

21M.370 Digital Instrument Design

Lab 5 - Mar 11

Today's lab is focused on three things:

1. preparing kits for you to take home so we can continue the course virtually for the rest of the semester
2. mini-performances with our photocell instrument
3. discussion on ideas for instrument design based on our experiences so far

Preparing a kit

While moving to online sessions will have a big impact on the class, at least we already have enough components to take us a long way in instrument design. Here is what you will need to take with you.

First, tools:

1. Your m370 PCB and ESP32
2. Your soldering kit with
 1. soldering iron
 2. soldering iron stand
 3. solder sucker
 4. tweezers
 5. yellow wirestripper



3. Multimeter



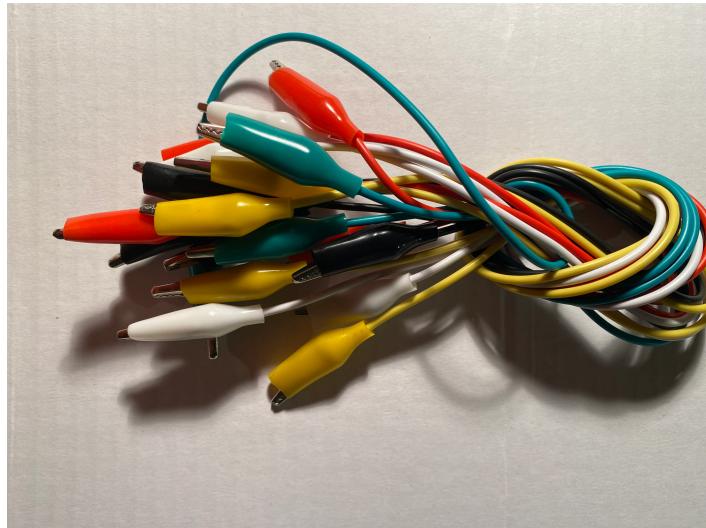
4. Mini screwdriver set



5. Breadboard, wiring kit, and new solder



6. Alligator jumper cables



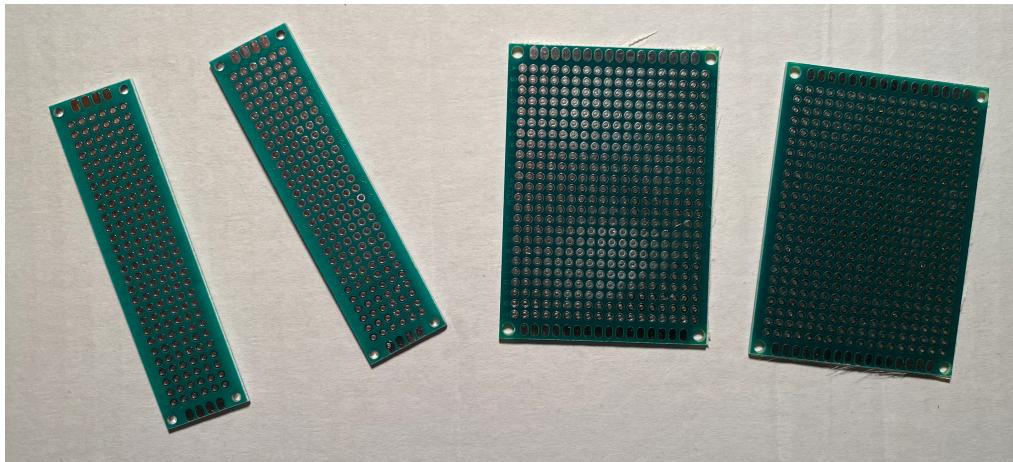
7. Pliers and wirecutter



8. Socket header cables
- 1 each of two lengths



9. Two large and two small prototyping PCBs



Now, a collection of sensors:

1. An MPR121 capacitive sensor.

This should already be in your kit in the white box.



