EECS192 Lecture 9  
Mar. 19, 2019

Notes:
1. Check off-
   1. 3/22 open loop figure 8 drop and run
   2. 4/5 closed loop figure 8 drop and run
2. 3/22 Setup 3rd floor track
3. Progress Report due Tues 4/9 before class
4. HW 2 due Fri 4/5, 6 pm in bcourses
5. CalDay Sat. April 13 @ UCB

Topics
• Quiz 4
• Feedback control overview: P, PI control
• Bicycle steering model
• V-rep steering simulator
• Software notes for embedded control
Track Layout -
need volunteers Fri 3/22
Control overview

On board…
Proportional control:
\[ U = kp \cdot e = kp \cdot (r-y); \]

Proportional + integral control
\[ U = kp \cdot e + ki \cdot e_{\text{sum}}; \]
\[ e_{\text{sum}} = e_{\text{sum}} + e; \]
Bicycle Steering Model
Bicycle Steering Control

Proportional control:

\[ r = 0 \quad \text{(to be on straight track)} \]
\[ \delta = u = kp*e \]

Note steady state error:
car follows larger radius
V-rep simulation demo
V-rep simulation

- Laterr (m)
- Steering angle (deg)
- Velocity (m/s)
Software Notes

Read sensors ➔ process ➔ output ..... Idle ........ Read sensors ➔ process ➔ output

```
mpu/dmp interrupt
_balance_controller()
thread telem_loop()
thread printf_loop()
thread setpoint_manager()
```

Interrupt-
highest priority (?)
ticks++;

Interrupt-
highest priority (?)
ticks++;

Threads are asynchronous wrt interrupt!
`rc_pthread_set_process_niceness()` ?
Debian Processes/Delay

htop
# systemctl disable avahi-daemon
# systemctl stop avahi-daemon

connmanctl> services
connmanctl> disable wifi

sudo kill -9 {avahi-daemon, rc_battery_monitor, apache2}. 