PCB Fabrication @ WSU

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Billy Kelley

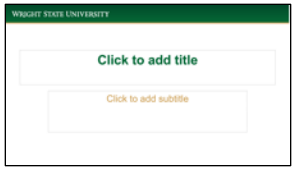
Who am I?

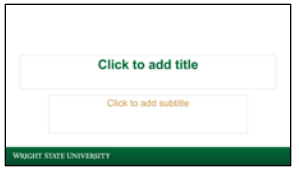
- Why am I making slides?
  - Today will likely be the worst day for listening / slides
- Why do these slides look so professional??
  - Hint: it's not chatgpt
- Why is Billy glaring at me???
  - It's because of love

I found Wright State's Powerpoint template!!!

Prepare for (up to) 7 Cover Designs

And 2 Inside Slide Designs





<--- These cover designs have the option of adding a photo, but not in .gif :(

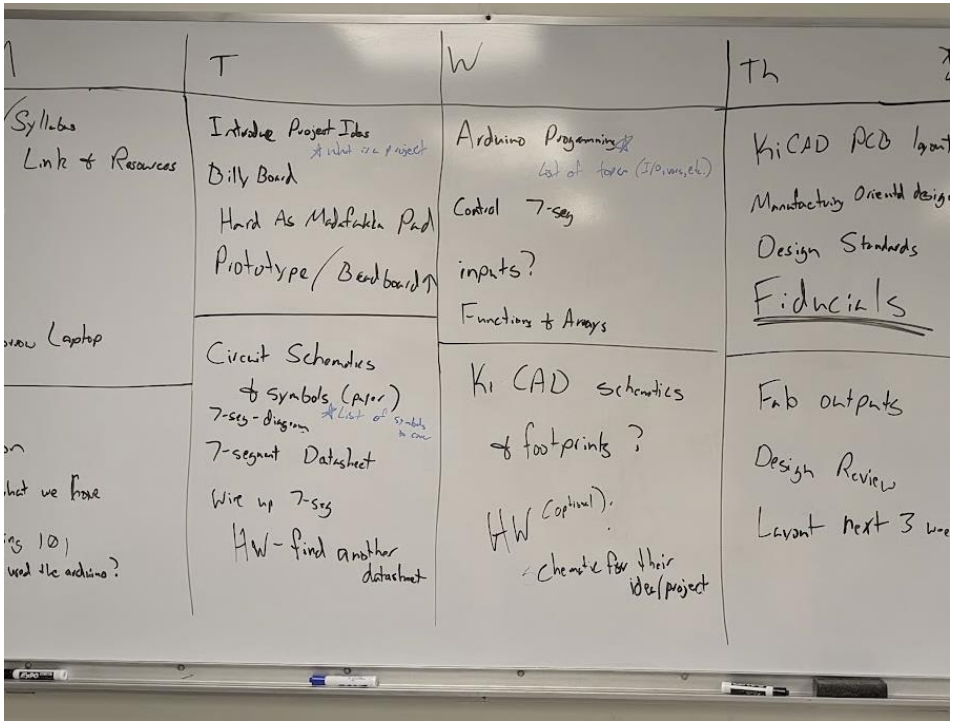
Where to be?

- Russ 152c (here) for big group meetings
- Russ 346, 347 for design and review
- Russ 348 for fabrication

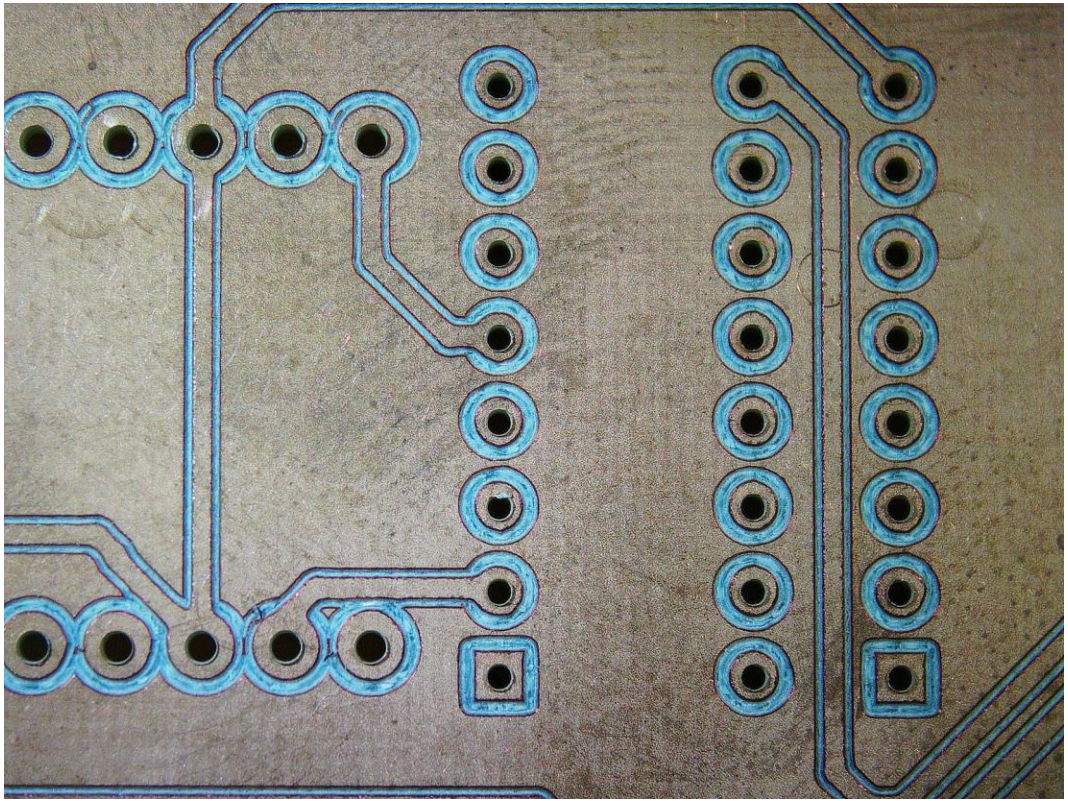
- Check github.com/wrightedu/intel for future days if lost

