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AN MMSE-BASED MCI AND MAI CANCELLATION RECEIVER FOR MIMO OVSF-OFCDMA SYSTEMS

By

Nuwan Kithsiri Kumara

A DISSERTATION

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A dissertation submitted in partial fulfillment of
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Master of Science in Telecommunications

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Declaration

This thesis to the best of my knowledge and belief, contains no material that has been accepted for the award of any other degree or recognized qualification by a university or institute of higher learning and it contains no material previously published or written by another person, except where due reference is made in the text of the thesis. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for inter-library loans, and for the title and summary to be made available to outside organizations.

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Abstract

Kumara, Nuwan Kithsiri (Master of Science in Telecommunications)

AN MMSE-BASED MCI AND ISSI CANCELLATION RECEIVER FOR MIMO OVSF-OFCDMA SYSTEMS (April, 2012)

Abstract of a dissertation at the University of Moratuwa.
Dissertation supervised by Dr. K.C.B. Wavegedara

Broadband orthogonal frequency code division multiple access (OFCDMA) with two dimensional spreading is a promising candidate for Beyond fourth Generation (B4G) networks. Since wideband channels are highly frequency-selective, orthogonality among orthogonal spreading codes are no longer maintained. Therefore, multiple code interference (MCI) is inevitable in OFCDMA-based systems. Multiple-Input Multiple-Output (MIMO) will be a key technology of future wireless communication systems. In MIMO-OFCDMA systems, in addition to MCI, inter-spatial stream interference (ISSI) will also exist. Even though maximum a posteriori probability (MAP)-based detectors provide the best performance, their computational complexity is high. Alternatively, minimum mean-square error (MMSE) detectors can be used to obtain a better tradeoff between the complexity and the performance.

Several interference cancellation techniques were proposed under LTE Advanced, B4G standardizations and corresponding literature. One such technique is zero-forcing MAI nulling and cancellation based on QR decomposition (ZF-QRD). That can be used to cancel the MAI separately. But we are proposing a combined ISSI and MCI cancellation technique. We also compare the performance of MIMO VSF-OFCDMA recursive ISSI and MCI cancellation scheme with conventional MC-CDMA, MC-DS-CDMA, MT-CDMA and OFCDMA.

To my parents ...

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First and foremost, I wish to express my heartfelt sincere gratitude to my research supervisor, Dr. K.C.B. Wavegedara, Senior Lecturer, Department of Electronic and Telecommunication Engineering, University of Moratuwa. I am very much indebted to you sir, for all your assistance given to me during my research. I must admit that your advice as well as your criticism kept me on track and helped me immensely in achieving my goals.

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