

Observability for CT Systems

- The previous derivation for observability was for DT LTI systems
- What if we have a CT LTI system? Do we obtain the same observability testing conditions?
- Yes, we do!
- First, note that the control input $u(t)$ plays no role in observability, just like how the output $y(t)$ plays no role in controllability
- To see that, consider the following system with n states, p outputs, where (again) we want to obtain $x(t_0)$ (unknown):

$$\dot{x}(t) = Ax(t), \quad y(t) = Cx(t) \quad x(t_0) = x_0 \implies$$

$$y(t_0) = Cx(t_0)$$

$$\dot{y}(t_0) = C\dot{x}(t_0) = CAx(t_0)$$

$$\ddot{y}(t_0) = C\ddot{x}(t_0) = CA^2x(t_0)$$

$$\vdots$$

$$y^{(n-1)}(t_0) = Cx^{(n-1)}(t_0) = CA^{n-1}x(t_0)$$