

## Lect 2. Example 2.1

Q: find  $p$  state model  $\rightarrow$  CCF

$$A = \begin{bmatrix} -0.5 & 0 \\ 0 & -0.8 \end{bmatrix} \quad B = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \quad C = [1 \quad -2]$$

Solution

$$|zI - A| = \begin{vmatrix} z+0.5 & 0 \\ 0 & z+0.8 \end{vmatrix} = z^2 + 1.3z + 0.4$$

$$A_c = \begin{bmatrix} 0 & 1 \\ -0.4 & -1.3 \end{bmatrix} \quad B_c = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$\tilde{W}_c = [B_c \quad A_c B_c] \quad A_c B_c = \begin{bmatrix} 1 \\ -1.3 \end{bmatrix}$$
$$= \begin{bmatrix} 0 & 1 \\ 1 & -1.3 \end{bmatrix}$$

$$W_c = [B \quad AB]$$
$$= \begin{bmatrix} 1 & -0.5 \\ 1 & -0.8 \end{bmatrix}$$

$$P = W_c \tilde{W}_c^{-1} = \begin{bmatrix} 1 & -0.5 \\ 1 & -0.8 \end{bmatrix} \frac{1}{-1} \begin{bmatrix} -1.3 & -1 \\ -1 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 1 & -0.5 \\ 1 & -0.8 \end{bmatrix} \begin{bmatrix} 1.3 & 1 \\ 1 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 0.8 & 1 \\ 0.5 & 1 \end{bmatrix} \checkmark$$

$$C_c = CP = \begin{bmatrix} 1 & -2 \end{bmatrix} \begin{bmatrix} 0.8 & 1 \\ 0.5 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} -0.2 & -1 \end{bmatrix} \checkmark$$

$$d_c = 0 \checkmark$$