

ELL333

MULTIVARIABLE CONTROL

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$$\dot{x} = Ax + Bu$$

$$y = Cx + Du$$

Is it controllable?

Yes, if $\text{rank}\{[B \ AB \ \dots \ A^{n-1}B]\} = n$

Many equivalent conditions are there.

How is this rank condition related to the following condition?

$$\text{rank}\{[\lambda I - A \ B]\} = n \quad \forall \lambda \in \mathbb{C}^{\text{complex number}}$$

If A, B real then always true?

Suppose $A = \begin{bmatrix} 0 & \omega \\ \omega & 0 \end{bmatrix}$ or $\begin{bmatrix} 0 & -\omega \\ \omega & 0 \end{bmatrix}$

Is $\text{rank}[\lambda I - A] = 2 \quad \forall \lambda \in \mathbb{C}$