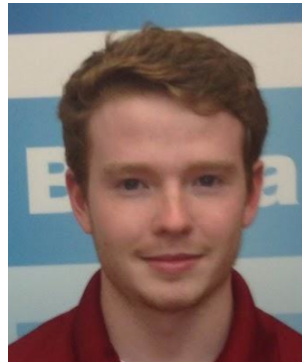


TrackStar:

Motion Tracking Stagelight Mount

Bradley Beady
Michael Bjorge
Ezra Dantowitz
Jason Gurney

Team 13



Bradley Beady, ME



Michael Bjorge, CSE



Ezra Dantowitz, EE



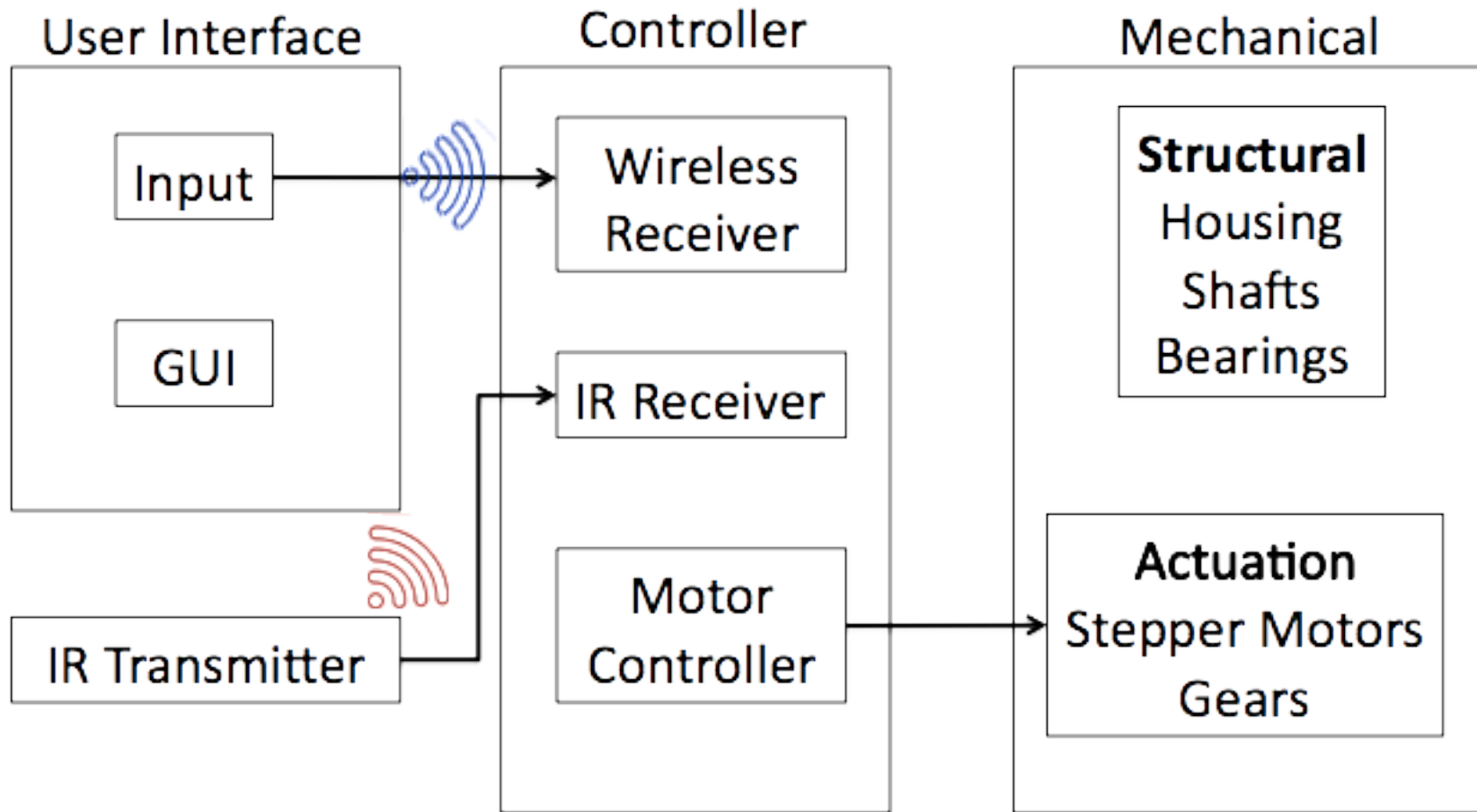
Jason Gurney, ME

Advisor: Tilman Wolf