Welcome!

- The plan ->



The actual plan



*minus all the errors
** plus a solder resist mask
*** plus components
**** and programming (for the arduino)

How do we get there?

- Simple circuits
- Breadboard a circuit
- Program an Arduino (C++)
- Make a circuit schematic
- Make a PCB layout
- Fabricate a PCB

Today's goals

- Morning
  - Resources
  - Arduino
  - KiCad
  - Arduino Kit
  - Laptops!!!!
- After Lunch
  - Electronic Circuits
  - PCB Fabrication
  - WSU resources
  - Breadboarding 101

This is a photo example.

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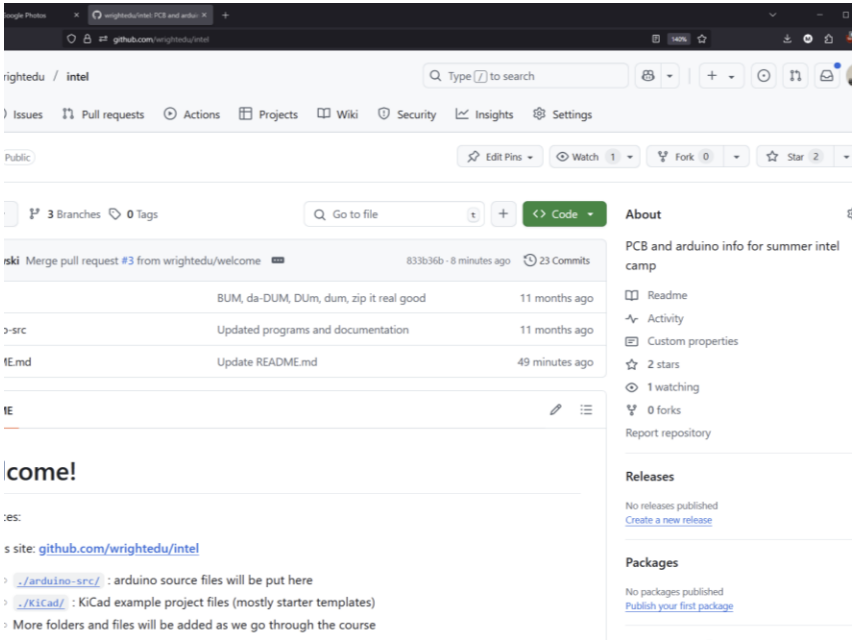
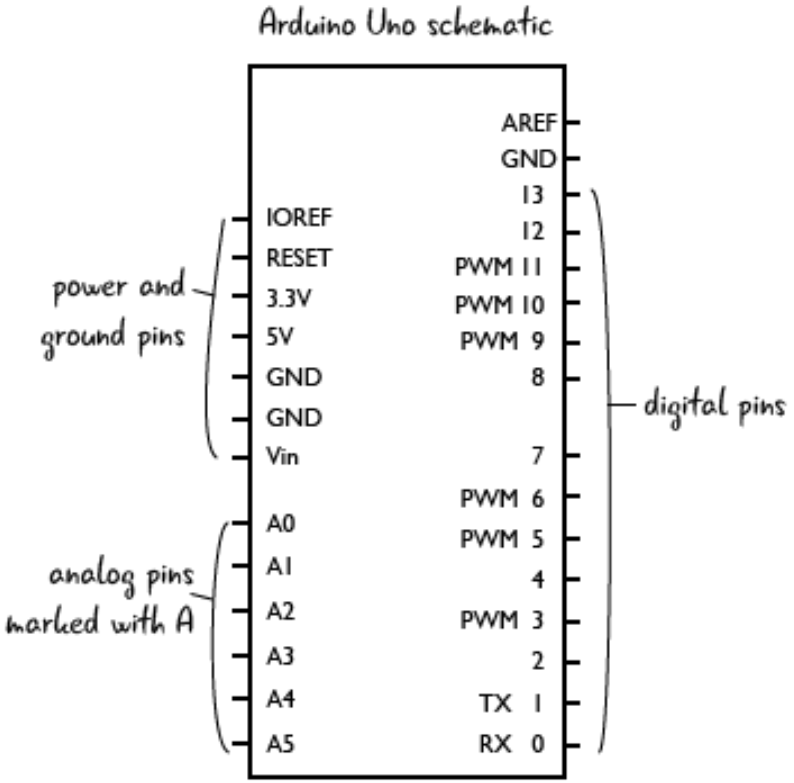
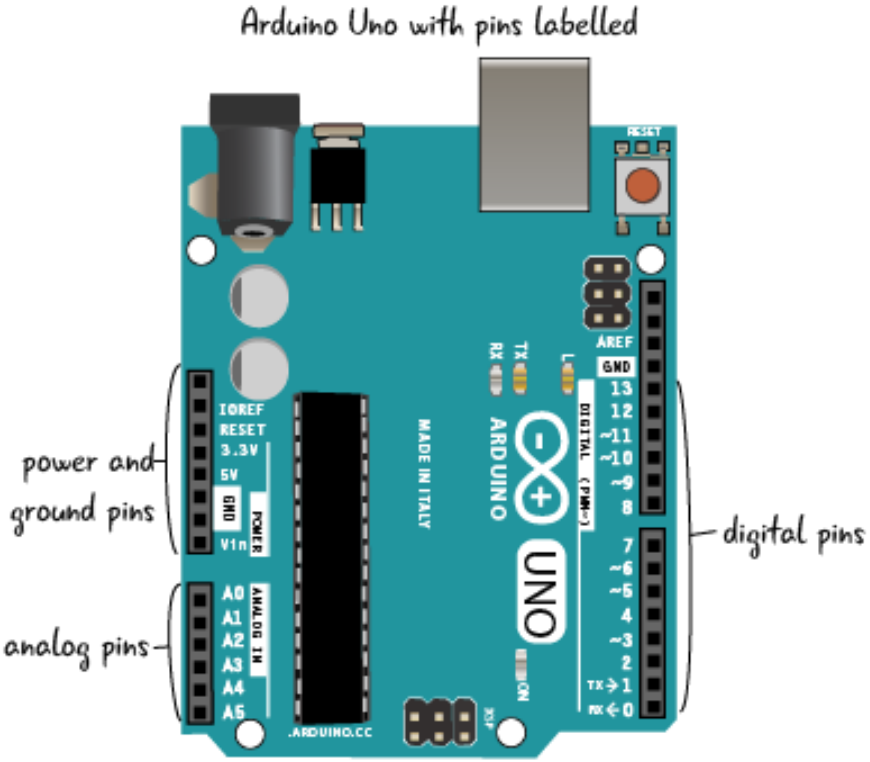
- Resources: **Github.com/wrightedu/intel**



