Today
- What we hope you will learn
- What you should already know
- What is feedback control
- Thermal Example

Learn:

Given a robot, car, oven, drone, etc
- Decide on actuators & sensors
- Extract a useful model
- Use the model to design a controller
- Implement and assess performance

Need insight to redesign. If not, gate

Videos: Flipping, Floating, Flying

Already Know
- Linear Alg (18.06, 18.C06)
- Some physics (8.01 at least 8.01 + 8.02)

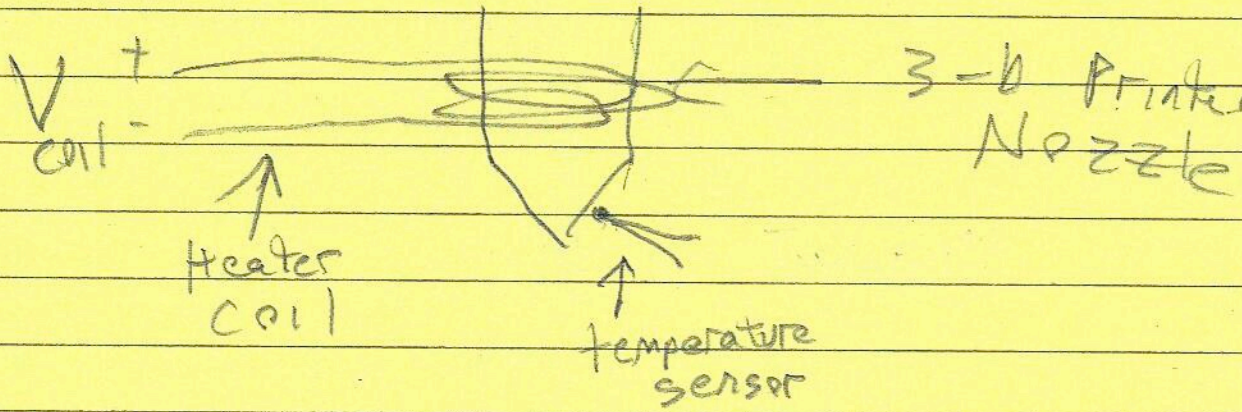
Logistics:

url: introcontrol.mit.edu ← Accts by 9/4 AM

grading: (10 finite retries)
- No exams, prelabs, labs, and postlabs
- Prelabs & Postlabs due Fridays!

(See website calender)

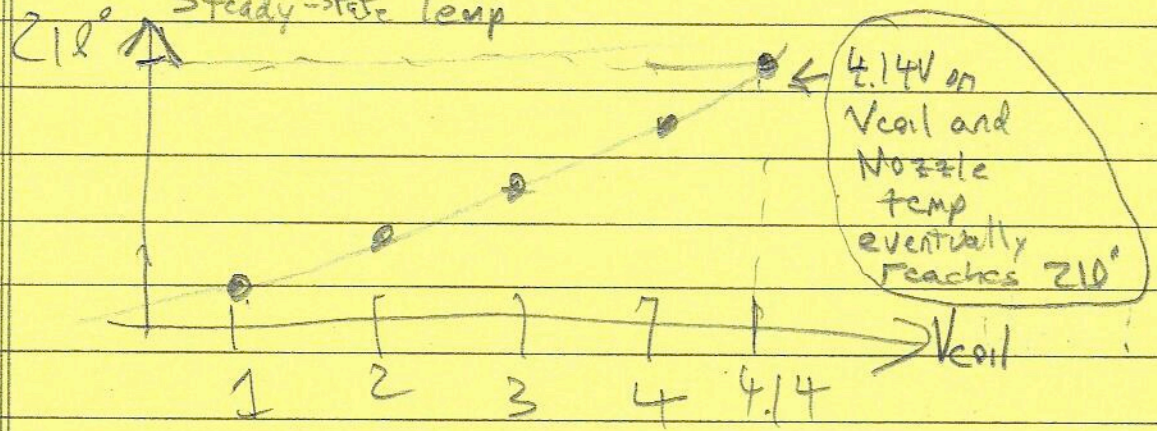
Thermal Example



Want Nozzle to be 210° (Temp. for PLA)

