Arduous Arduinos

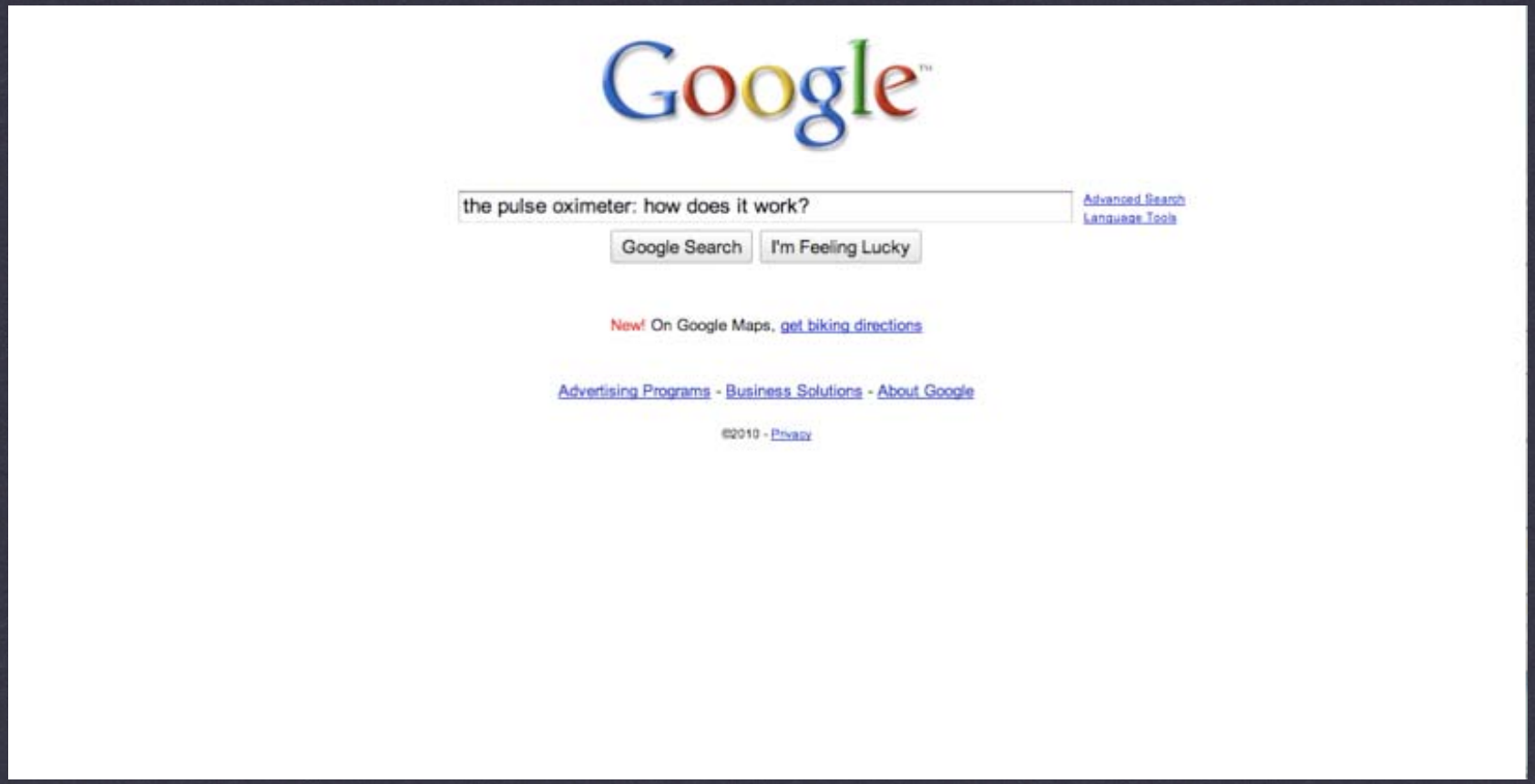
How can we make useful things?

Before we begin...

- Is there a need?
- How do we fill this need?
- Is technology appropriate for this need?

