

MIMO

Multiple Input

Multiple Output

Key Technology

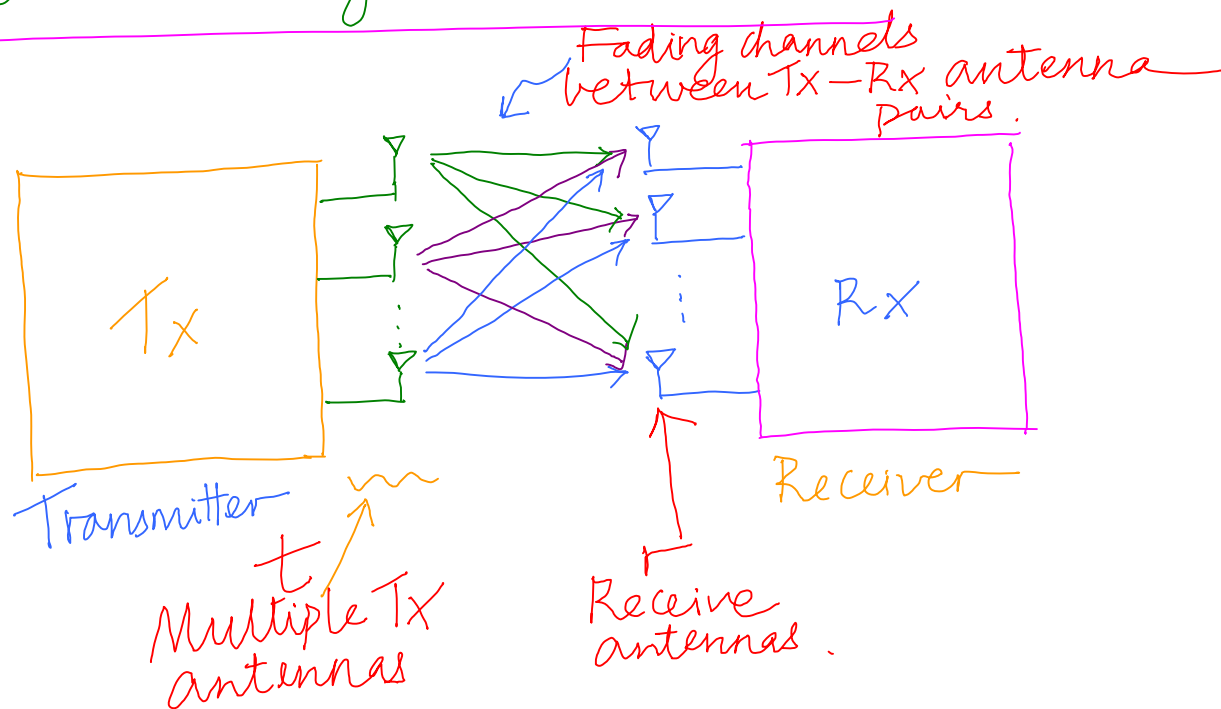
3G/4G wireless systems

MIMO $\Rightarrow$ Increase in
Data Rates.

Multiple Inputs $\Rightarrow$ Multiple
Transmit
Antennas.

Multiple outputs $\Rightarrow$ Multiple
Receive
Antennas.

Block Diagram of MIMO:



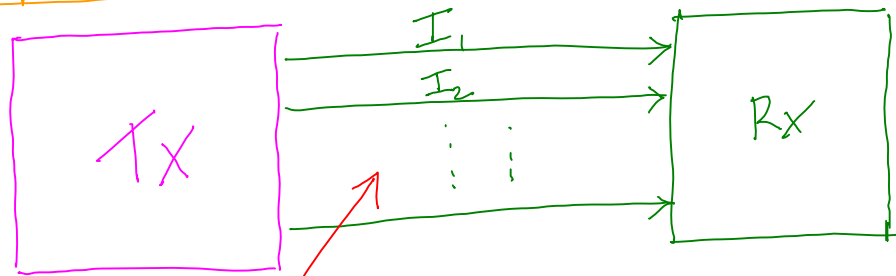
Multiple Antennas

$\Rightarrow$ Diversity $\Rightarrow$ Increased Reliability.

MIMO can also be used to increase the data rate.

