AE353 (Spring ZOZI)

Day 17. "Ackermann!s Method"

T. Bretl.

Controllable Canonical Form (CCF)
$$A = \begin{bmatrix} I - a_1 & \cdots & -a_n \end{bmatrix} \quad B = \begin{bmatrix} I & I \\ I & I \end{bmatrix}$$

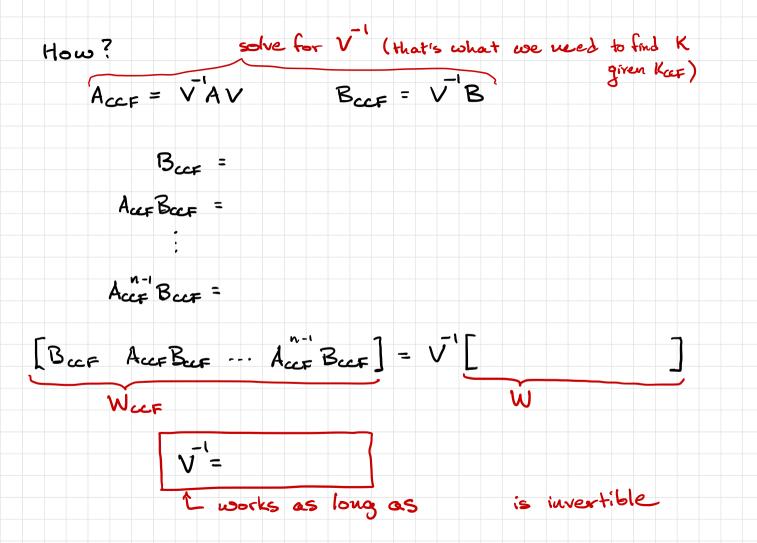
$$I = \begin{bmatrix} I & I & I \\ I & I & I \end{bmatrix}$$
Facts
$$det(sI - A) = s^n + a_1 s^{n-1} + \cdots + a_{n-1} s + a_n$$

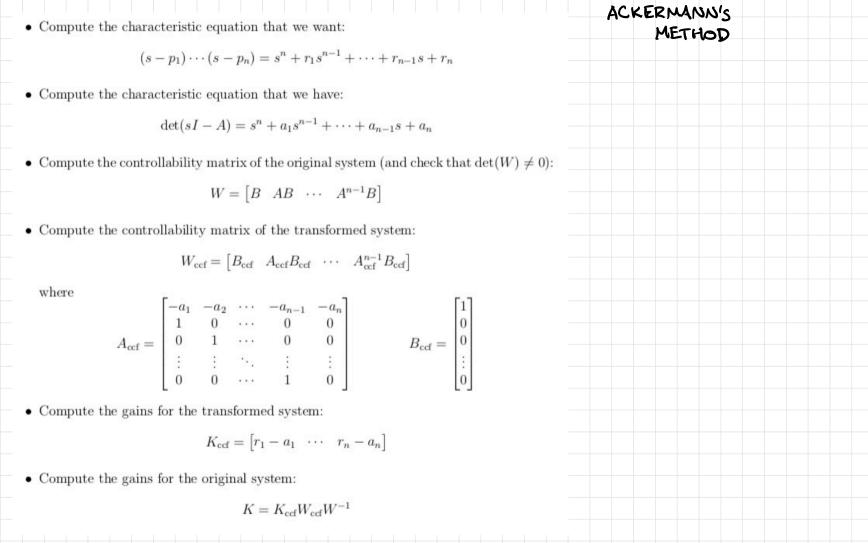
$$A - BK = \begin{bmatrix} I - a_1 - k_1 & \cdots & -a_n - k_n \end{bmatrix}$$

$$I = \begin{bmatrix} I & I & I & I \\ I & I & I & I \end{bmatrix}$$

$$det(sI - (A - BK)) = s^n + (a_1 + k_1) s^{n-1} + \cdots + (a_{n-1} + k_{n-1}) s + (a_n + k_n)$$

$$Consequenca$$
if you want
$$k_1 = r_1 - a_1 + \cdots + r_{n-1} s + r_n$$
then
$$k_1 = r_1 - a_1 + \cdots + r_{n-1} s + r_n$$





states (.e. 1) The system i = Ax+ Bu is controllable if W = [B AB ··· has full rank. in MATLAB, this means "rank (W)" is the same as "N" if there is only one input, W is square, and so "full rank" and "invertible" mean the same thing - so, for a system with only one input, you can simply check if det(w) 70

$$V = V \qquad A = [O] \qquad B = [I]$$

$$PINTORN \qquad G_0 = -V \qquad A = [O] \qquad B = [O]$$