

Research Issues in Wireless

Communications and Networking

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CHAPTER 1

An Overview of Multiplexing Schemes for MIMO Channel Sounding

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1.1 INTRODUCTION

MIMO (multiple input multiple output) wireless communication system is an innovative solution to improve the bandwidth efficiency by exploiting multipath-richness of the propagation environment. The degree of multipath-richness of the channel will determine the capacity gain attainable by MIMO deployment. MIMO antenna systems have recently gained considerable interest as they offer high data throughput and significant enhancement in link reliability over single antenna systems without requiring additional power or bandwidth [1, 2]. There can be various MIMO configurations. For example, a 2x2 MIMO configuration is 2 antennas to transmit signals and 2 antennas to receive signals.

The benefits of MIMO system are; higher capacity (bits/s/Hz) (spectrum is expensive, number of base stations limited), better transmission quality (BER, outage), increased coverage and improved user position estimation [3, 6]. According to the following issues MIMO is preferable:

- (i) Spatial multiplexing gain - Capacity gain at no additional power or bandwidth consumption obtained through the use of multiple antennas at both sides of a wireless radio link.
- (ii) Diversity gain-Improvement in link reliability obtained by transmitting the same data on independently fading branches.
- (iii) Array gain
- (iv) Interference reduction.

Capacity describes the amount of bits that can be sent over the channel in one cycle or second per Hertz. It can also be defined by maximizing the mutual information, defined below, of the input and output of the system.

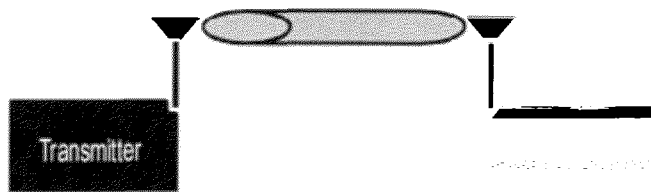


Figure 1.1(a): Single Input Single Output (SISO)

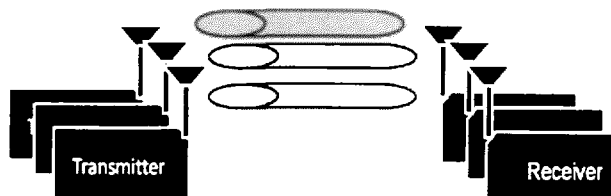


Figure 1.1(b): Multiple Input Multiple Output (MIMO)