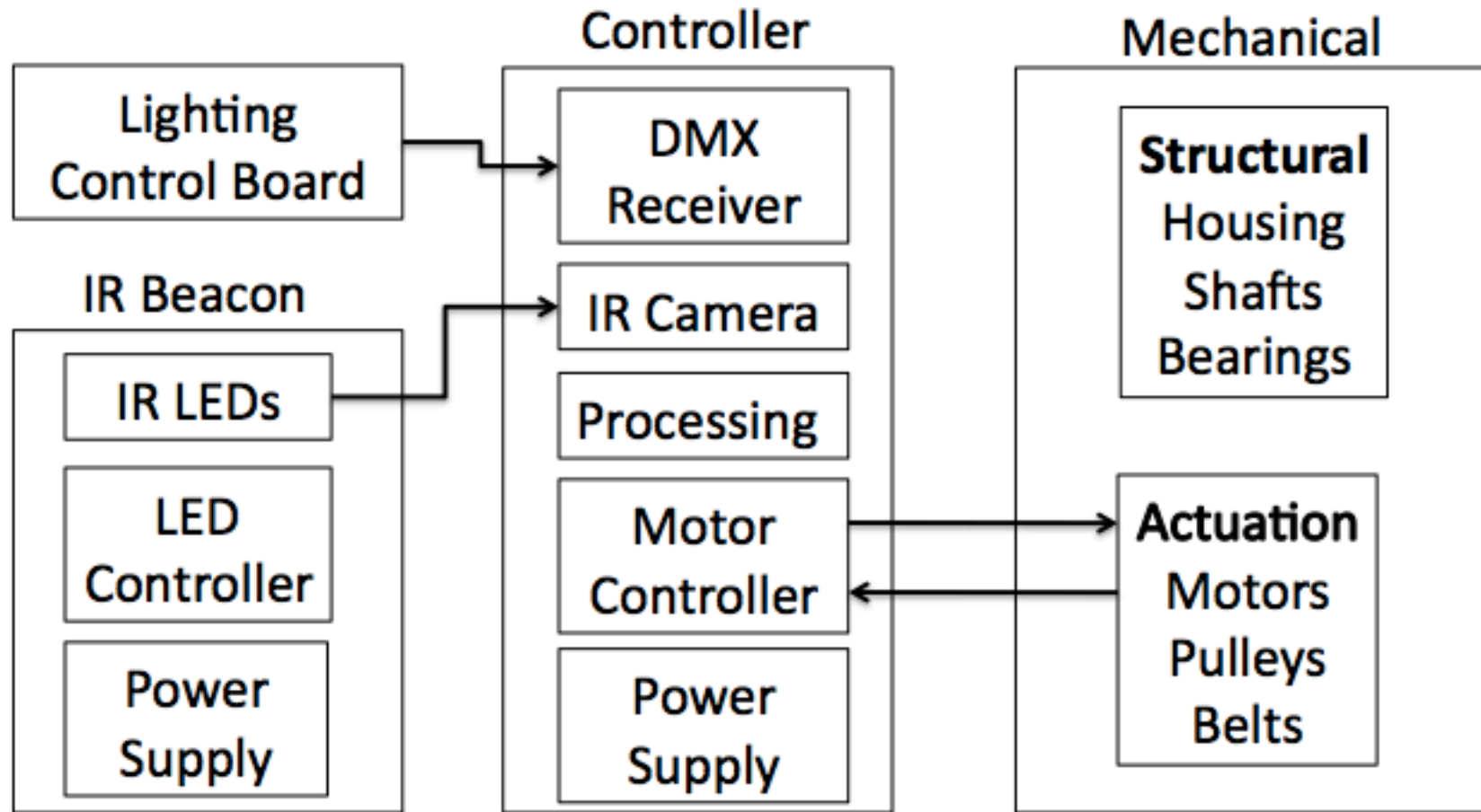
System Requirements

- Real-time motion tracking
- Full Range of Motion
 - 300° Pan (Yaw)
 - $\pm 45^\circ$ Tilt (Pitch)
- Compatible with common fixed lights
 - Ellipsoidals, Fresnels, Washes
- Configure individual lights through DMX
- Quiet

