Control Notes

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1 Full-State Feedback

2 Laplace Transfer and Z Transfer

$$
\begin{aligned}
z &= e^{sT} \\
s &= \ln(z)/T
\end{aligned}
$$

3 Estimator and Controller

$$
\begin{aligned}
\hat{x}_{k+1}^+ &= F\hat{x}_k^+ + Gu_k + L(y_k - H\hat{x}_k^+) \\
u_k &= -K\hat{x}_k^+
\end{aligned}
$$

Controller (state-error) dynamics: $F - GK$

Estimator (estimator-error) dynamics: $F - LH$

The estimator-error dynamics should be faster than the controller-error dynamics.

Observability Matrix (discrete)

$$
\mathcal{O} = \begin{pmatrix} H \\ HF \\ HF^2 \\ ... \\ HF^{n-1} \end{pmatrix}
$$

Controllability Matrix (discrete): convergence and stability of error

$$
\mathcal{C} = \begin{pmatrix} G \\ FG \\ F^2G \\ ... \\ F^{n-1}G \end{pmatrix}
$$

4 Questions

1. Pf: 20-0.5; Euler integration;

2. B tilde for discretion