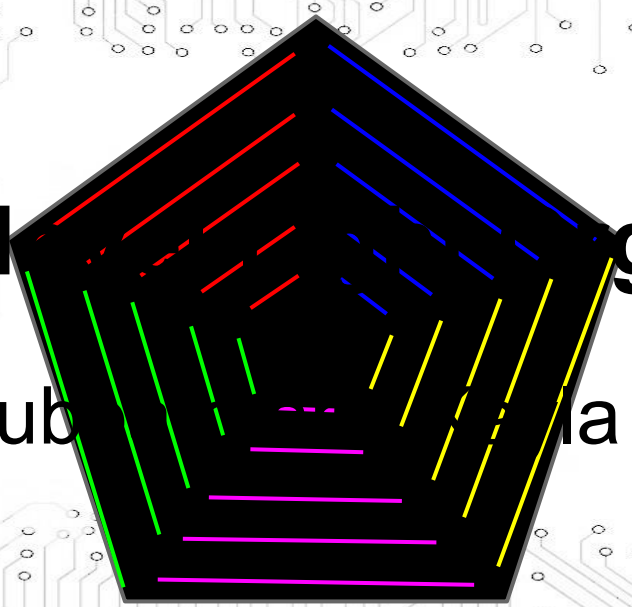
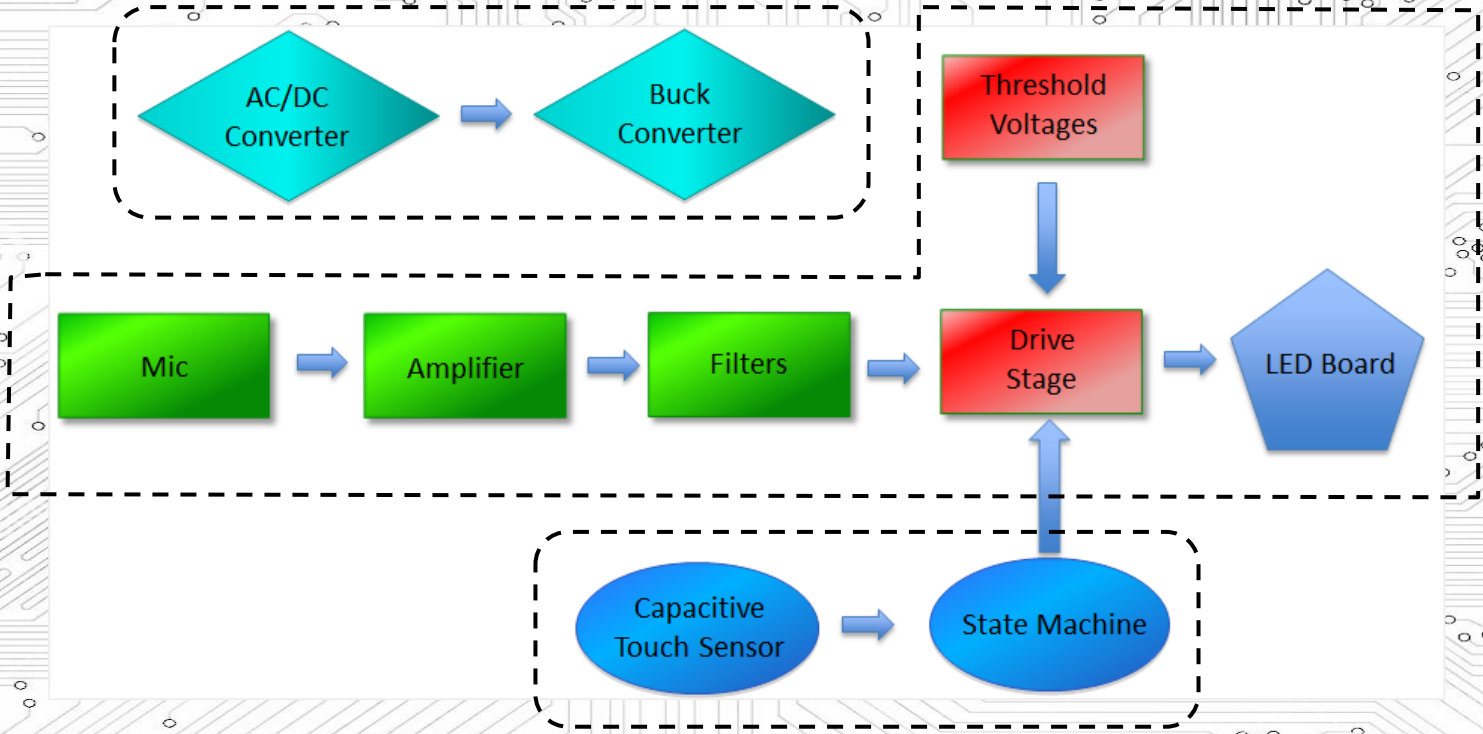
A N gan