Previous Block Diagram

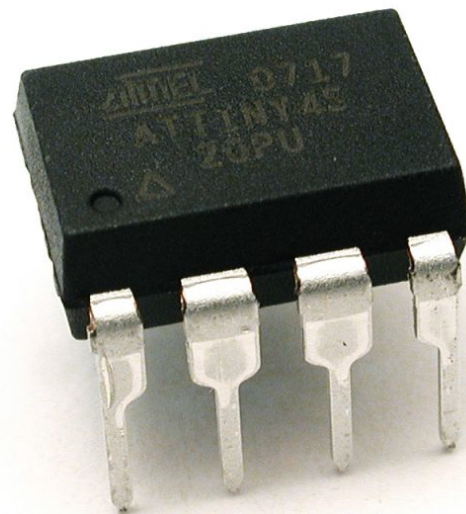


Updated Block Diagram



IR Beacon

- Blinks pattern on IR LEDs
- User selects one of 8 patterns
- Battery powered



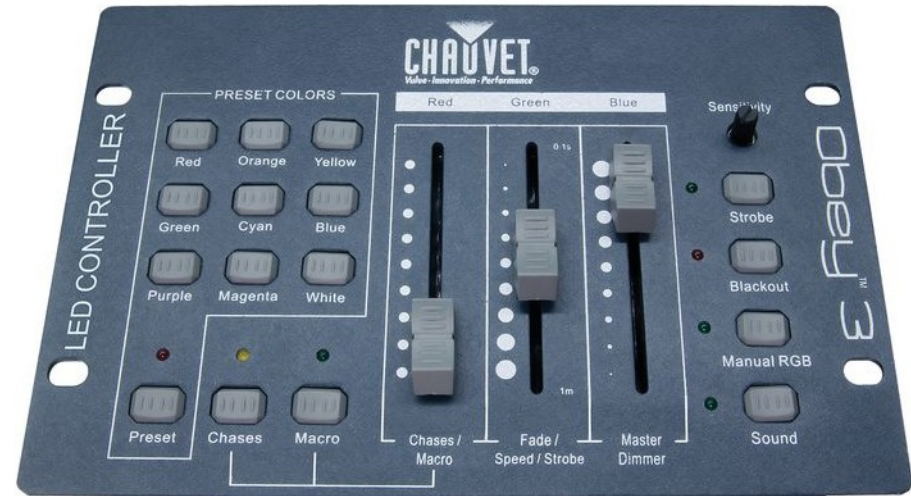
IR Tracking

- Camera with IR band pass filter
- Tracks an IR beacon
- Detects pattern of blinking beacon LEDs