2. 1m of copper tape and 1m of two different color wires



3. An LSM6DS3 accelerometer/
gyroscope



4. Two arcade buttons
- should already be in your kit



5. 1 linear potentiometer



6. 1 joystick

- should already in your kit, unwrapped



7. 1 rotary encoder w/ nut and washer, and a rotary encoder PCB

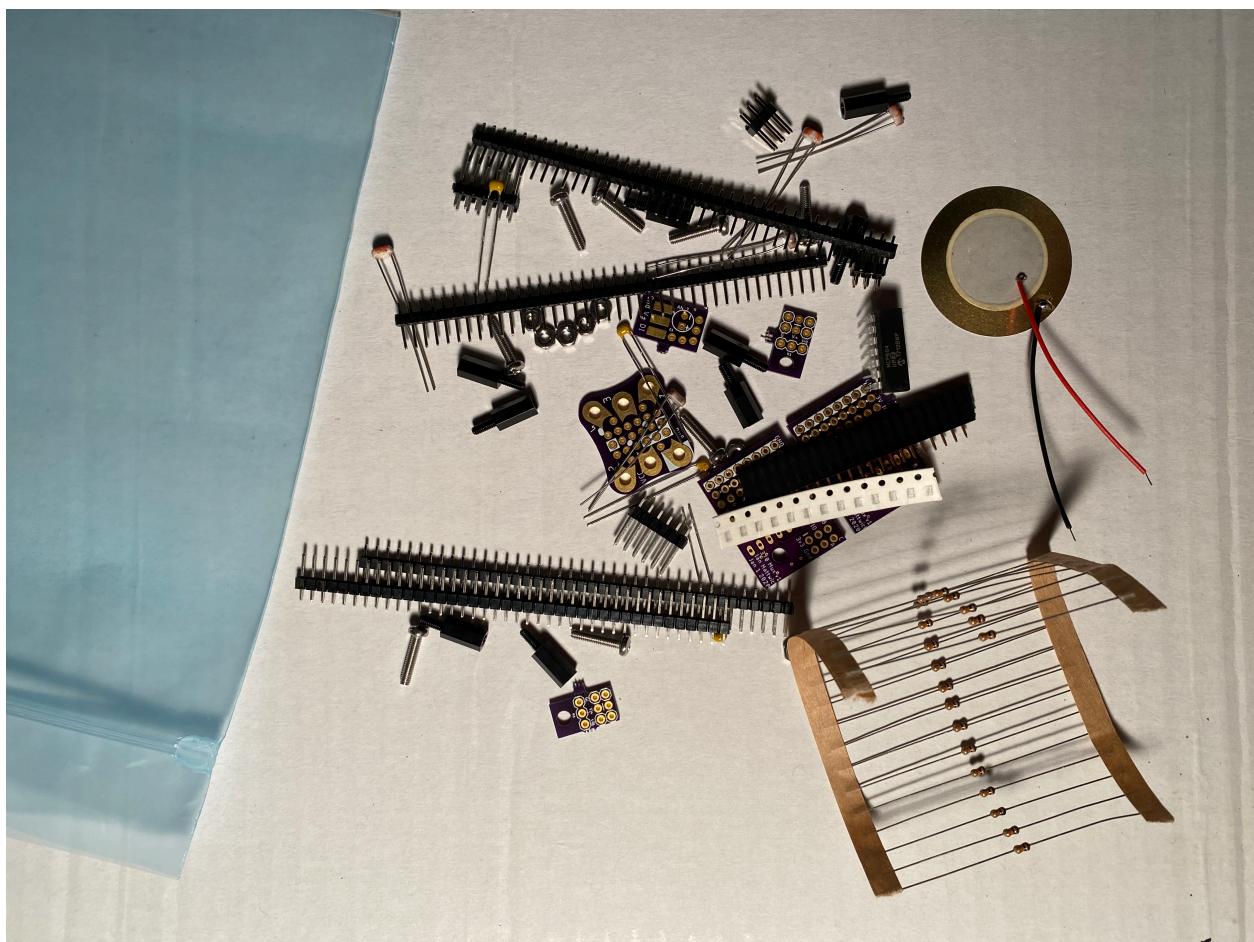


8. 1 bag of 5 rotary potentiometers, with nuts and washers, and 5 knobs



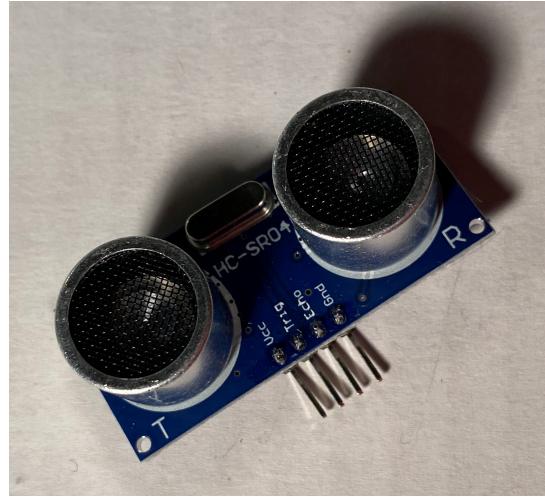
9. 1 grab bag with assorted parts

- piezo disc
- op-amp
- breakout PCBs
- headers
- screws and nuts
- hall effect sensor
- four CdS photocells



Optional items

1. HC-SR04 ultrasonic distance sensor
 - will require some hacking to make it work



2. Heart rate sensor and/or APDS-9900 proximity sensor
 - We only have a few of each of these. Take one if it seems particularly pertinent to your interests
 - the heart rate sensor is in the bag with the yellow sticker



3. Additional extra components
 - joysticks, faders, potentiometers, arcade buttons
 - we have extras, so take more if you have an idea for an instrument that would use them

Checklist:

Tools

1. Your m370 PCB and ESP32
2. Your soldering kit with
 1. soldering iron
 2. soldering iron stand
 3. solder sucker
 4. tweezers
 5. yellow wirestripper
3. Multimeter
4. Mini screwdriver set
5. Breadboard, wiring kit, and new solder
6. Alligator jumper cables
7. Pliers and wirecutter
8. Socket header cables
 - 1 each of two lengths
9. Two large and two small prototyping PCBs

Sensors:

1. An MPR121 capacitive sensor. This should already be in your kit in the white box.
2. 1m of copper tape and 1m of two different color wires
3. An LSM6DS3 accelerometer/gyroscope
4. Two arcade buttons
 - should already be in your kit
5. 1 linear potentiometer
6. 1 joystick
 - should already be in your kit, unwrapped