Approach 1

1) Tabulate (by experiment) V_{coil} v.s. Steady-State Temp

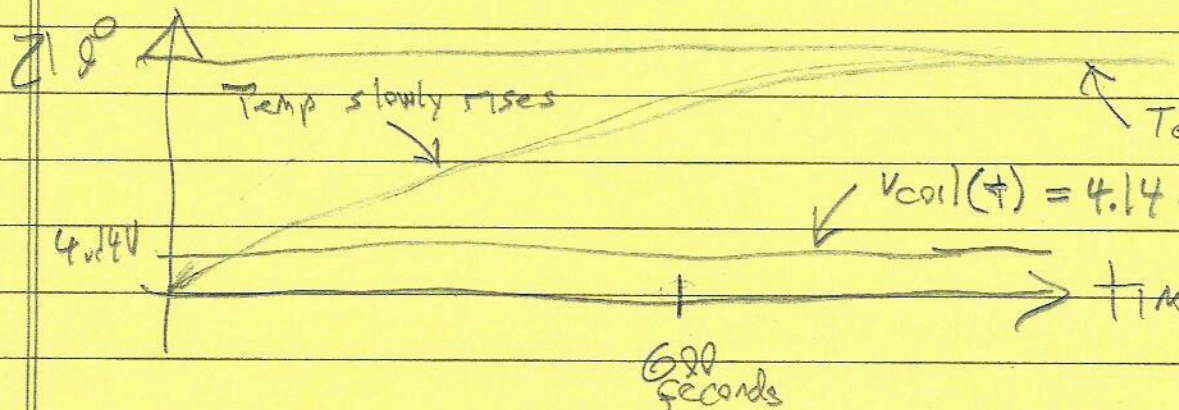


Problems?

