Space-Time Wireless Communications HW#4

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◦ MIMO Sampled Signal Model

• At time k.

$$\underline{y}[k] = \begin{bmatrix} y_1[k] \\ \vdots \\ y_{M_R}[k] \end{bmatrix} = \sqrt{\frac{E_s}{M_T}} \begin{bmatrix} \underline{h}_{1,1} & \cdots & \underline{h}_{1,M_T} \\ \vdots & & \vdots \\ \underline{h}_{M_R,1} & \cdots & \underline{h}_{M_R,M_T} \end{bmatrix} \begin{bmatrix} \underline{s}_1[k] \\ \vdots \\ \underline{s}_{M_T}[k] \end{bmatrix} + \begin{bmatrix} n_1[k] \\ \vdots \\ n_{M_R}[k] \end{bmatrix}$$

where, $\underline{h}_{i,j} = [\, h_{i,j}[L-1], \cdots, h_{i,j}[0] \,]$, $\underline{s}_j[k] = \begin{bmatrix} s_j[k-L+1] \\ \vdots \\ s_j[k] \end{bmatrix}$

• For T continuous received vector samples

$$[\, \underline{y}[k] \cdots \underline{y}[k+T-1] \,] = \sqrt{\frac{E_s}{M_T}} \begin{bmatrix} \underline{h}_{1,1} & \cdots & \underline{h}_{1,M_T} \\ \vdots & & \vdots \\ \underline{h}_{M_R,1} & \cdots & \underline{h}_{M_R,M_T} \end{bmatrix} \begin{bmatrix} \underline{s}_1[k] & \underline{s}_1[k+1] & \cdots & \underline{s}_1[k+T-1] \\ \vdots & \vdots & & \vdots \\ \underline{s}_{M_T}[k] & \underline{s}_{M_T}[k+1] & \cdots & \underline{s}_{M_T}[k+T-1] \end{bmatrix}$$

$$+ \begin{bmatrix} n_1[k] & \cdots & n_1[k+T-1] \\ \vdots & & \vdots \\ n_{M_R}[k] & \cdots & n_{M_R}[k+T-1] \end{bmatrix}$$

$$\triangleq \sqrt{\frac{E_s}{M_T}} \begin{bmatrix} \underline{h}_{1,1} & \cdots & \underline{h}_{1,M_T} \\ \vdots & & \vdots \\ \underline{h}_{M_R,1} & \cdots & \underline{h}_{M_R,M_T} \end{bmatrix} \begin{bmatrix} \underline{s}_1 \\ \vdots \\ \underline{s}_{M_T} \end{bmatrix} + \underline{N}$$