

07 -- Wed Nov 17

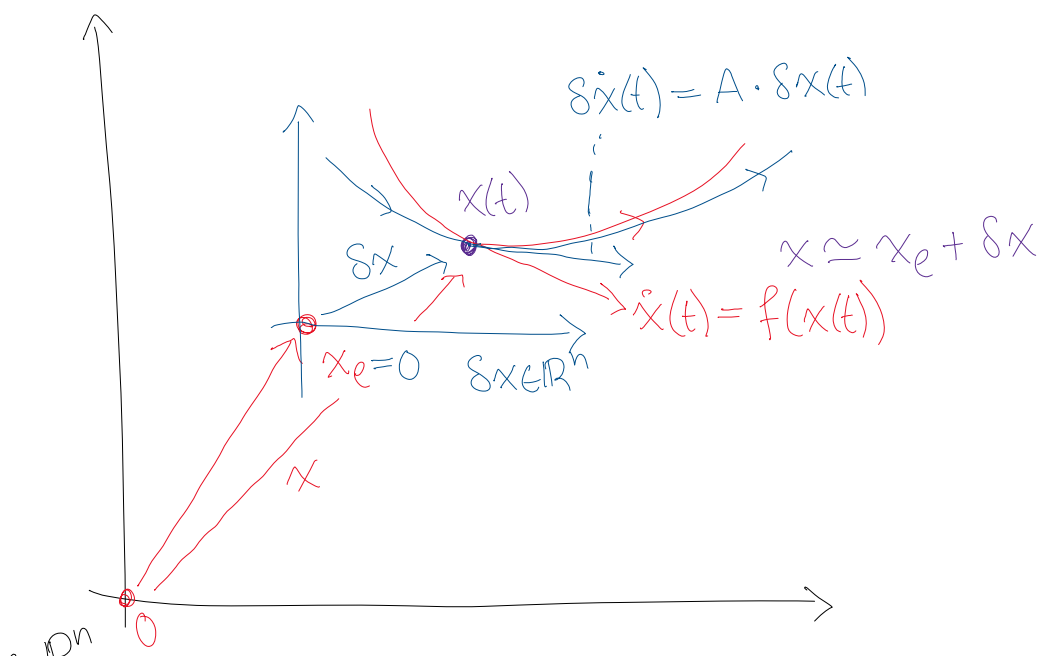
ECE 447: Control Systems (Fall 2021)

Prof: Sam Burden TA: Sat Singh

today: ☐ logistics: HW 6 due Fri Nov 19  
~~exam 1 results & regrades~~  
~~mid-quarter feedback~~  
HW 8 due Fri Dec 3

☐ break

☐ office hour



$x \in \mathbb{R}^n$

- suppose given  $\begin{cases} \dot{x} = f(x, u) \\ \text{NL} \quad y = h(x, u) \end{cases}$  with operating point / equilibrium  $(x_0, u_0)$  s.t.  $f(x_0, u_0) = 0$   
(let  $y_0 = h(x_0, u_0)$ )
- linearize to obtain  $\begin{cases} \delta \dot{x} = A \delta x + B \delta u \\ \delta y = C \delta x + D \delta u \end{cases}$  where:  $x \simeq x_0 + \delta x$   
 $u \simeq u_0 + \delta u$   
 $y \simeq y_0 + \delta y$
- synthesize full-state observer + controller  $\begin{cases} \delta \dot{\hat{x}} = A \delta \hat{x} + B \delta u - L(\delta \hat{y} - \delta y) \\ \delta \hat{y} = C \delta \hat{x} + D \delta u, \delta u = -K \delta \hat{x} \end{cases}$

so that  $\rightarrow$

is stable,  $\checkmark$

i.e.  $\delta x, \delta \hat{x} \rightarrow 0$