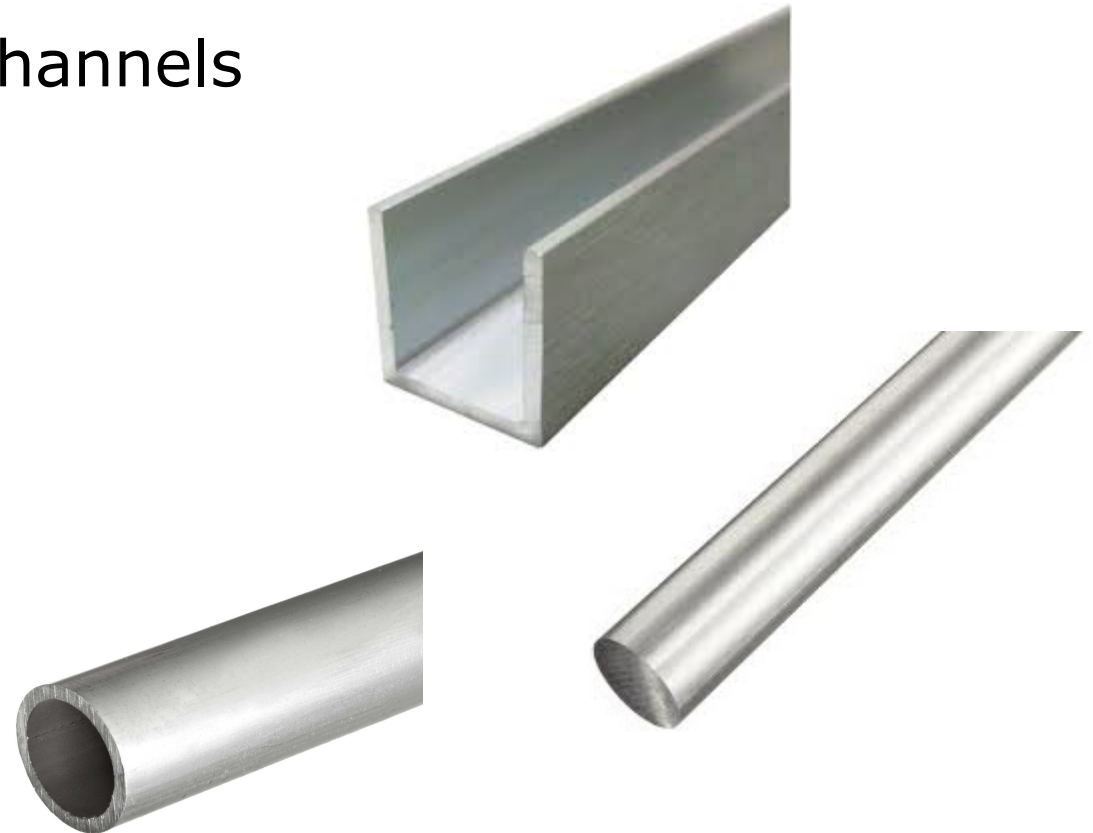
DMX

- Manual configure mode
 - Sets pan angle
 - Sets tilt angle
- IR Tracking mode
 - Selects pattern to track



Frame & Shafts

- Aluminum 6063 U-Channels
- Solid Pan Shafts
- Hollow Pan Shafts



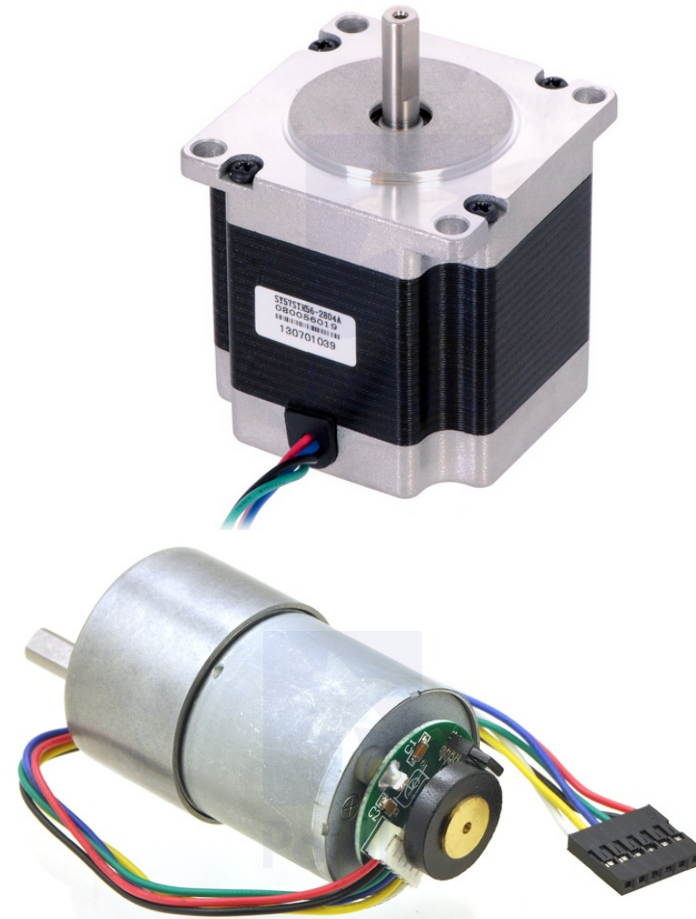
Bearings, Pulleys & Belts

- Roller Bearings for Tilt Shafts
- Thrust Bearings for Pan Shaft
- 2:1 Flanged pulleys with belt