- A laptop (needed tomorrow)!
- Your Arduino kit (needed today!)
- Github.com/wrightedu/intel

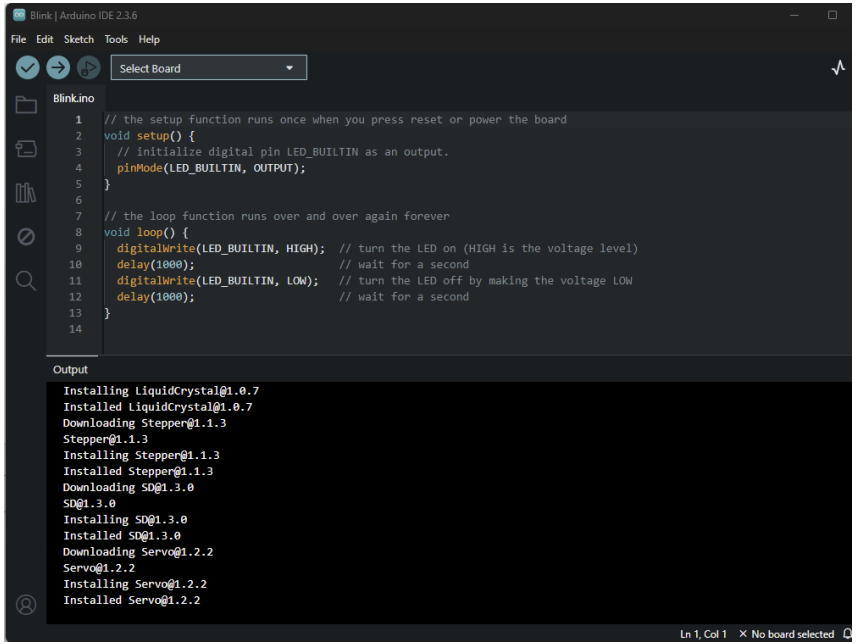
What is an Arduino?



