Bonus Points 1

Monday, October 2, 2023 3:58 PM

$$C(s) = \frac{5}{(s+5)(s+6)} \cdot \frac{1}{s}$$

Roots $= -5, -6$

$$5 = \frac{k_1}{s} + \frac{k_2}{s+5} + \frac{k_3}{s+6}$$

$$5 = k_1(s+5)(s+6) + k_2 s(s+6) + k_3 s(s+5)$$

$s \equiv 0$

$$5 = k_1 5 \cdot 6 + 0 + 0$$

$$\frac{1}{6} = k_1$$

$s \equiv -5$

$$5 = 0 + k_2(-5)(1) + 0$$

$$-1 = k_2$$

$s \equiv -6$

$$5 = 0 + 0 + k_3(-6)(-1)$$

$$\frac{5}{6} = k_3$$

$$\frac{1}{6s} - \frac{1}{s+5} + \frac{5}{6(s+6)}$$

$$c(t) = \frac{1}{6} - e^{-5t} + \frac{5}{6} e^{-5t}$$

Video 1

4 1 Formulation University of Pennsylvania Coursera

From <https://www.youtube.com/watch?v=t1Q9_PlN4GU&ab_channel=Rshoots>

There are two coordinate systems. This tracks with robotics. Ohhhhhhhh. I like this! It's talking about using Euler Angles and the Rotaional system to describe what's happening. Also how it's happening in relation to itself and transforming that into it's orientation to the ground.

Video 2

4 4 Quadrotor Equations of Motion University of Pennsylvania Coursera

From <https://www.youtube.com/watch?v=lAVYDUeqdW4&ab_channel=Rshoots>

While the initial math looks similar to the state space equations, I don't think they are. Ohh! Newton-Euler equations that we'll use later to develop controllers. One set is for body frame of reference and the other set is for the ground fixed frame. Then we get roll pitch and yaw angles. I'm hooked. Keep going.

Planar motion first? Weak! (But really useful without the crazy complications that 1 added dimension brings.

Good. Lord. The State Vector gets 6 dimensions (x, y, z, roll, pitch, yaw angles) but then the next vector is the previous vector + it's derivative vectors to give us 12 dimensions to describe it's motion. This does make me wonder though, why not take it to the next logical step, 6 dimensions for position, 6 dimensions for speed, and 6 dimensions for acceleration? Wouldn't including acceleration allow for a smoother flight?

Video 3

Somebody finally made PID tuning make sense | Chris Rosser PID tune method | Part 1

From <https://www.youtube.com/watch?v=s0dNRe0XWJ8&ab_channel=JoshuaBardwell>

First. Make sure the drone is mechanically sound. Don't attempt to PID tune away mechanical problems. There's even a checklist (which I won't get into.) Before tuning get the drone into flight ready status. If ou fly with a gopro, have to gopro on it. If you fly with a big battery pack, have the big battery pack. The finer the tune the less room there is for deviations from the norm. There's a process to use a flight recorder and what kinds of maneuvers need to happen in order to have the proper data to work with.
If there are any vibrational issues, anything at all, go back to step 1, there's a mechanical issue that needs to be solved.
When looking at the blackbox data you're looking for resonance, well, looking for it because it's undesirable. But then there's all kinds of filtering that can be done! Find the D first. Interesting.

Make changes. More testing! (I'm noticing a trend here.)

Video 4

Basics of Drone Flight - Aerobatics

From <https://www.youtube.com/watch?v=YQ8ZhHBraZg&ab_channel=BladeHelis>

Because, umm, fun!

Flips and rolls. Add throttle flip, drop throttle. Keeps motion more linear. Loops, add throttle pull back on the stick let off on the throttle. Fuuuun!