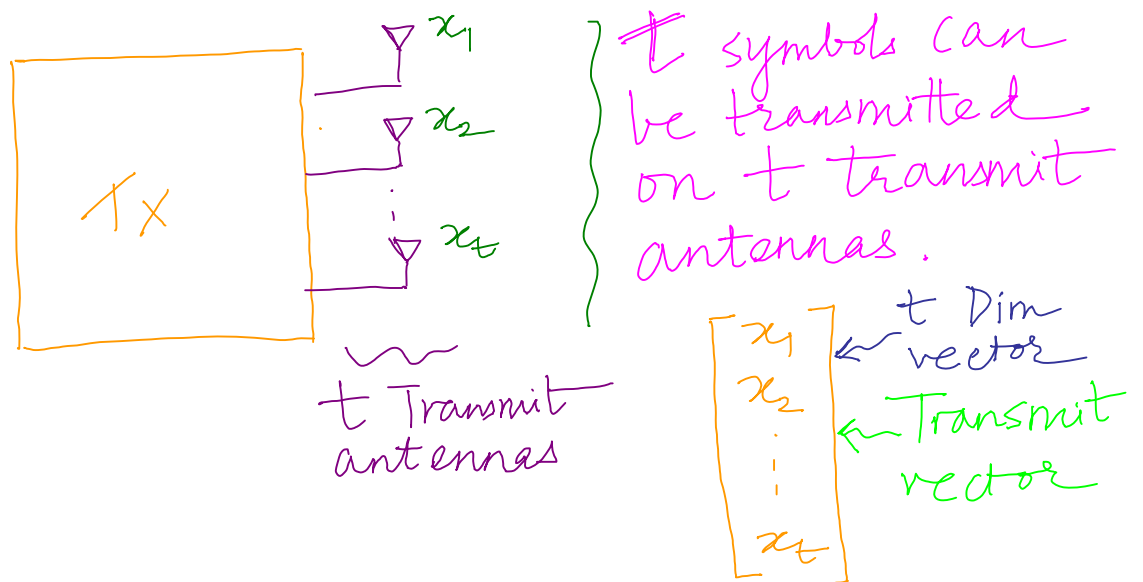
Possible by Transmitting several information streams in parallel.

Spatial Multiplexing:

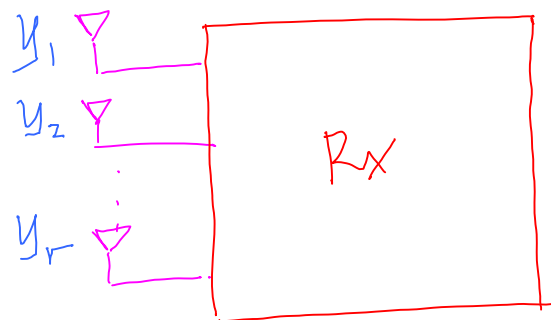


Transmit Multiple
Information Streams
in parallel.

Model for MIMO :

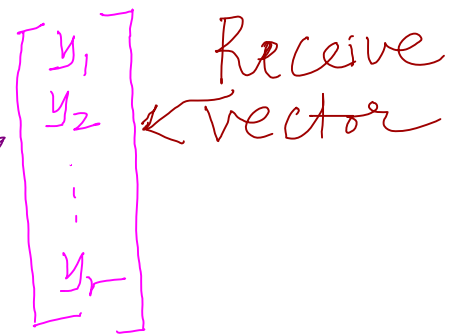


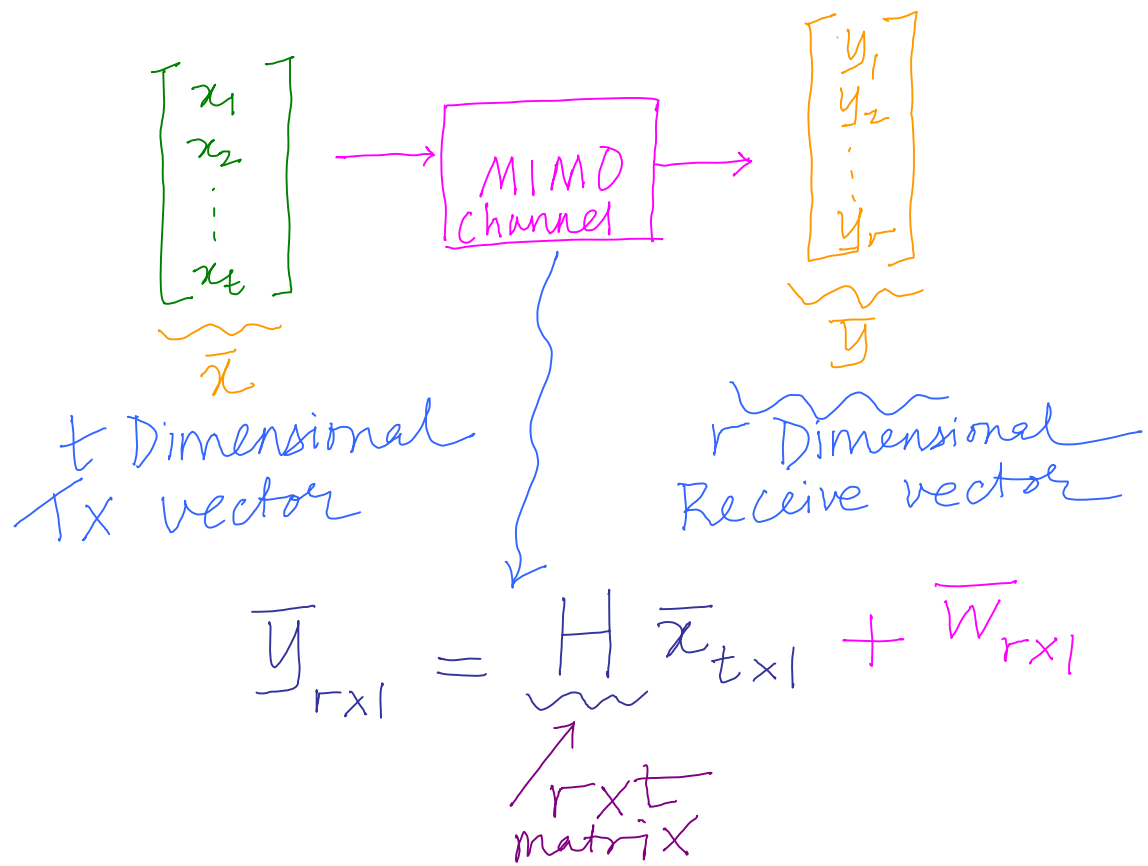
r received
samples
across r
receive antennas