7. 1 rotary encoder w/ nut and washer, and a rotary encoder PCB
8. 1 bag of 5 rotary potentiometers, with nuts and washers, and 5 knobs

9. 1 grab bag with assorted parts

- piezo disc
- op-amp
- breakout PCBs
- headers
- screws and nuts
- hall effect sensor
- four CdS photocells

Mini-performances

Once you have your kit ready, prepare for your mini performance.

1. Get together with your group and evaluate how long it will take to get ready to perform.
2. When you are ready you will need to plug into a speaker.
 - Ian will give your group three speakers and cables. Plug into the speakers and then you will most likely need to restart PD so it sees the headphone jack
3. Performances will be 90s long
 - Ian will give you a cue when you have 15s left
4. Performances will be videotaped and put in a dropbox folder to share with the class
 - purely for research purposes
5. We may want to post a performance on social media.
 - Ian will ask and get permission before anything like this.

Post performance discussion

1. What are the areas you find to have creative potential? Sensors, mechanical layout/design, mapping, synthesis
 - what areas for improvement
 - what was challenging / easy, both technically and conceptually
2. What kind of instrument **could** you make right now given 1 solid week to focus on building it?
3. What other kinds of instruments are possible based on CdS photocells (and potentially other sensors/controls)
4. For the future
 1. individual instrument
 1. Mar 30 proposal

2. Apr 8 milestone 1: minimal sensor/mapping/synthesis implementation
 3. Apr 22 milestone 2: mechanical construction
 4. May 4: individual presentations (overview of design)
 5. May 6: performance dress rehearsal
2. Apr 1 virtual visit with Jeff Snyder
 1. others TBD
 3. group research project 2: design a digital instrument
 1. Apr 6 proposal
 2. Apr 13, 15, 20, 22 group presentations