Motor Selection

- Stepper Motor
 - 11.25 in.-lb. Holding Torque
 - 200 Steps/Revolution
 - Phase draws 2.8 A at 2.5V
- Brushed DC Motor
 - 6.875 in.-lb. Stall Torque
 - 30:1 Gearbox
 - 64 CPR Encoder
 - 5A Stall Current at 12 V

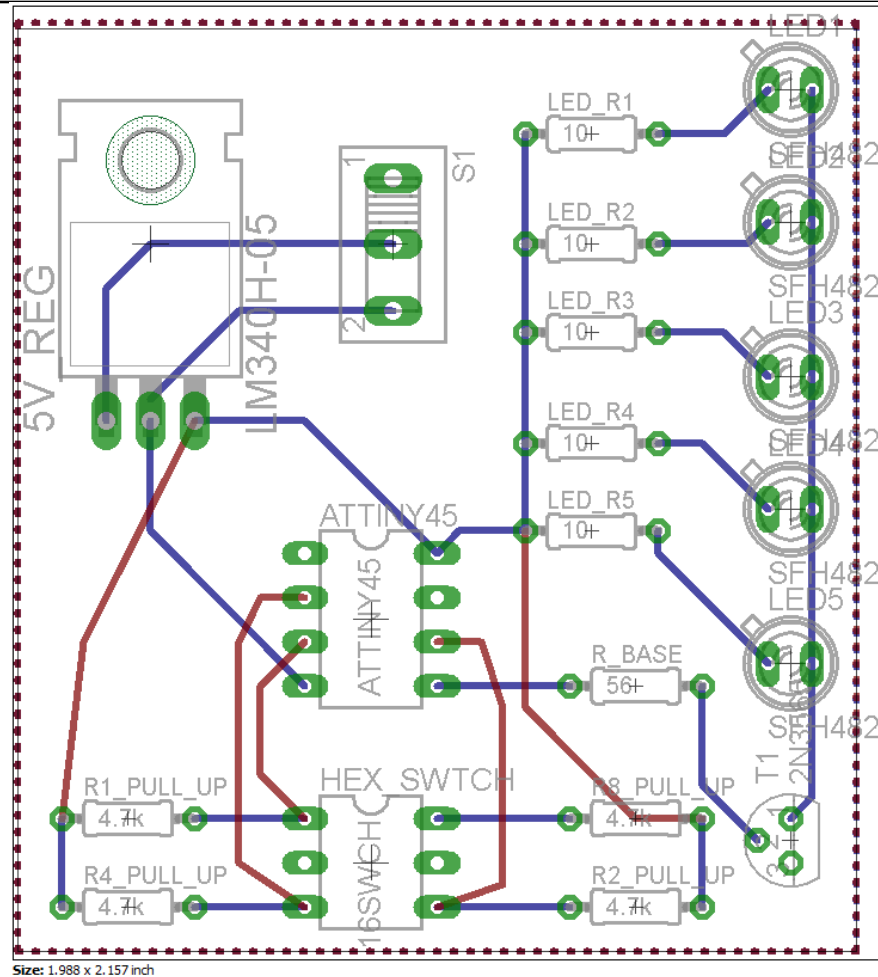


Fall Semester Schedule

- Finish PCB design
- MDR Report
- MIE Final Presentation
- MIE Poster Session
- MIE Final Report

