EECS192 Lecture 9
Mar. 14, 2017

Notes:
1. Check off-
   1. 3/17 Closed loop figure 8 drop and run
   2. Setup courtyard track
2. Progress Report due Tues 4/5 in class
3. HW 2 due Fri April 1, 6 pm in bcourses
4. CalDay Sat. April 22 @ UCB

Topics
• Feedback control overview: P, PI control
• Bicycle steering model
• V-rep steering simulator
• Software notes for embedded control
• Quiz 4
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
Software Notes

Read sensors $\rightarrow$ process $\rightarrow$ output ..... Idle ....... Read sensors $\rightarrow$ process $\rightarrow$ output

interrupt

User IO

Blocking IO

Printf

interrupt

Idle

Idle

Highest priority

Highest priority
Hall sensor
angle skewed 60 degrees
REV: weak rotation

<table>
<thead>
<tr>
<th>Hall Sensor</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>A=HAC</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>B=HA</td>
<td>C</td>
<td>A</td>
</tr>
<tr>
<td>C=HAB</td>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>D=HB</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>E=HBC</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>F=HC</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>
Hall sensor
angle skewed 60 degrees
FWD = STUCK!