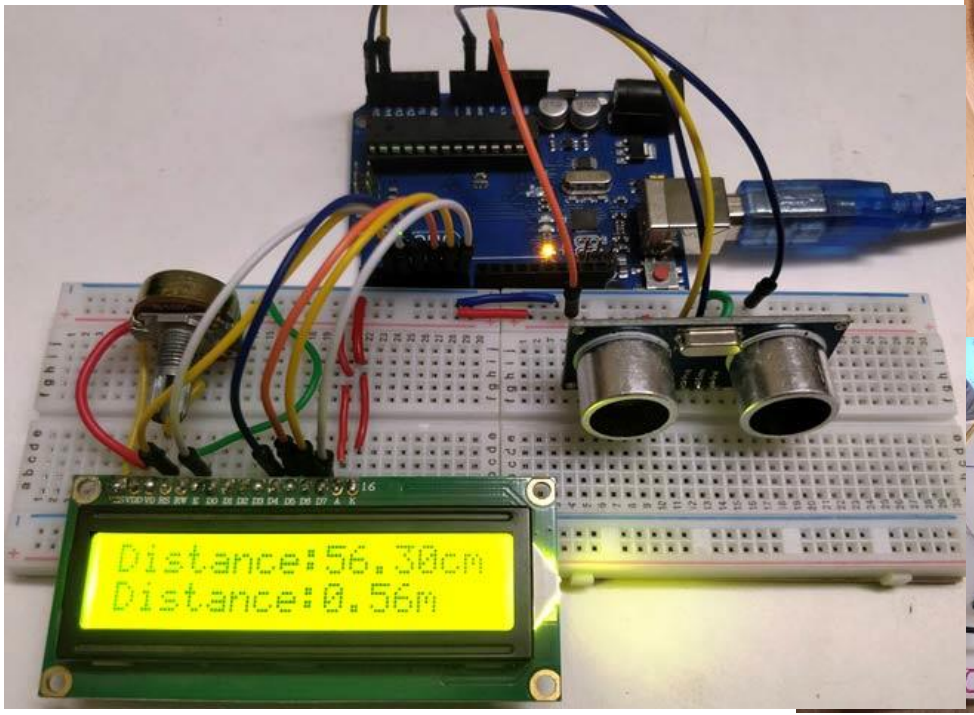


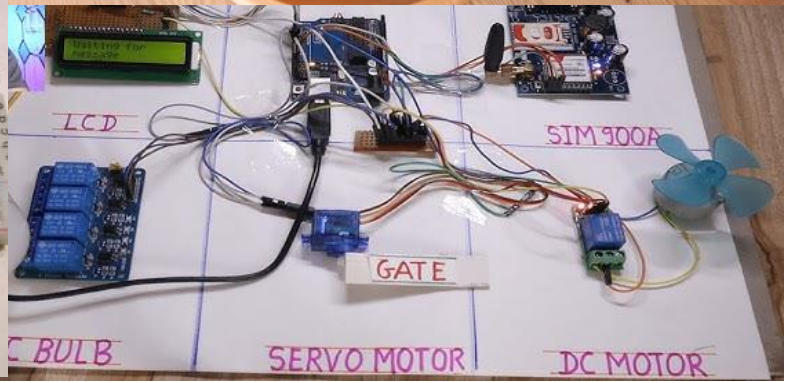
The Arduino IDE

- IDE == Integrated Development Environment
- Write code
- Test code
- Push code to your Arduino