1) Slow

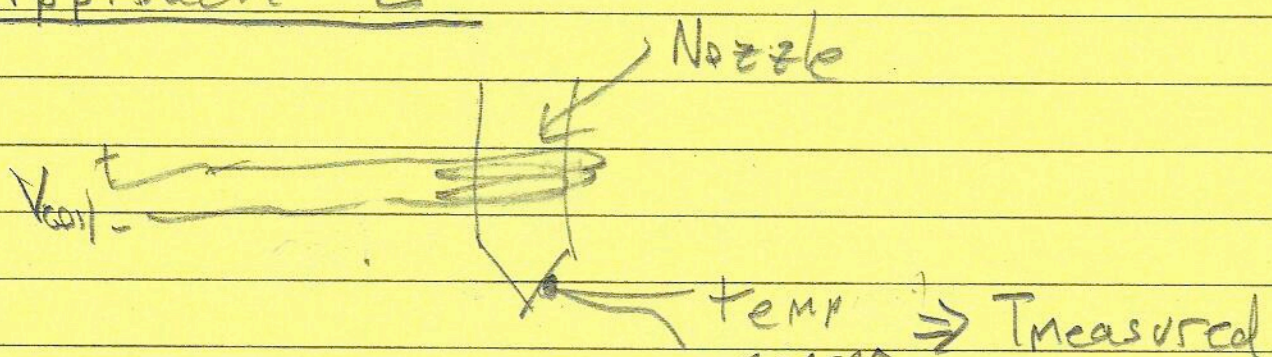
2) What if a window occurs

2) Set $V_{coil} = 4.14$ Volts



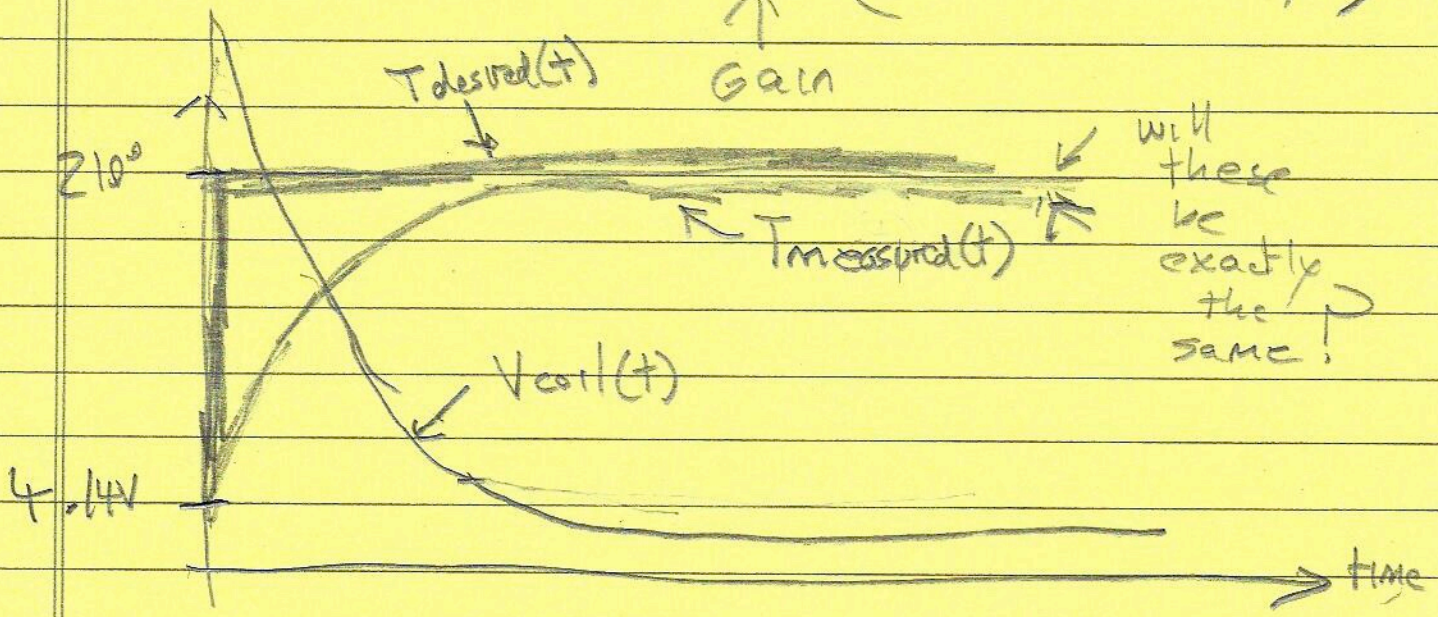
Thermal Example Cont

Approach 2



Set $V_{coil}(t) = K\left(T_{desired}(t) - T_{measured}(t)\right)$

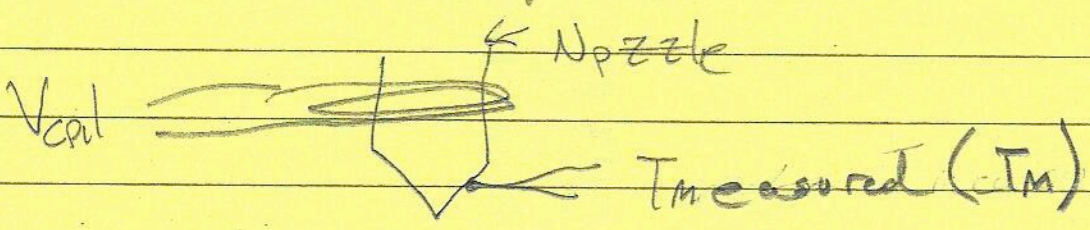
(time)



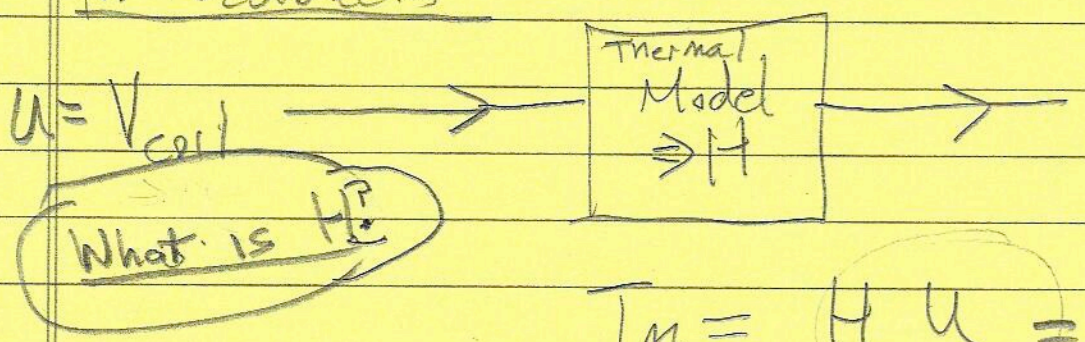
1) Faster Response ← Better Tracking (Sort of)

