K-BEST SPHERE DETECTOR BASED RECEIVER FOR MIMO NON-ORTHOGONAL MULTIPLE ACCESS SYSTEMS

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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 it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

K-Best Sphere Detector based Receiver for MIMO Non-Orthogonal Multiple Access Systems

Non-Orthogonal Multiple Access (NOMA) is a promising radio access technology, which improves the spectrum efficiency and system throughput considerably over conventional Orthogonal Multiple Access (OMA) techniques and also enables massive connectivity. NOMA is currently being considered extensively as a key enabling technology for 5G wireless networks. However, in NOMA, one of the key technical challenges is to develop efficient receivers due to the presence of Multiple-Access Interference (MAI) caused by non-orthogonal resource allocation. Minimum Mean Square Error (MMSE) based Successive Interference Cancellation (SIC) receivers have widely been discussed in the literature for power-domain NOMA systems. However MMSE detector is a linear detector with poor error performance. In this research, a K-Best sphere detector based SIC receiver is discussed for the downlink of power-domain MIMO-NOMA systems. The BER performance of the proposed receiver is investigated for different power allocation ratios and for different K values of the K-Best detector. Link level simulation results demonstrate that our proposed K-Best detector based receiver offers much superior performance over the MMSE-SIC based receiver.

Keywords : NOMA, SIC, MIMO

To my parents ...

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LIST OF ABBREVIATIONS

AWGN Additive White Gaussian Noise. 3

BER Bit Error Rate. 6

BLER Block Error Rate. 23

BS Base Station. 4

CCD Cyclic Delay Diversity. 33

CDMA Code Division Multiple Access. 1

CP Cyclic Prefix. 8

CSI Multiple Access Interference. 3

CWIC Code Word level SIC. 23

DL Down Link. 3

DoF Degree of Freedom. 20

ED Euclidean distance. 15

FDMA Frequency Division Multiple Access. 1

FFT Fast Fourier Transform. 8

IFFT Inverse Fast Fourier Transform. 8

IoT Internet of Things. 1

IR Increased Radius. 18

ISI Inter Symbol Interference. 3

LD Linear Detector. 15

LDS Low Density Spreading. 7

LTE Long Term Evolution. 2

MA Multiple Access. 1

MAI Multiple Access Interference. 2

MCS Modulation and Coding Schemes. 23

MIMO Multiple Input Multiple Output. 2

ML Maximum Likelyhood. 10

MMSE Minimum Mean Square Error. 5

MUD Channel State Information. 3

MUSA Multi User Shared Access. 7

NOMA Non-Orthogonal Multiples Access. 1

OFDMA Ortogonal Frequency Division Multiple Access. 1

OMA Orthogonal Multiples Access. 1

PA Power Allocation. 6

PAPR Peak-to-Average Power Ratio. 9

PED Partial Euclidean distance. 16

QoS Quality of Service. 6

QRD QR Decomposition. 16

RB Resorce Block. 2

SCMA Sparse Code Multiple Access. 7

SD Sphere Detector. 16

SEE Schnorr Euchner Enumeration. 18

SIC Successive Interference Cancellstion. 5

SIMO Single Input Multiple Output. 19

SISO Single Input Single Output. 13

SLIC Symbol level SIC. 23

SNR Signal to Noise Ratio. 20

TDMA Time Division Multiple Access. 1

TIM Topological Interference Management. 20

TM3 Transmission Mode 3. 23

UL Up Link. 3