Example projects

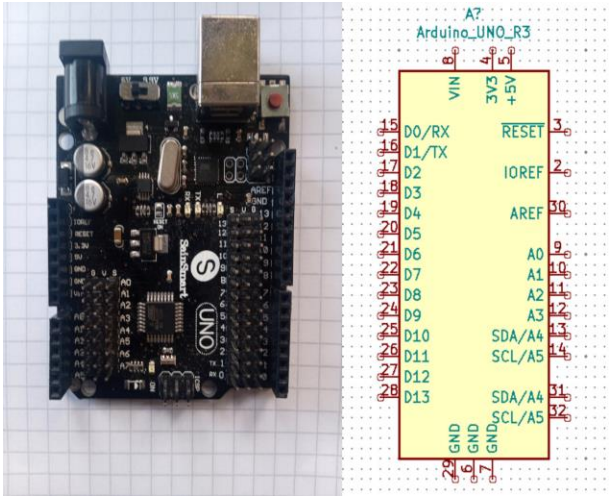


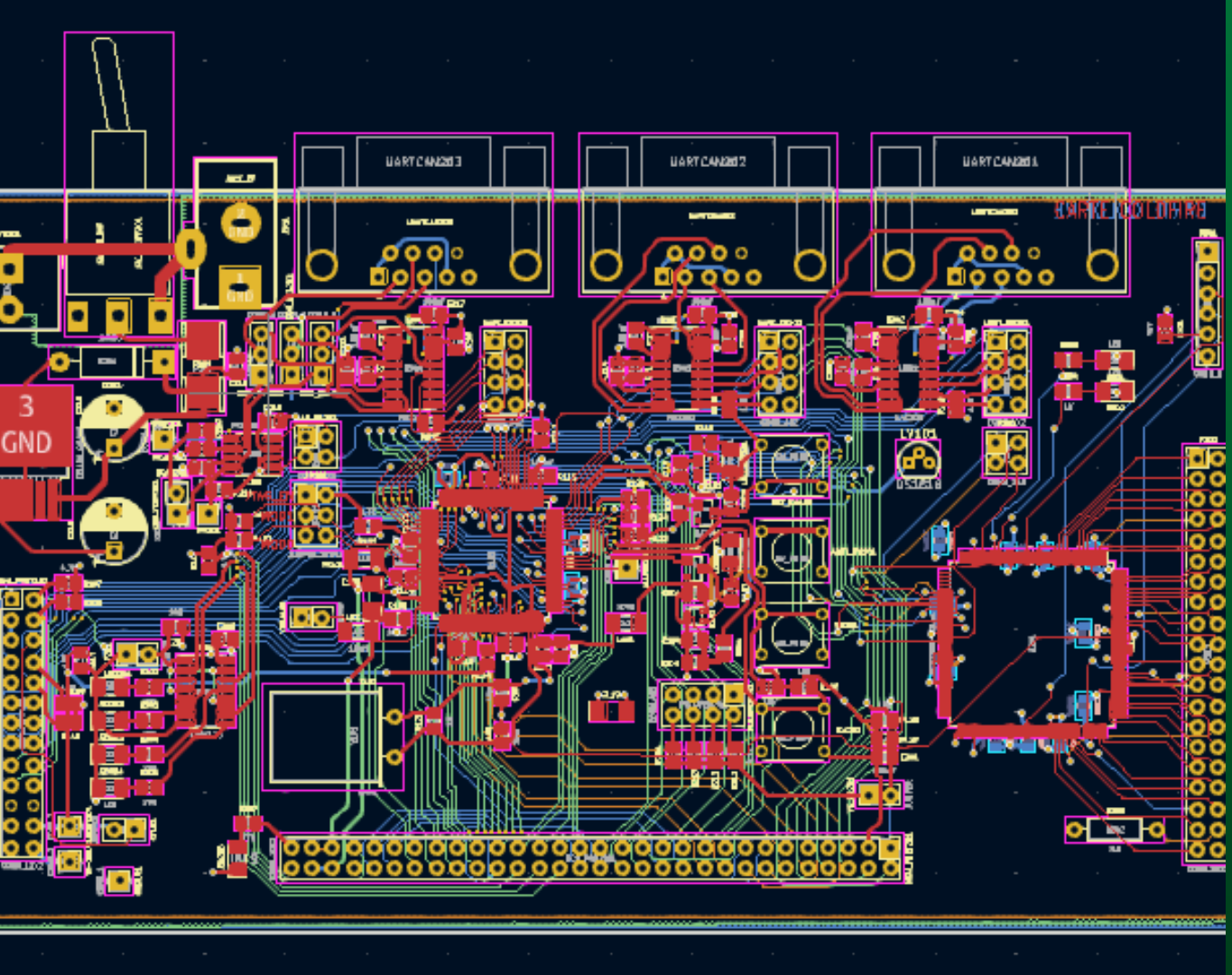


Arduino questions?

KiCad

- Software tool for creating circuit schematics and PCB layouts
- Really cool
- Very powerful
- Pain in the ass to learn





This is a photo example.

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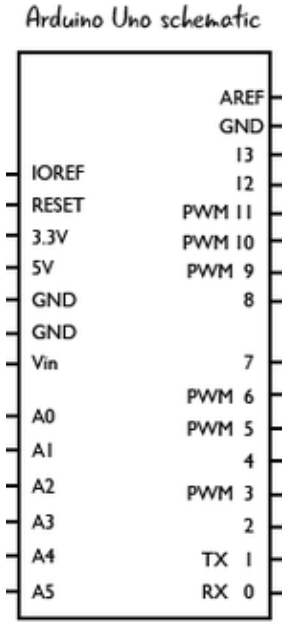
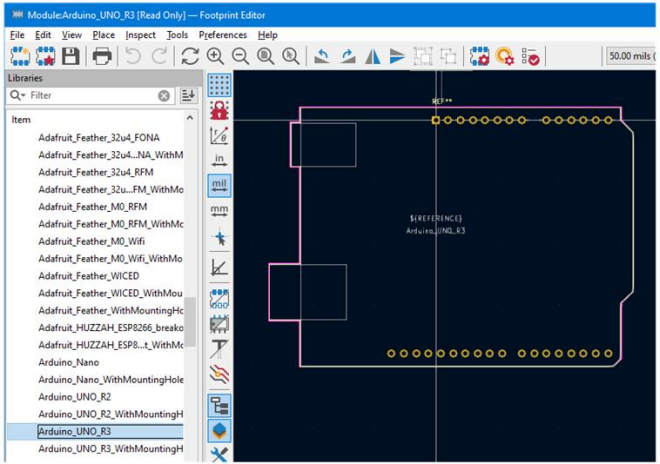
My first schematic

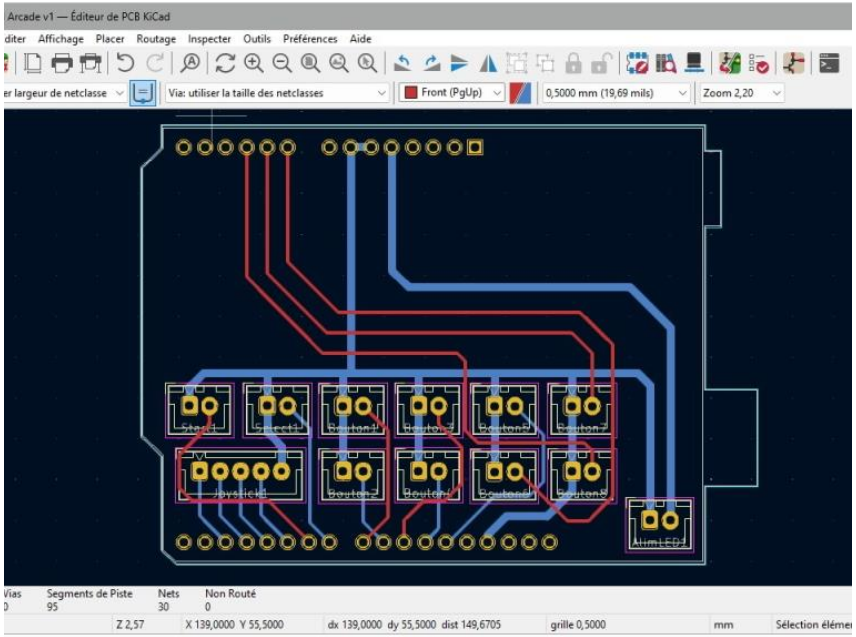


KiCad is more than just schematics

- It has "Footprints" for most common components
- 2D / 3D understanding of the physical connections for a given component



