

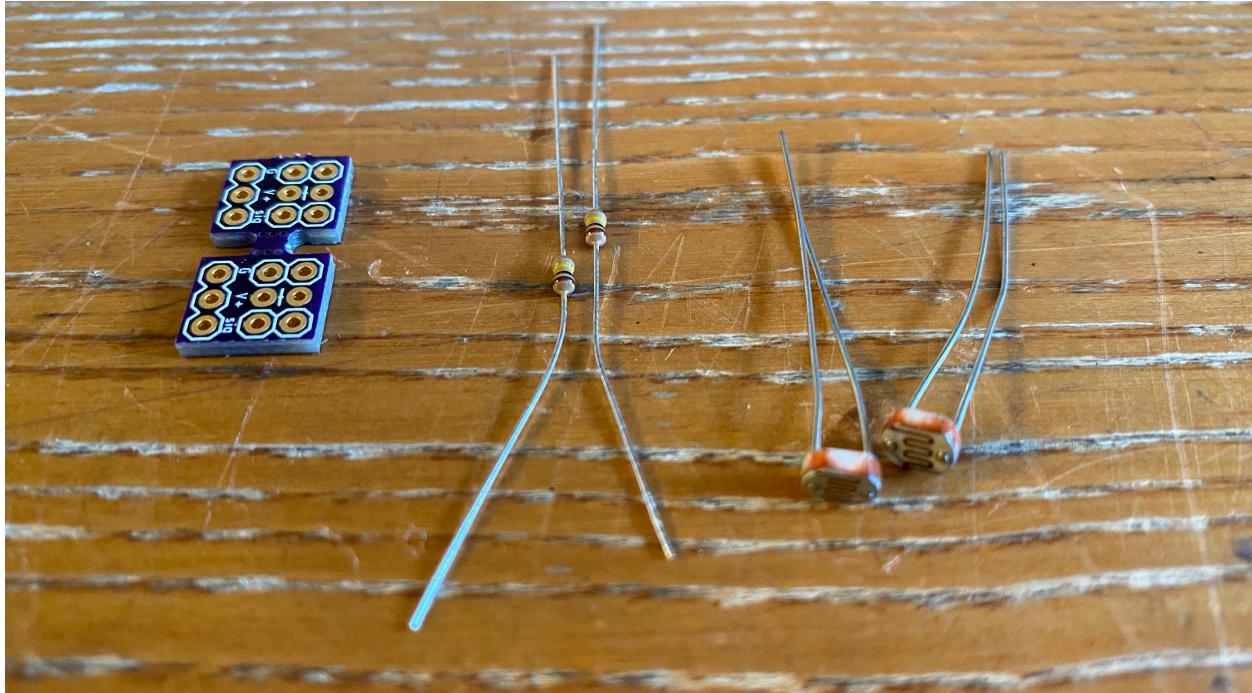
## 21M.370 Digital Instrument Design

### Lab 3 - Feb 26

In this lab we are going to work with photosensors to make a minimal playable instrument. The steps we are going to go through are the following:

1. Make two photosensors
2. Upload firmware and open software
3. Process raw signal data to gestural signals
4. Map gestural signals to synthesizer parameters
5. (Much later :-) ) create a mini performance

## Make two photosensors



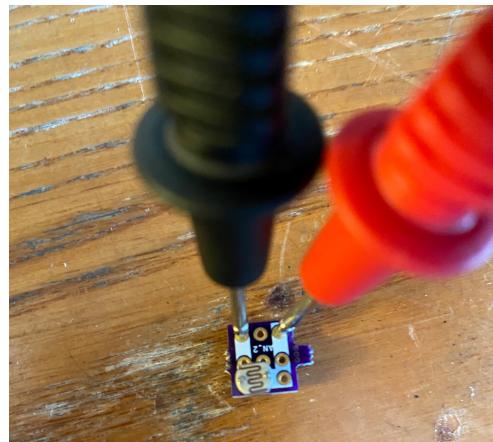
What you will need:

1. Two CDS photocells
2. Two 220k resistors
3. Two sensor breakout boards
4. Two 3-wire female-to-female headers



CDS photocells are essentially variable resistors. Take a look at their properties by doing the following:

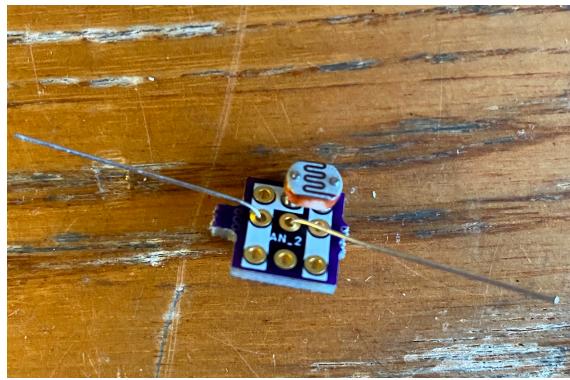
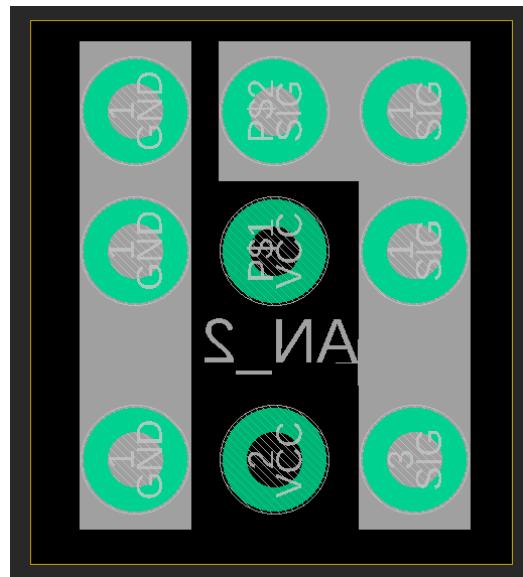
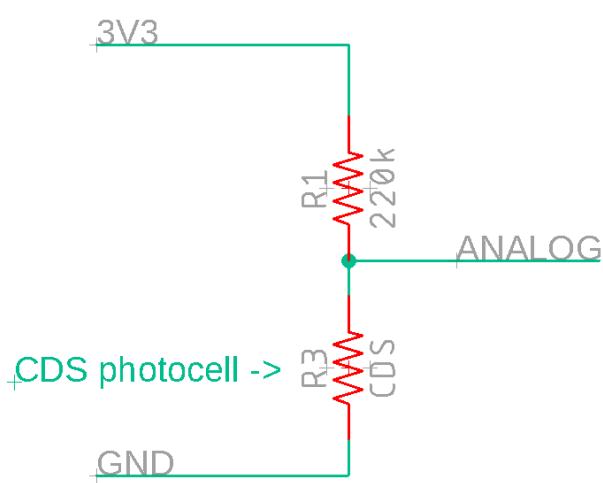
Grab your multimeter and set it to read resistance values:



Hold one multimeter probe to each leg of the CDS cell. Change the amount of visible light the CDS sees by shading it with your hand or shining a bright light on it. Notice the range of resistance shown on the multimeter for each extreme.

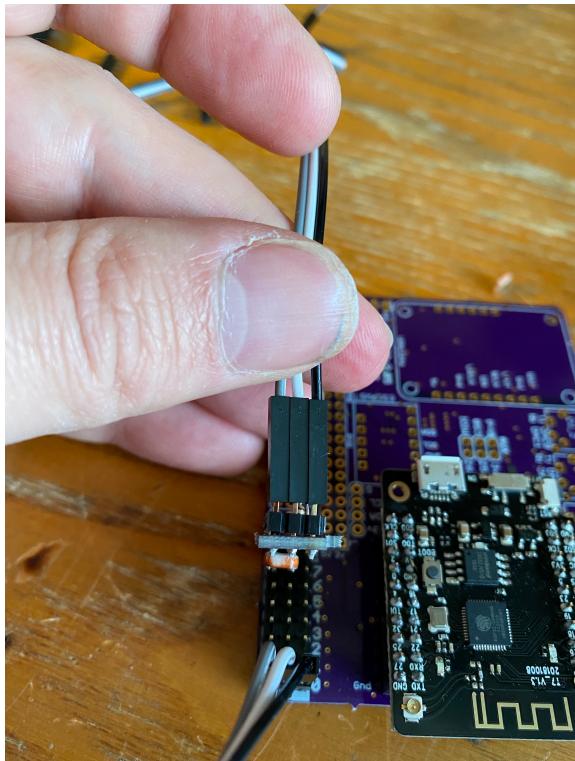
To use the photosensor we are going to implement it in a voltage divider circuit using the analog sensor breakout board.

The photosensor will be connected to the signal and ground pins. The resistor will be connected to the V+ and signal pins.



The jumper will connect the breakout board to one of the analog inputs on our main PCB. You'll probably want to use analog 0 and 1 for your two sensors. The analog headers on the PCB will always be:

- signal on the board edge
- 3v3 on the middle pin
- Gnd on the inner pin.



Check the labels on the board and see if you can verify this.

## Software

For this lab, we are going to use the following files:

1. M370\_ALL\_ANALOG - upload to ESP32 (note: analog0-3 are confirmed to work. . . )

2. 370\_HELLO\_PD.py - open and run script
3. M370\_LAB3\_0 - sample PD patch to use for the lab

### **Processing signal values to create control signals**

Using the voltage divider circuit you will get a changing value as the resistance of the CDS cell changes. The next step is to think about how to process this raw sensor value into something that provides information more closely related to your gestural interaction with the sensor.

Use the Lab3 Automatonism patch for this.