EECS192 Lecture 4
Feb. 9, 2016

Notes:
Check off-
• 2/12: Motor drive/stall, steering servo
• Quiz 2: power MOSFET/motor drive Tues 2/16

Topics
• Project proposal feedback
• RC servo basics
• PWM and motor drive
• Power supplies
• Boost converter
Project proposal feedback

Motor Driver

Schematic
• Estop: what to switch?
• Motor drive from battery, not voltage regulator
• Snubbing capacitors
• Drive/brake/enable/dir

Circuit Layout
• Mounting holes
• Big wires, short distances
• QFN vs SOIC package
• Heat sinks
• Estop switch
• Signal connectors

Software
• Threads vs interrupts vs main() vs RtosTimer
PWM for Steering Servo

Gotchas:
- 4.8 or 6V, (Not 7.2V!)
- max current 2A
- May be sensitive to noise on supply line
- Performance depends on voltage
PWM

https://developer.mbed.org/handbook/PwmOut

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
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<tbody>
<tr>
<td>PwmOut (PinName pin)</td>
<td>Create a PwmOut connected to the specified pin.</td>
</tr>
<tr>
<td>void write (float value)</td>
<td>Set the output duty-cycle, specified as a percentage (float)</td>
</tr>
<tr>
<td>float read ()</td>
<td>Return the current output duty-cycle setting, measured as a percentage (float)</td>
</tr>
<tr>
<td>void period (float seconds)</td>
<td>Set the PWM period, specified in seconds (float), keeping the duty cycle the same.</td>
</tr>
<tr>
<td>void period_ms (int ms)</td>
<td>Set the PWM period, specified in milli-seconds (int), keeping the duty cycle the same.</td>
</tr>
<tr>
<td>void period_us (int us)</td>
<td>Set the PWM period, specified in micro-seconds (int), keeping the duty cycle the same.</td>
</tr>
<tr>
<td>void pulselength (float seconds)</td>
<td>Set the PWM pulselength, specified in seconds (float), keeping the period the same.</td>
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<tr>
<td>void pulselength_ms (int ms)</td>
<td>Set the PWM pulselength, specified in milli-seconds (int), keeping the period the same.</td>
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</tr>
</tbody>
</table>

PwmOut & operator= (float value)
A operator shorthand for write()

operator float ()
An operator shorthand for read()
PWM for Main Motor control

\[ <i_m> = \left( \frac{T}{T_o} \right) i_{\text{max}} \]

Is \( i_{\text{max}} \) constant?
Power supply wiring

On board: what does this look like electrically (as a schematic)?
``7.2V'' supply waveforms with motor PWM

- Battery model
- Waveforms on board
- Wiring to reduce voltage resistance effects of wiring

Linear Regulator $V_{IN} > V_{REG}$

Boost Converter $V_{IN} < V_{REG}$
Waveforms on board
(also see boost converter notes)