Models

AE353 Spring ZOZ5 Bretl

https://go.aerospace.illinois.edu/ae353-sp25

COURSE WEBSITE

PLEASE COMPLETE HCD SURVEY NOW IF YOU HAVE NOT ALREADY



MODEL OF DYNAMICS

STEP 0 - get EOMs Jij = 7 This is the model we are given. We want to rewrite $\dot{x} = Ax + Bu$ given. We want to rewrite $\dot{x} = Ax + Bu$ in "state-space this model in "state-space in to books this. STEP 1 - rewrite EDMs as a set of first-order ODEs 9 √ = 9 < find time derivative of highest order

E define new variables for each time derivative of lower order

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°g = ∨

g=V v=(1/J)~

 $\begin{bmatrix} 8 \\ i \end{bmatrix} = \begin{bmatrix} V \\ (1/5) \end{bmatrix}$

< rourite EOMs in terms of new variables

< add an ODE for each new variable

collect ODEs together, solving for time derivatives if necessary

 \leftarrow write in standard form $m = f(m, n) \leftarrow m = \begin{bmatrix} 8 \\ V \end{bmatrix} = \begin{bmatrix} 1 \\ V \end{bmatrix}$



- STEP Z find an equilibrium point
 - O = Ve (1/J)re (1/J)re
 - Ve=0 Te=0 « solve
 - ge = Z ve = O Te = O ~ pick a solution
 - Me = [T1/2] Ne = [0] & write in standard form
- STEP 3 define state and input $x = m - me = \begin{bmatrix} 8 \\ V \end{bmatrix} - \begin{bmatrix} 8e \\ V \end{bmatrix} = \begin{bmatrix} 8 - \pi/2 \\ V \end{bmatrix}$ (x = m - me) (x = m - me)

STEP 4 - compute A and B

We defined the state × and the input a like this:

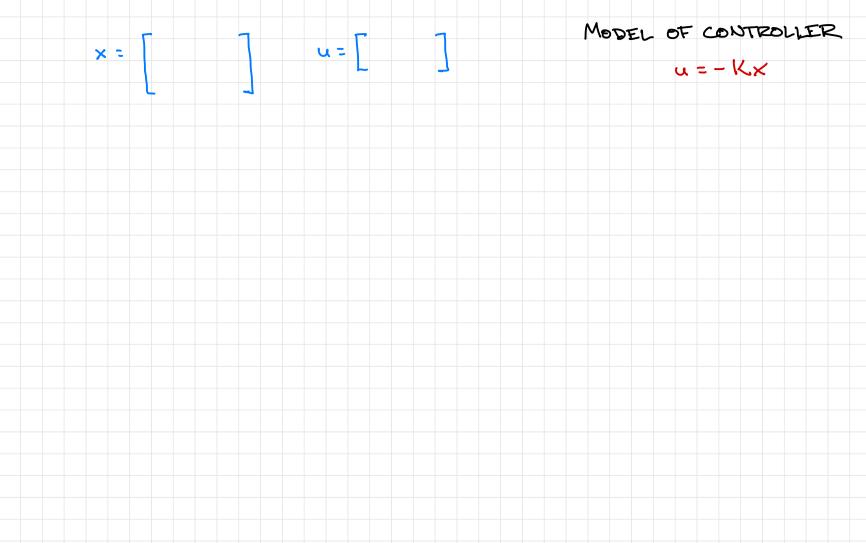


What matrices A and B would make

× = Ax + Bu

and $\begin{bmatrix} q_0 \end{bmatrix} = \begin{bmatrix} v \\ v \end{bmatrix}$

describe the same set of ODEs?



FOR NEXT TIME

- Setup
- Group preferences form (by llam Monday)
- Prairie Learn HWI (by 11am Wednesday)