PCB design



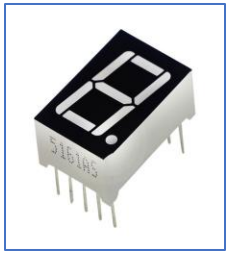
- Assigning a footprint to each component on our schematic lets us make a PCB!

KiCad questions?

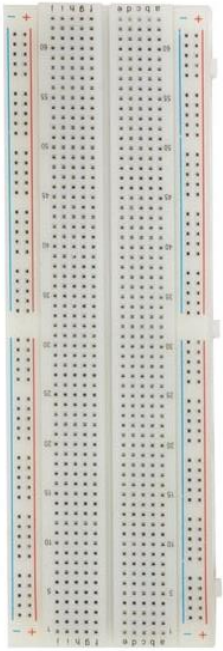
Arduino Kit contents (of interest)

LEDs

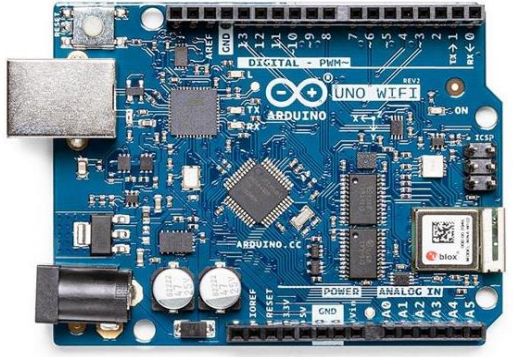
RGB LED



7 segment display



breadboard



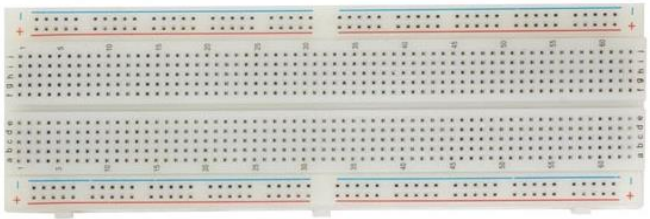
Arduino

Keypad / membrane switch

Distance sensor

Various resistors

How do we get there?



- Simple circuits
- Breadboard a circuit
- Program an Arduino (C++)
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KiCad

This is a photo example.

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The plan (continued)

- Week 1: learn and design
- Week 2: finish design and fabricate
  - Only ~12 students can be fabricating at the same time
  - Split into teams of 4 students
    - Next week, the first 3 teams done with their design will fabricate
    - Fabrication takes ~3 days

Safety

- Safety glasses or approved eyewear must be worn near milling machines and chemicals while in use
- No open-toed shoes in 348 Russ (while fabricating)
- No cell phone usage in 348 Russ while processes are underway (chemical or mechanical)
- More safety talks to come later

Week 3 & 4

- Additive Manufacturing with Dr. Mian
- Clean Room with Dr. Dan ?

- Groups of ~12 students will be moving around to different rooms, we will try to keep things clear but when in doubt find one of us

I lied, it can totally be a .gif

It just breaks when I .pdf this :p

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After lunch

- Bring your Arduino kits
- Bring your laptop (if convenient)

Break for Lunch

No you do not have to go to the Rancho.

Please be back by ???