Xavier Hub a Statham



Overview

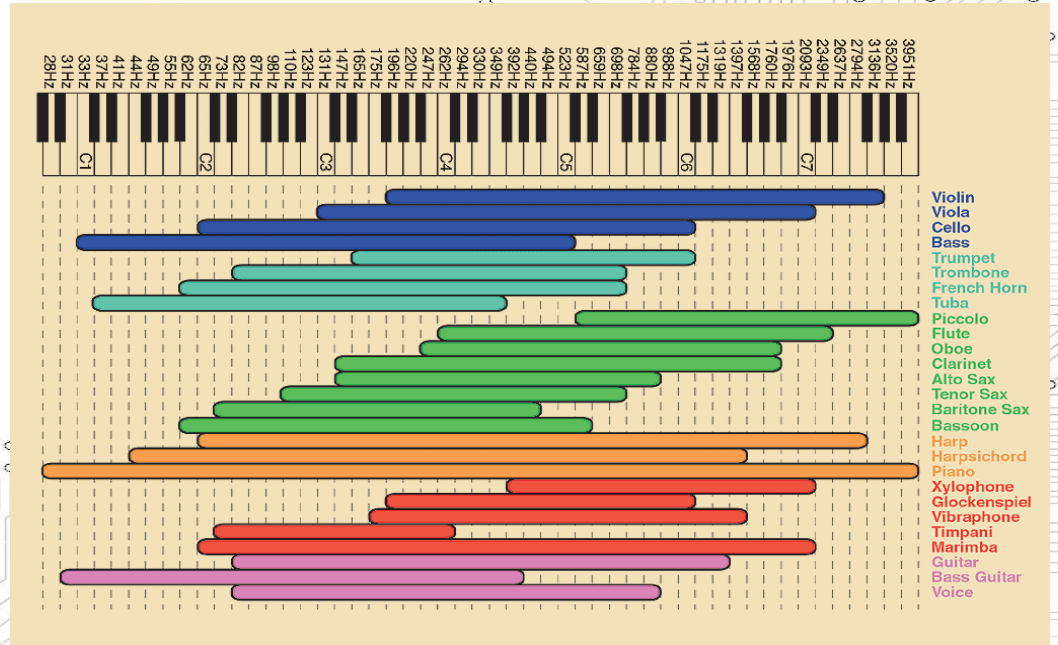
Block Diagram



Choosing Frequency Bands

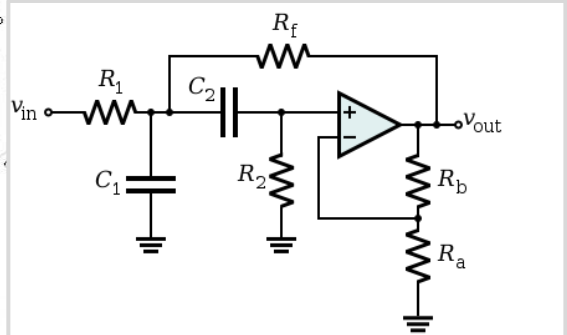
- Well populated midrange & sparsely populated highs and lows

- Selected Frequency Bands:
  - 0 - 131Hz
  - 132-262Hz
  - 263-523Hz
  - 524-1047Hz
  - 1048-3951Hz

