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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Development of MCM-MIMO Processing for Urban Cellular Link

Abstract

Modern day mobile communication systems rely heavily on Multi Carrier Modulation (MCM) and Multiple Input Multiple Output (MIMO) technologies the challenges predominantly faced are of maximizing data rates and capacity. In this report, a methodology is developed to use current 4G and future 5G systems in both diversity and multiplexing modes to improve on both data rates and capacities. Theoretically, it is possible to use Single Input Single Output (SISO) systems to achieve the same capacities and data rates. However, the complexities involved in designing modems that are capable of achieving these rates are too cost prohibitive and thus it becomes necessary to address this problem through MCM and MIMO.

MIMO however is too broad a term as it consists of various configurations and setups. A system which can be operated in two modes is designed, namely diversity and multiplexing. Diversity is suitable for low SNR regimes where, multiple copies of the same data needs to be sent to maintain a feasible Quality of Service (QoS). Multiplexing is the scheme of choice in high SNR regimes where the option exists to maximize data rates and capacity by transmitting differing data over good channels. that are already providing good BER.

This report shows the simulations of the work with the help of MATLAB. The ultimate goal of this report is to design a 2 X 2 MIMO system and in this regard, at rst a SISO system is designed to lay the foundation for multi carrier communication systems. Further, a 1 X 2 SIMO and 2 X 1 MISO system is also designed to operate in diversity mode. Finally, a 2 X 2 MIMO system is designed to work in both diversity and multiplexing modes to improve the data rates and capacities. The design of this system employs unique precoding schemes like Alamouti coding, Inverse Channel Estimation precoding and SVD. This report also demonstrates the use of Rayleigh fading and Friis' path loss formula for real world simulation purposes.

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