2) Less sensitive to opening a window. ← Better Disturbance Rejection

Block Diagram



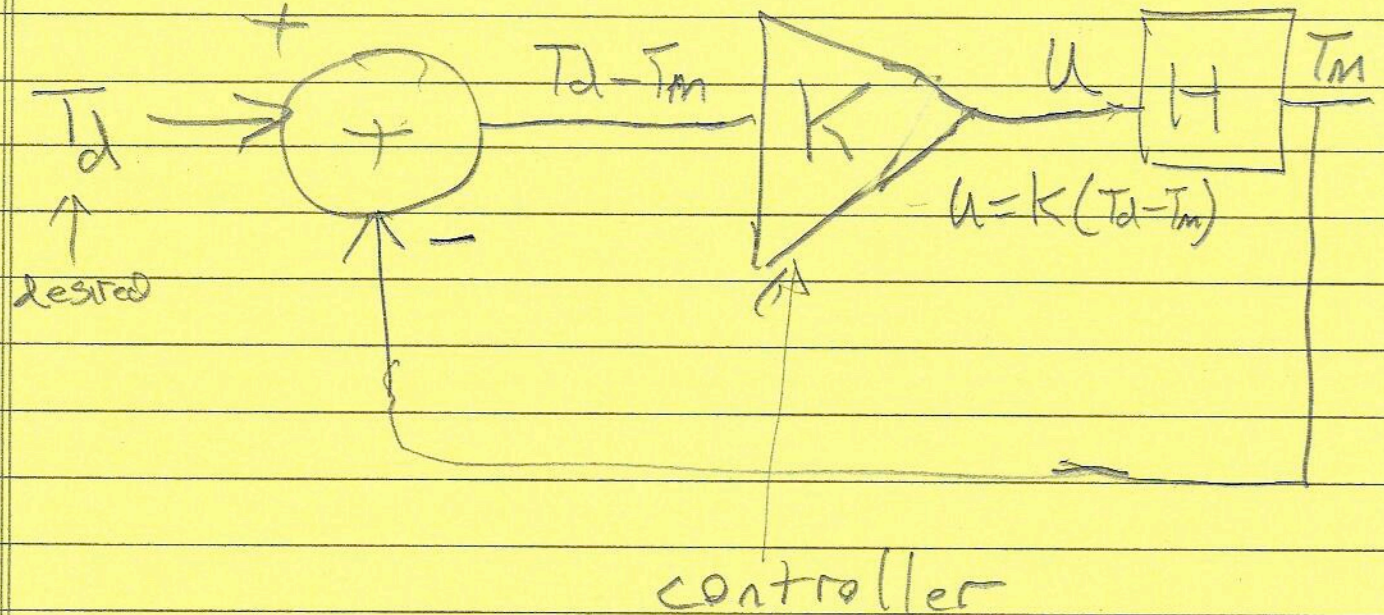
No Feedback



$$T_M = H\,u = H\,V_{coil}$$

operator

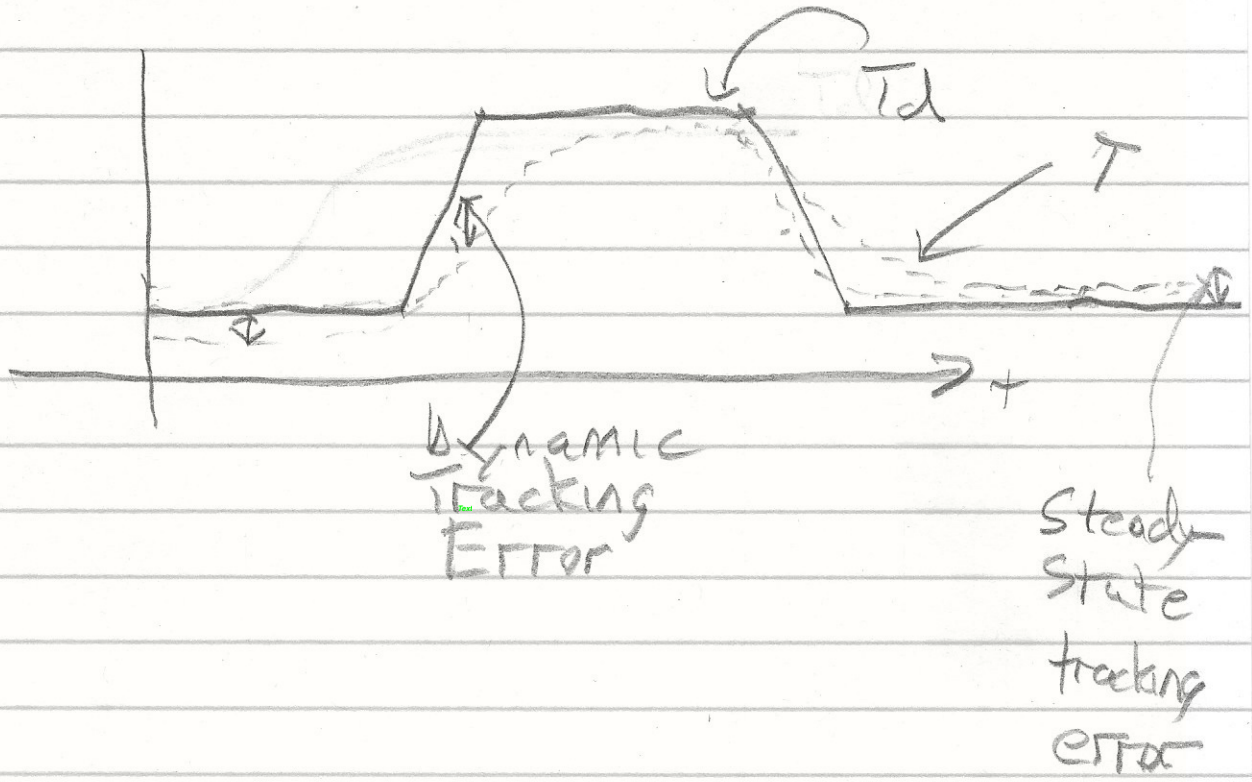
With Feedback



How will you design K?

Optimize What?

- Tracking Accuracy



- Uncertainty Insensitivity or Disturbance Rejection