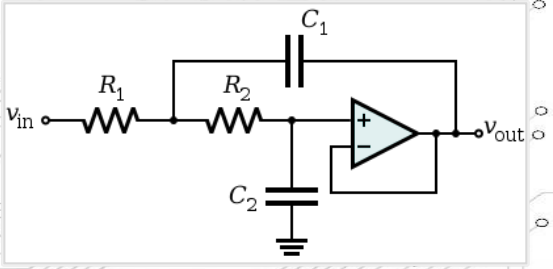


Filtering

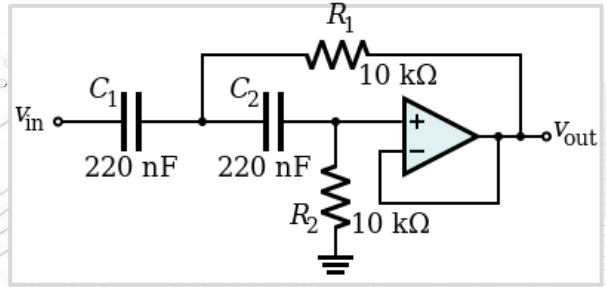
- Sallen-Key Topology for 2nd order response
- Lowpass, Highpass and Bandpass used.



$$H(s) = \frac{\overbrace{\left(1+\frac{R_b}{R_a}\right)\frac{s}{R_1C_1}}^{G}}{s^2 + \underbrace{\left(\frac{1}{R_1C_1}+\frac{1}{R_2C_1}+\frac{1}{R_2C_2}-\frac{R_b}{R_aR_fC_1}\right)}_{2\zeta\omega_0=\frac{\omega_0}{Q}} s + \underbrace{\frac{R_1+R_f}{R_1R_fR_2C_1C_2}}_{\omega_0^2=(2\pi f_0)^2}}$$



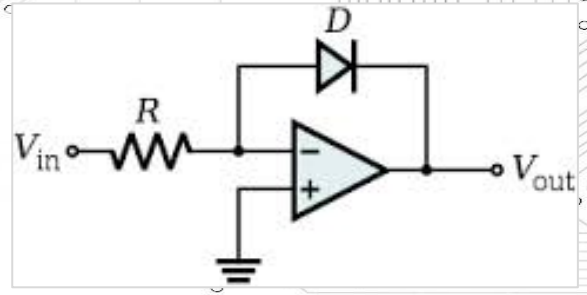
$$\frac{Vout(s)}{Vin(s)} = \frac{\frac{1}{R1C1R2C2}}{s^2 + s\left(\frac{1}{R2C1}+\frac{1}{R1C1}\right)+\frac{1}{R1C1R2C2}}$$



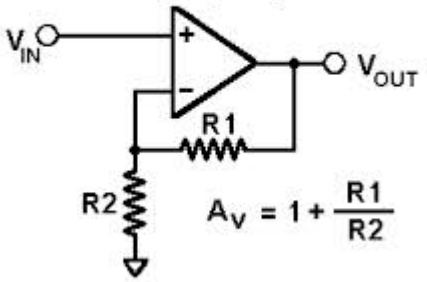
$$H(s) = \frac{C_1C_2s^2}{1/R_1R_2 + sC_2/R_2 + sC_1/R_2 + C_1C_2s^2}$$

Amplification !

- Raise Voltage Levels to drive MOSFETs
- Humans Hear on a Logscale
- Amplifier/LogAmplifier
- Not a lot of current draw!