Example: Pulse Ox

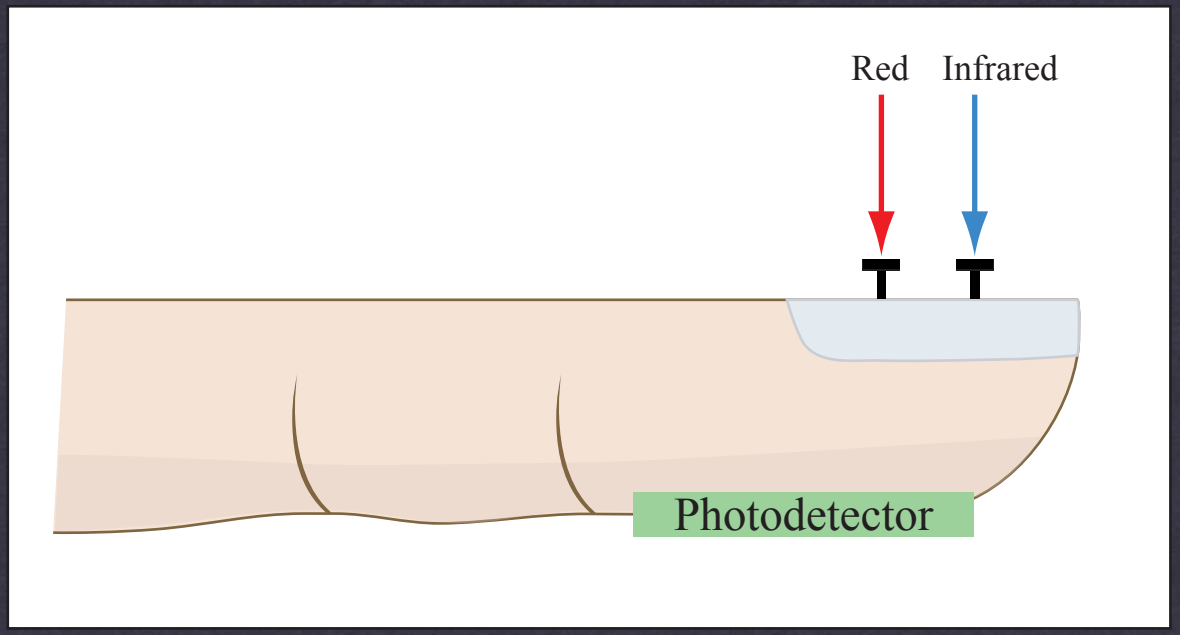
- Is there a need?
- How do we fill this need?
- Is technology appropriate for this need?



Courtesy of Google.com. Used with permission.

The pulse oximeter

how does it work?



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The pulse oximeter

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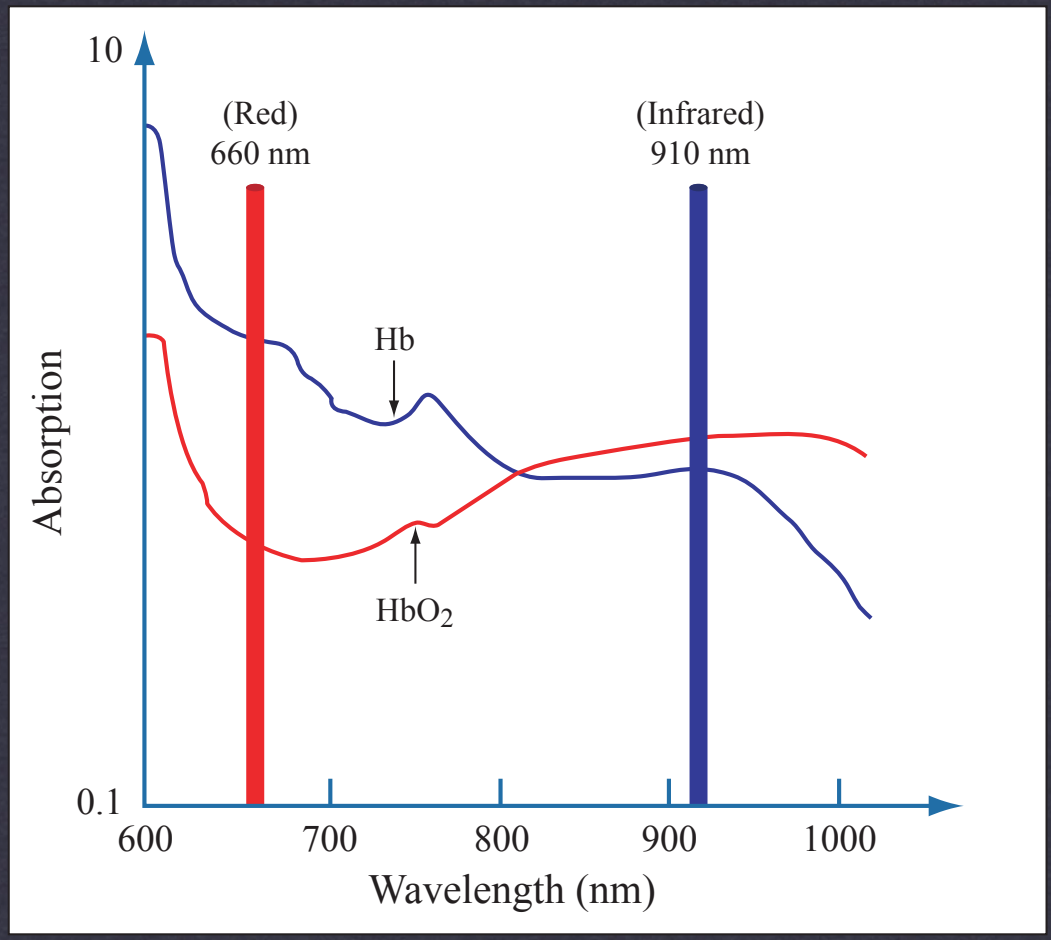