Questions

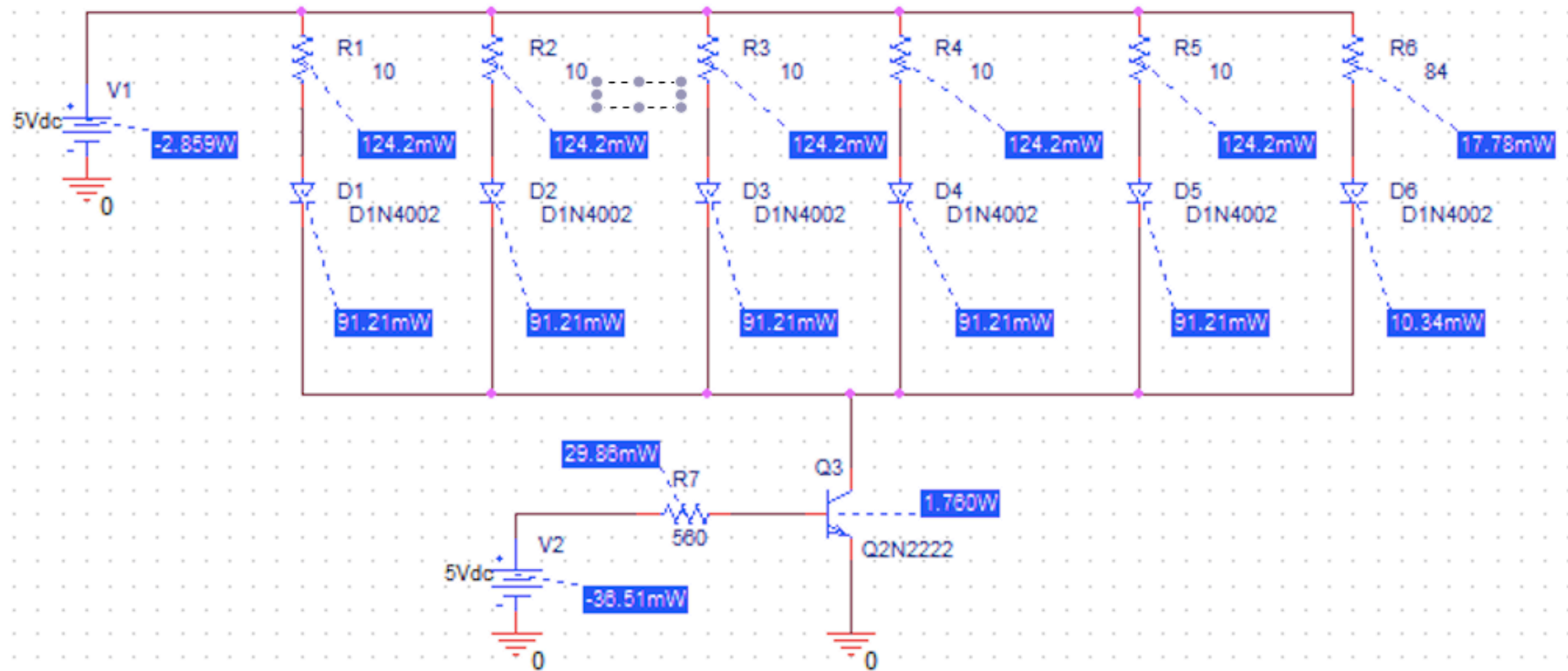
PCB



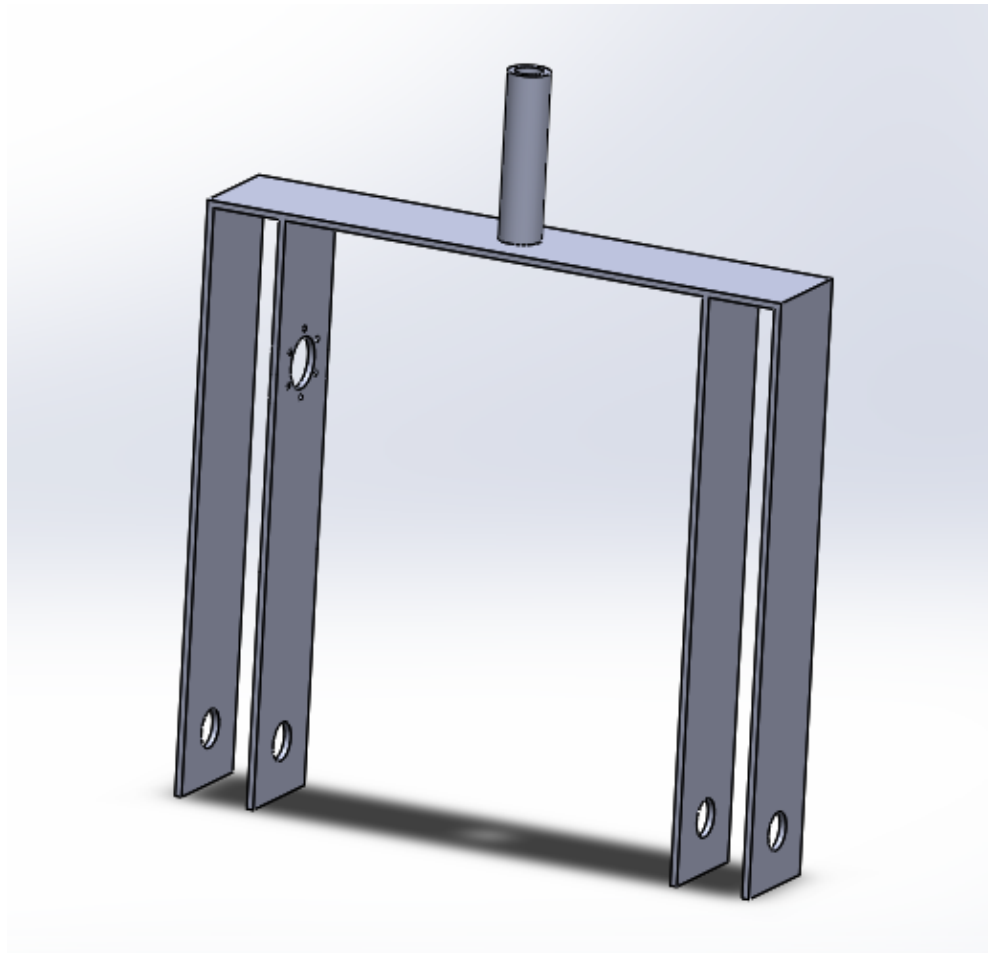
Power Calculations

- 280mA at 6V
 - $(.280)*6 = 1.68W$
- 4 AAA batteries at 860-1200 mAh
 - 3.44Ah-4.8Ah
 - Duty Cycle: 58%-86%
 - At least 14 hours

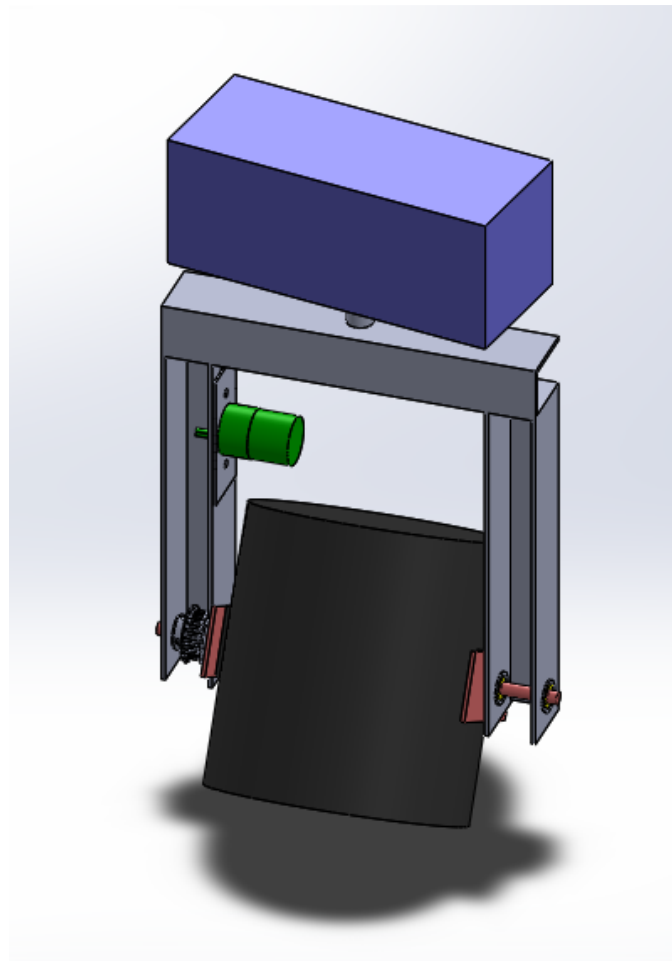
PSpice



Previous Design



Current Design



Toque Calculations

■

$$T = J\alpha$$
$$\alpha = \frac{\omega_1 - \omega_0}{t}$$
$$J = \frac{m}{4} \left(r^2 + \frac{L^2}{3} \right)$$
$$T = 8.5 \text{ in lbs.}$$

Material Selection

- Stress = My/I
- $M = 10$ in lbs.
- $y = D/2$
- $I = \frac{\pi D^4}{64}$
- $D = 3/8$ in
- Stress = ~ 2000 psi