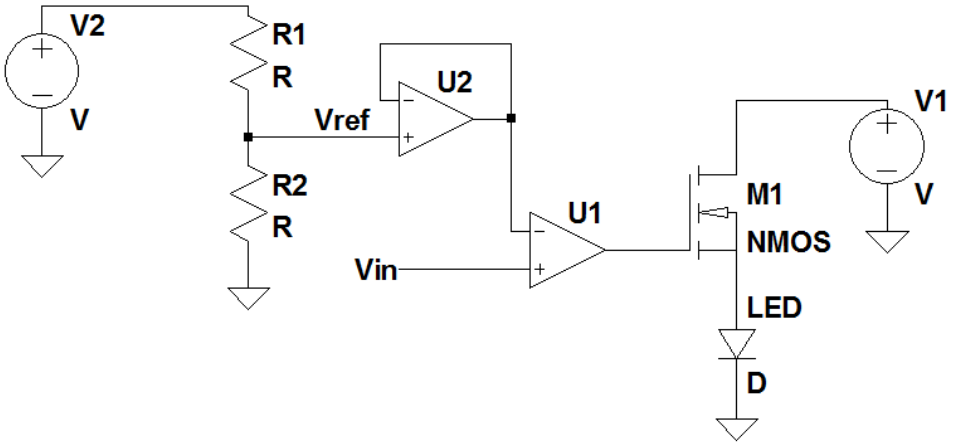


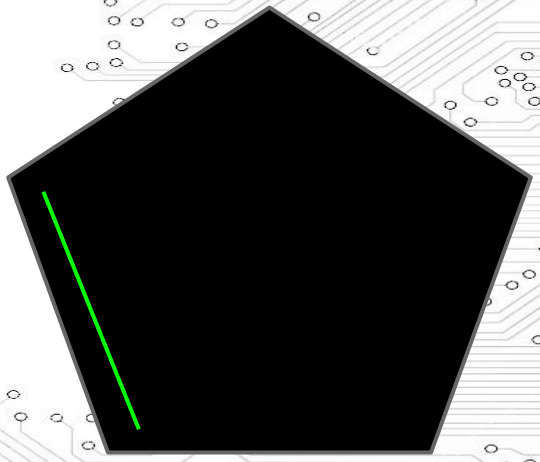
$$V_{out} = K \ln \frac{V_{in}}{V_{ref}}$$



