complete the research. A conference paper will be published based on the research outcomes and I would like to thank all of the coordinators for their immense support.

I would like to thank all the authors and owners of the materials that have been referred in this thesis and finally, I would like to thank all the people who supported to successfully complete the research.

Contents

List of Figures

List of Tables