02 -- Thu Oct 13

ECE 447: Control Systems (Fall 2020)

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*if/when possible: keep video on; unmute to ask Questions

* update your preferred name at identity.uw.edu

today:
- ☑ HW1 assigned – due Fri Oct 16
  - * Euler's formula
- ☑ week 2 lectures posted (~1 hr 20 min)
- ☐ office hour
- → Colaboratory notebook

Euler's formula

$$u_1(t) = \cos \cancel{x}\,t = \mathrm{Re}(e^{i\cancel{x}\,t}) = \frac{e^{i\cancel{x}\,t} + e^{-i\cancel{x}\,t}}{2},$$

$$u_2(t) = \sin \cancel{x}\,t = \mathrm{Im}(e^{i\cancel{x}\,t}) = \frac{e^{i\cancel{x}\,t} - e^{-i\cancel{x}\,t}}{2i}.$$

$\overset{G}{\rightsquigarrow}$

$$y_1(t) = \frac{1}{2}\left(G(i)e^{it} + G(-i)e^{-it}\right)$$

$$= \mathrm{Re}\left(G(i)e^{it}\right)$$

$$= (G(1j) * np.exp(1j*t)).real$$

$$y_2(t) = \frac{1}{2i}\left(G(i)e^{it} - G(-i)e^{-it}\right)$$

∘ if 1 input $u(t) = e^{st}$, $s \in \mathbb{C}$

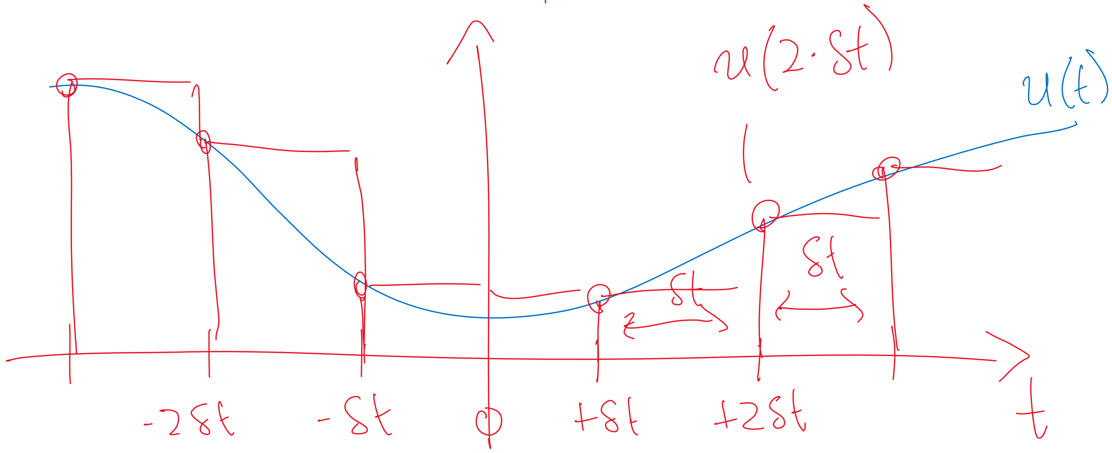
$$u : (-\infty, \infty) \to \mathbb{C}$$

the output $y(t) = G(s)e^{st}$

$$y : (-\infty, \infty) \to \mathbb{C}$$

$u \xrightarrow{\mathcal{F}} \hat{u}$ $\quad\quad \hat{u}(s) = \int_{-\infty}^{\infty} u(t)\, e^{\pm st}\, dt$

$$\simeq \sum_{k=-\infty}^{+\infty} u(k \cdot \delta t) \cdot e^{\pm s \cdot \delta t} \cdot \delta t$$



$$G_{yr} = \frac{PC}{1+PC} \xmapsto{1.1 \times P} \frac{1.1\, PC}{1+1.1PC} = \tilde{G}_{yr}$$

* P, C could be $\in \mathbb{C}$ or even negative, in which case it's not clear how $|G_{yr}|$ changes

* in the case $P, C > 0$ then:

$$PC \to \infty \implies \tilde{G}_{yr} \to G_{yr}$$

$$PC \to \infty \implies \tilde{G}_{gyr} \to G_{gyr}$$

$$PC \to 0 \implies \tilde{G}_{gyr} \to 0 \quad (G_{gyr} \to 0 \ldots)$$