$$V_{out} = \left(1 + \frac{R_2}{R_1}\right) V_{in}$$

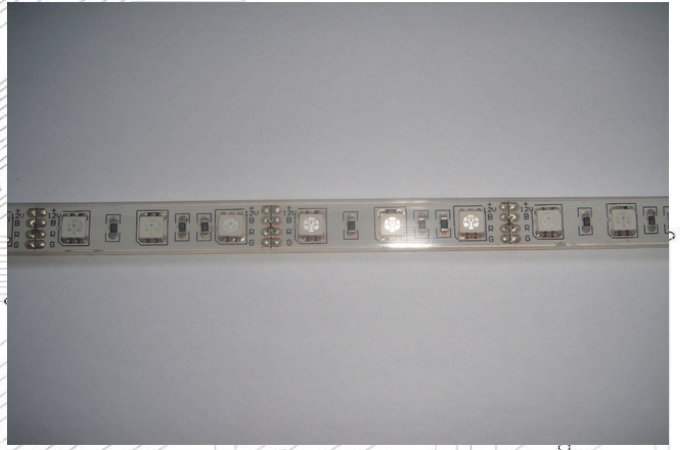
Light Organ: Driving and Board





LED Strips

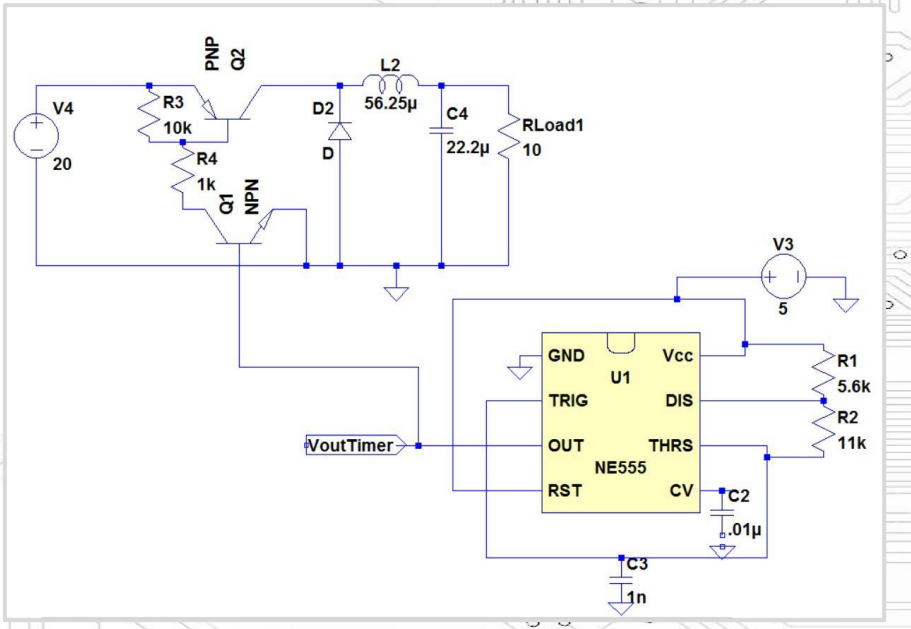

Super Warm White - 2700K
Warm White - 3500K
Pure/Day White - 5500K



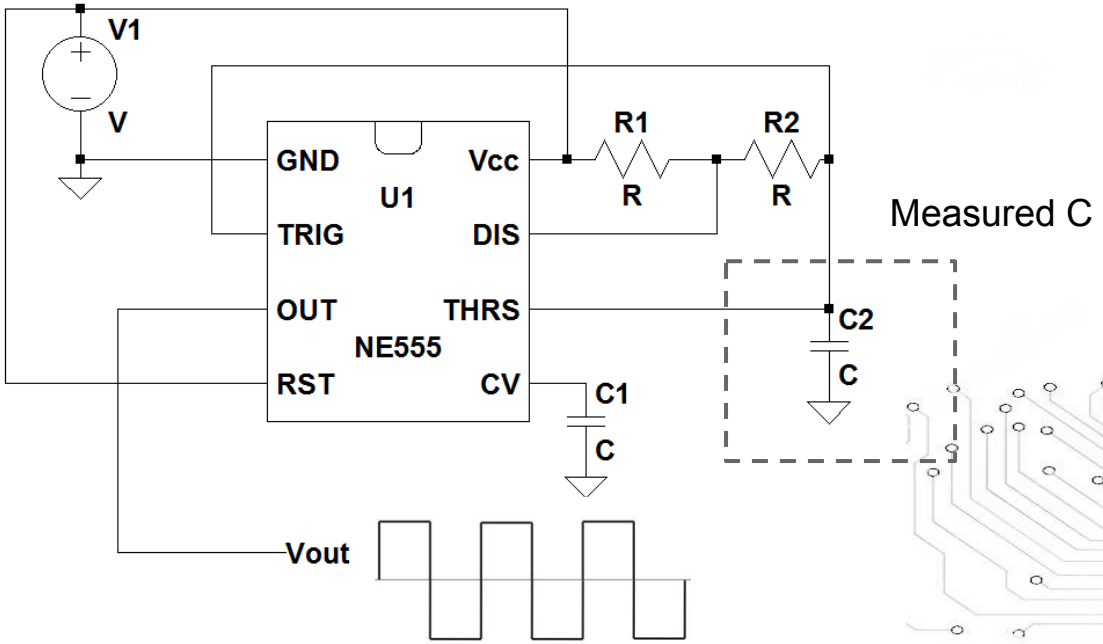

SUPERNIGHT™ LED

Power Supply

- Using a simple laptop charger to create 20VDC from wall outlet
- Buck Converter will provide us with 12V DC for driving LED Strips
- LM805 Regulator will be used to power the 555