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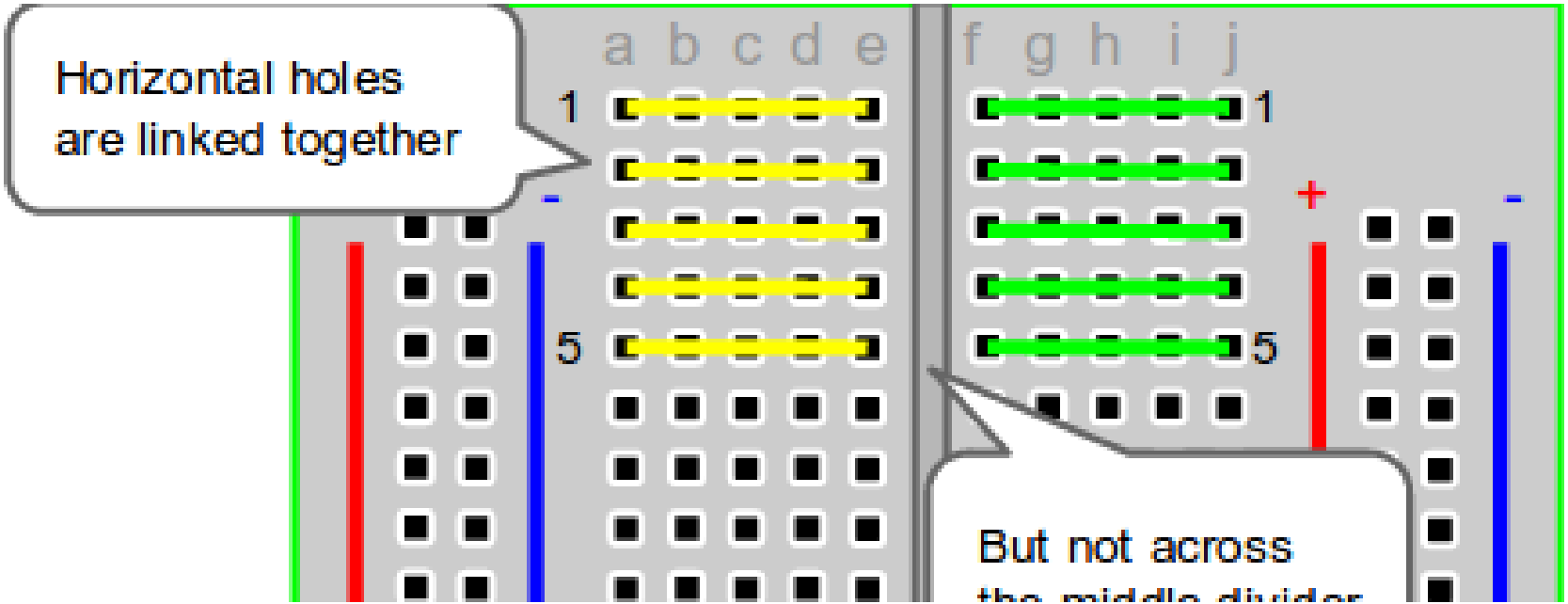
WSU resources images

Breadboarding 101



Fabrication outputs

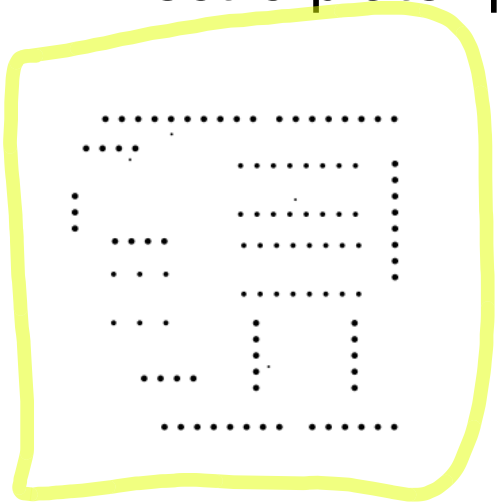
- Fiducials
- Plated Through Holes (PTH)
- Non-Plated Through Holes(NPTH)
- Front Cu (FCU)
- Back Cu(BCU)
- Solder Mask
- Edge Cuts / Board Outline

Fiducials

- Alignment holes for everything else
- Frequently not a separate output file

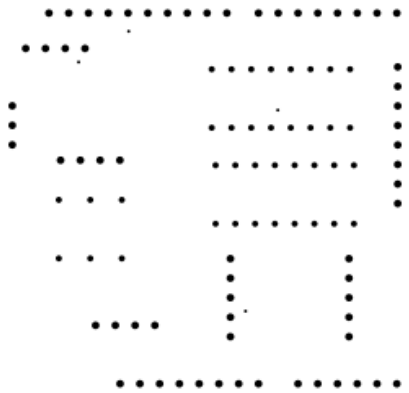
Plated Through Holes (PTH)