r receive
antennas

r Dimensional
vector





$$\bar{y} = H \bar{x} + \bar{w}$$

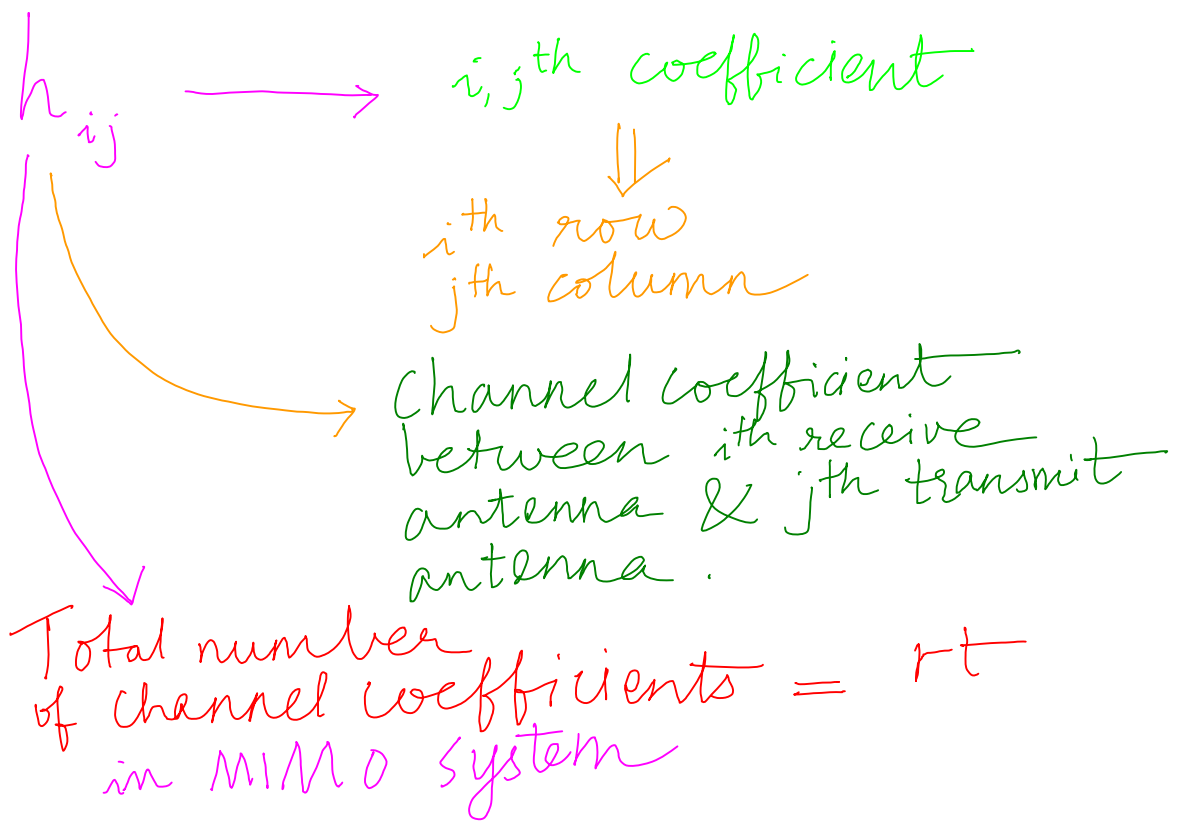
$r \times t$ matrix

$r \times t$ matrix

$$H = \begin{bmatrix} h_{11} & h_{12} & \dots & h_{1t} \\ h_{21} & h_{22} & \dots & h_{2t} \\ \vdots & \vdots & \ddots & \vdots \\ h_{r1} & h_{r2} & \dots & h_{rt} \end{bmatrix}$$

r rows

t columns



h_{32} ← coefficient between
3rd receive antenna &
2nd Transmit antenna

h_{23} ← channel coefficient
between 2nd. receive
antenna & 3rd Transmit
antenna.