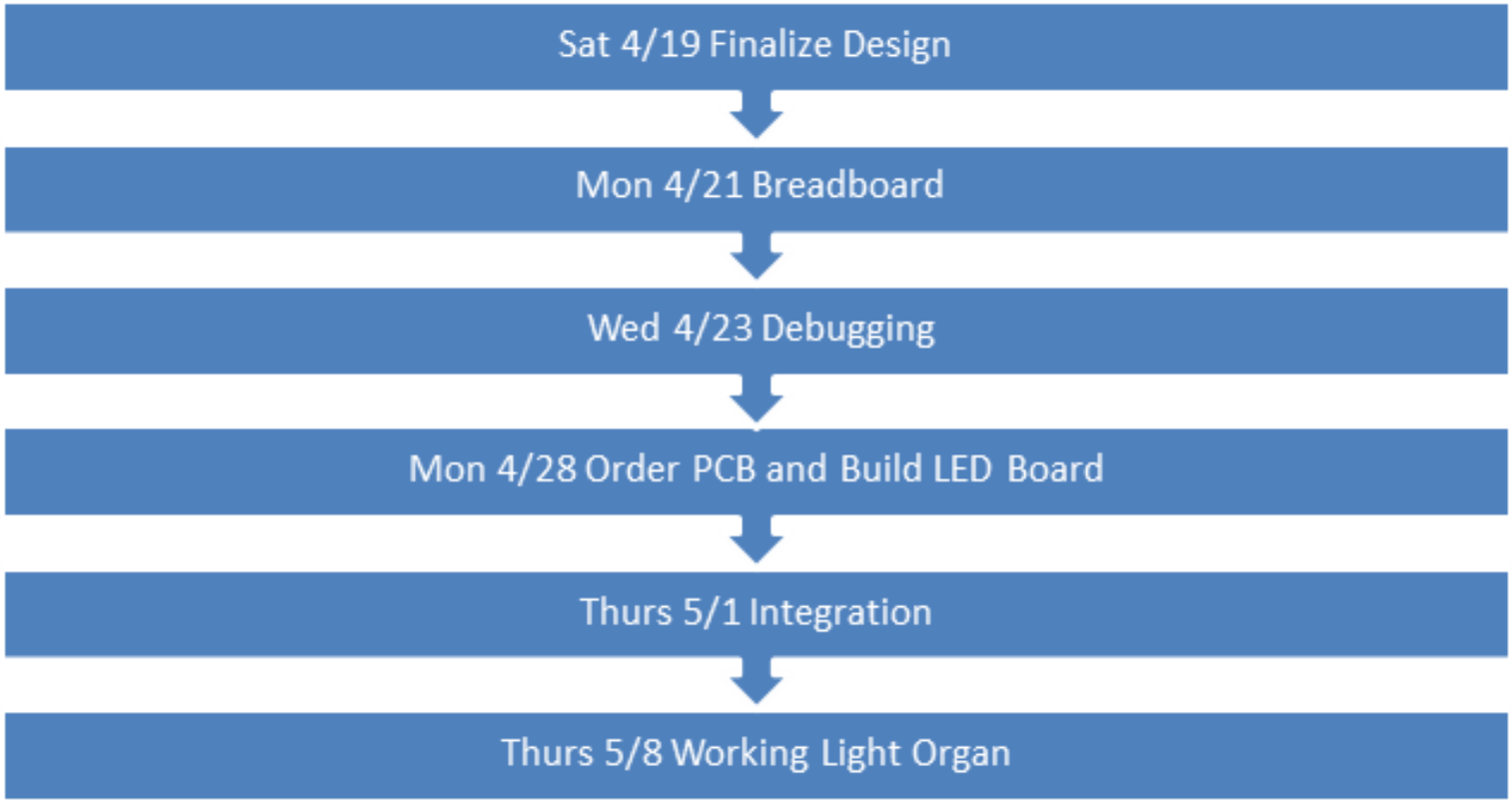
Capacitive Touch



$F \propto 1/C$

Detect change in frequency to toggle on/off

Timeline

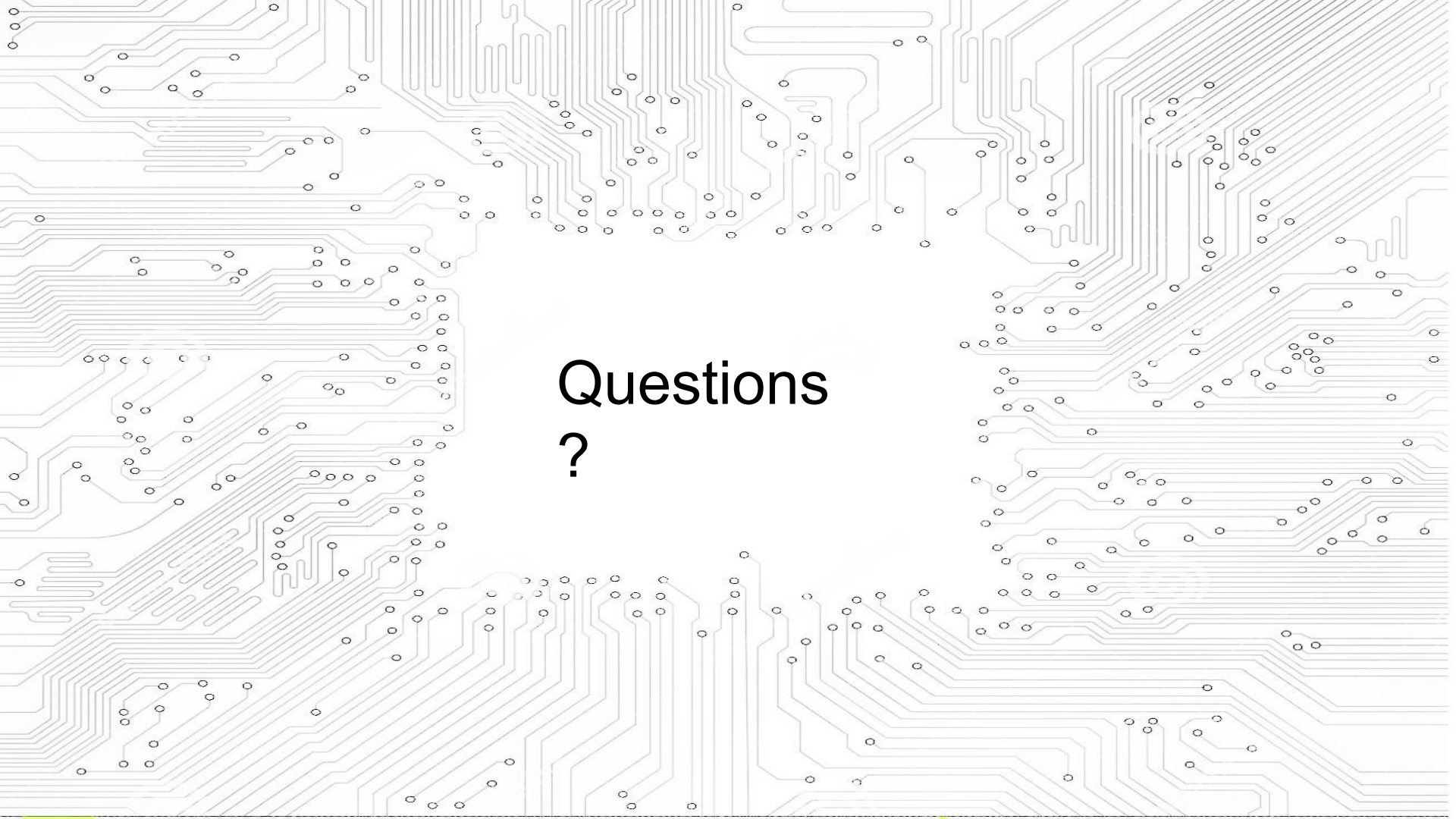

Sat 4/19 Finalize Design
Mon 4/21 Breadboard
Wed 4/23 Debugging
Mon 4/28 Order PCB and Build LED Board
Thurs 5/1 Integration
Thurs 5/8 Working Light Organ

Potential Hiccups

- Many Op Amp comparators used so sizing will be difficult
- Current draw from power stage needs to be carefully monitored
- Designing an analog on/off toggle that works with the capacitive touch stage
- Choosing material for LED board

Looking Forward

- Creating multiple LED boards that are hot-swappable
- Using capacitive touch to control the brightness of the LEDs
- Using batteries as an optional power supply


Questions
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