- Drill bits make holes
- Electro plater plates holes



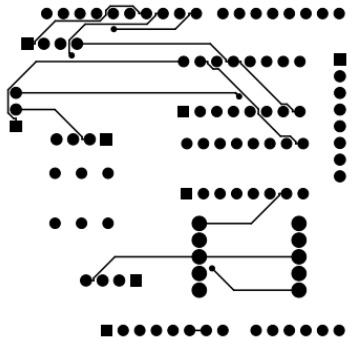
Non plated through holes

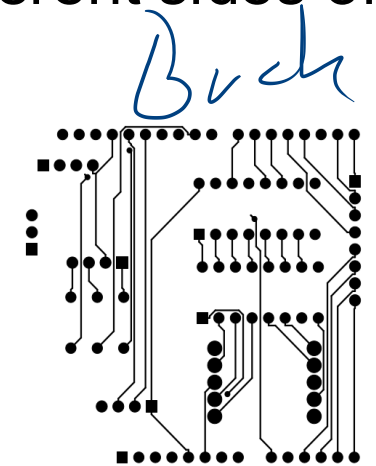
- Look just the same... just not plated



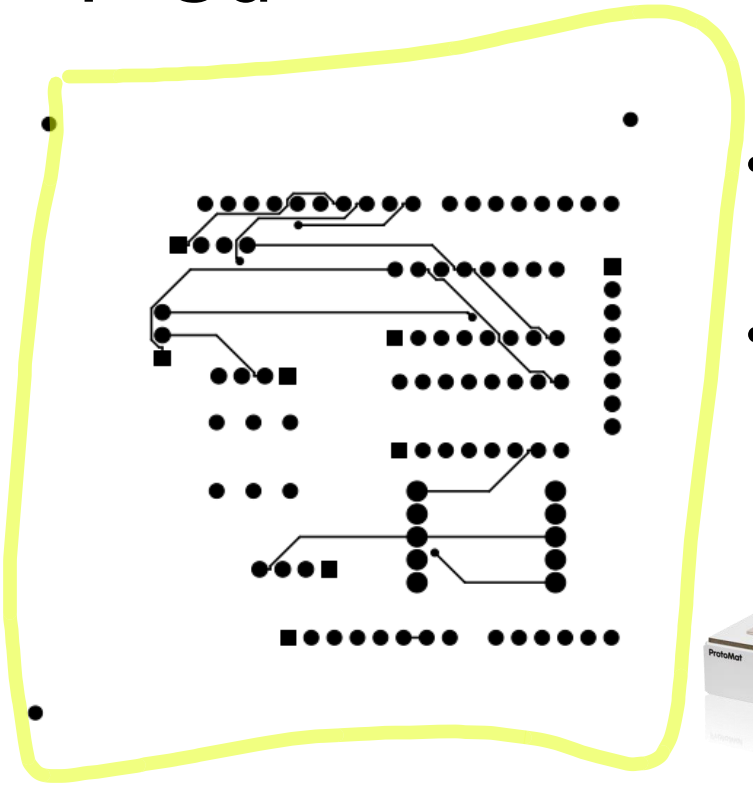
Front and Back Copper

- Require fiducials to align
- Looks similar, same process on different sides of board





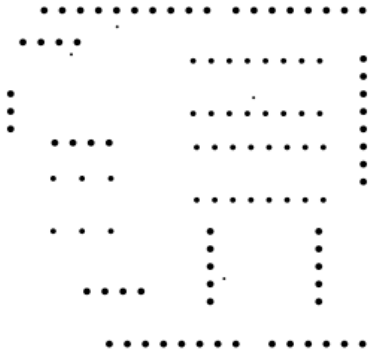
F-Cu



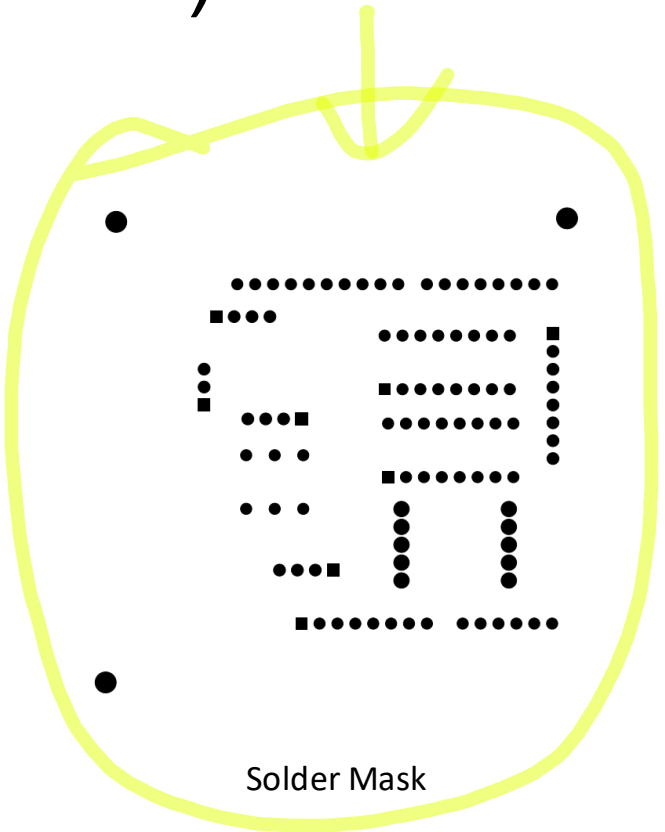
- Either mill this with Universial Cutter (depth matters!) OR Laser
- This is not the final tool path, just what needs isolating

Solder Resist Mask (Solder Mask)

- Paint the entire board
- Laser off the black parts



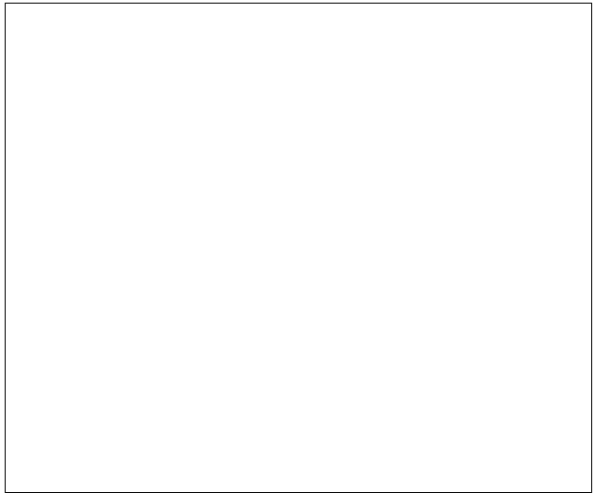
PTH



Solder Mask

Edge Cuts

- Board outline, again most of these are not the "tool path"



Tool Paths

- Specialty software (usually made by the machine manufacturer) generates "tool paths" from all previous files