Multi-Antenna Systems

Exercise 1: Would a WiFi system be more likely to use multiple antennas for MIMO or SDMA? How about a cellular system?

WiFi : more interest in throughput (MIMO)

Cellular : " " " number of users (SDMA)

Exercise 2: Consider a 2×2 channel where H is $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and x is $[1, -1]$. Find y.

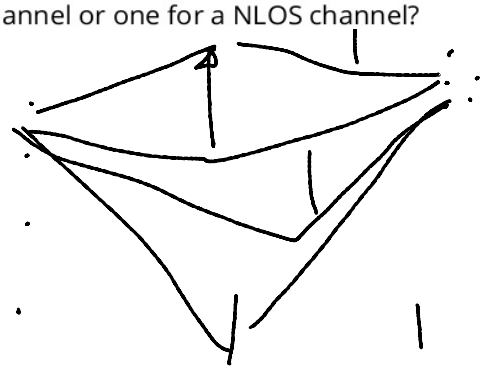
$$y = Hx = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} -1 \\ -1 \end{bmatrix}$$

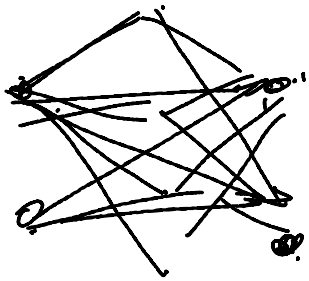
Exercise 3: By (up to) what factor could a MIMO system with 3 transmit and 4 receive antennas increase throughput?

$$\min(N_r, N_t) = \min(3, 4) = \underline{3}$$

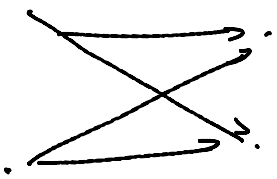
$$\begin{bmatrix} \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot \end{bmatrix} \begin{bmatrix} \cdot \\ \cdot \\ \cdot \end{bmatrix}$$

Exercise 4: Which channel matrix is more likely to be full-rank (rank N), one for a LOS channel or one for a NLOS channel?





(1) NLOS



(2) LOS

probably NLOS case is more likely to have full-rank H.