Image by MIT OpenCourseWare.

The pulse oximeter

how does it work?

How does it work?

- Shines light through a finger
- Measures light intensity
- Converts intensity into blood oxygen level

So what do we need?

- We need to shine a light through a finger
- We need to measure light intensity
- We need to display and record the collected data
- We need to convert intensity into blood oxygen level

Display and record?

- The world is complicated
- We can break complicated systems down into easier problems
- We can use same data for multiple projects

The pulse Oximeter

how we did it

So what do we need?

- We need to shine a light through a finger

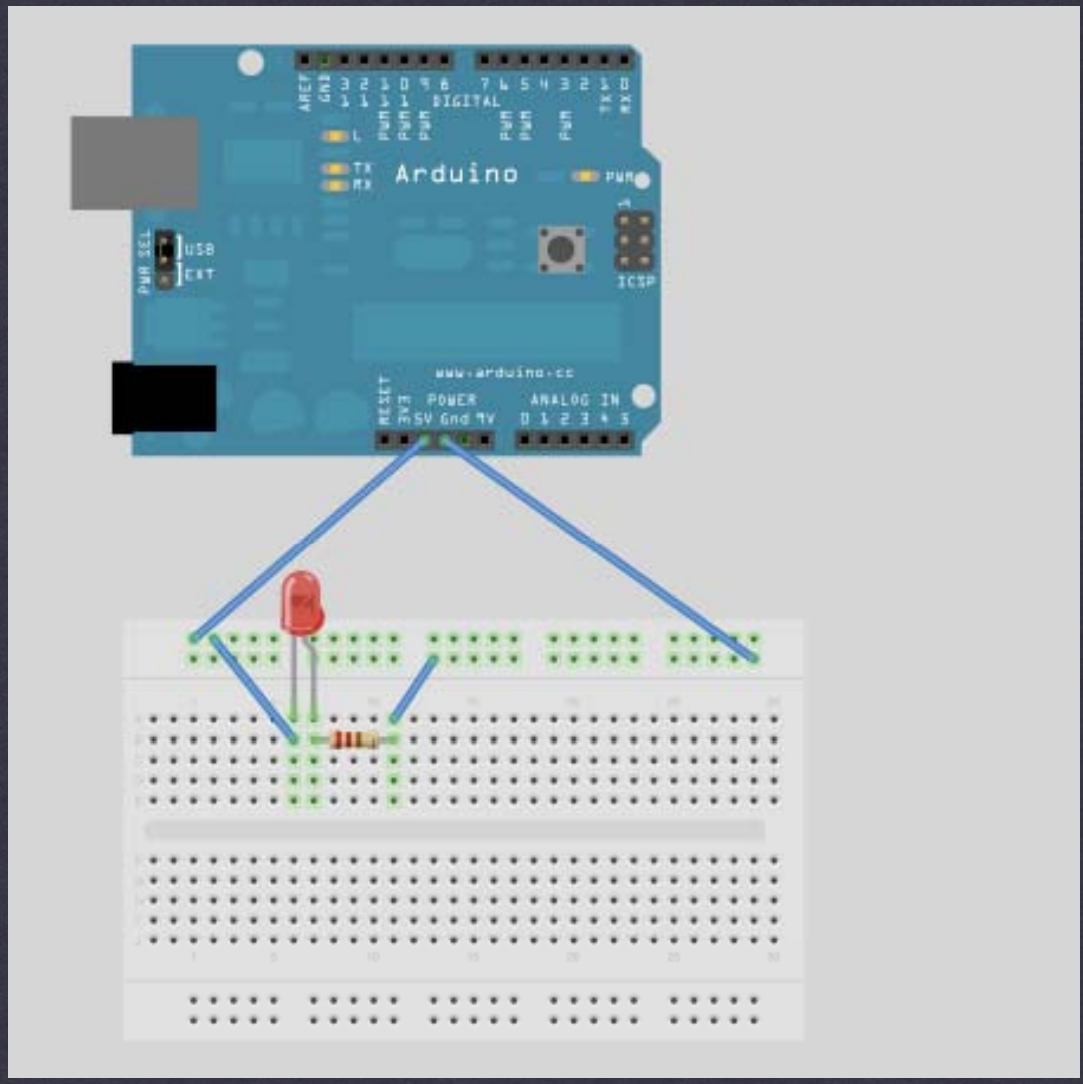


Image made using http://fritzing.org/

light through a finger

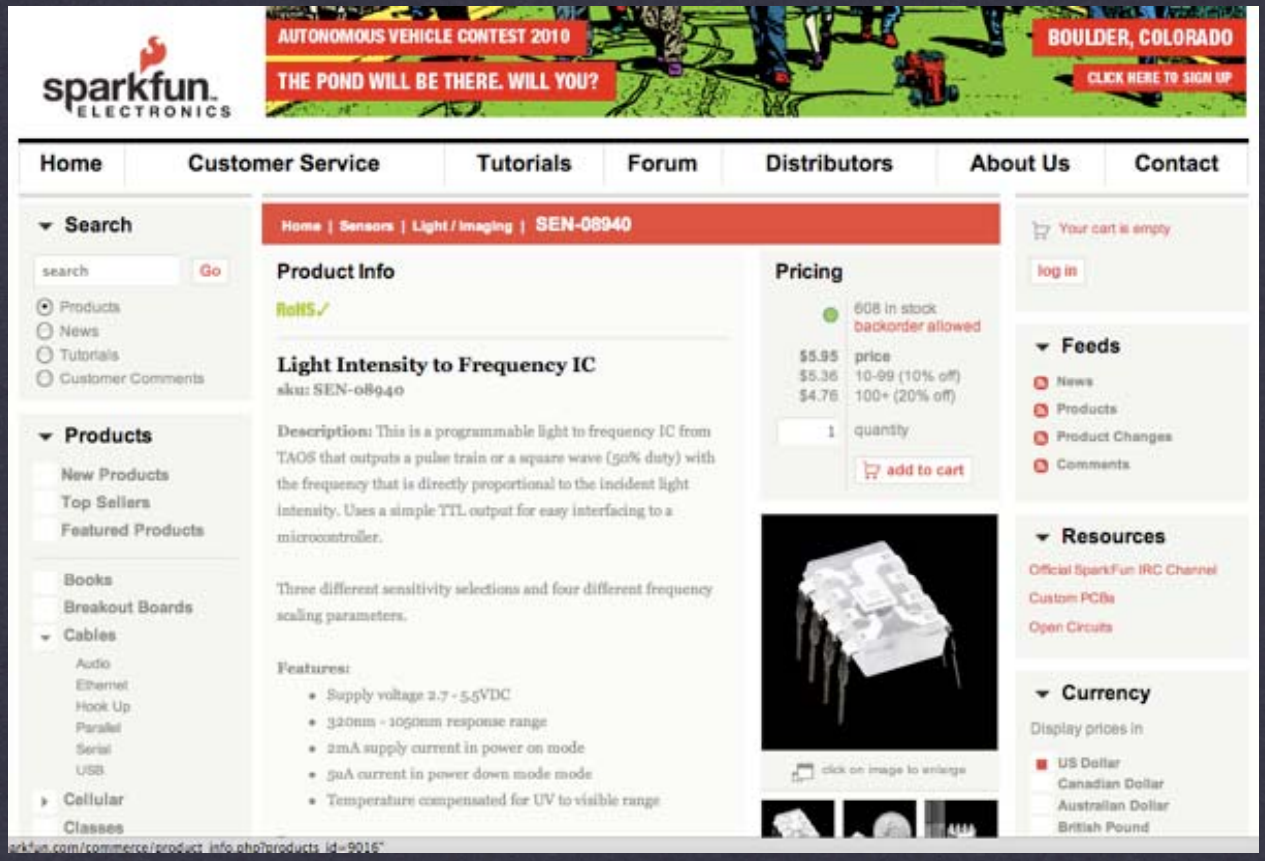
how we did it

burn Through a finger

how We screwed up

So what do we need?

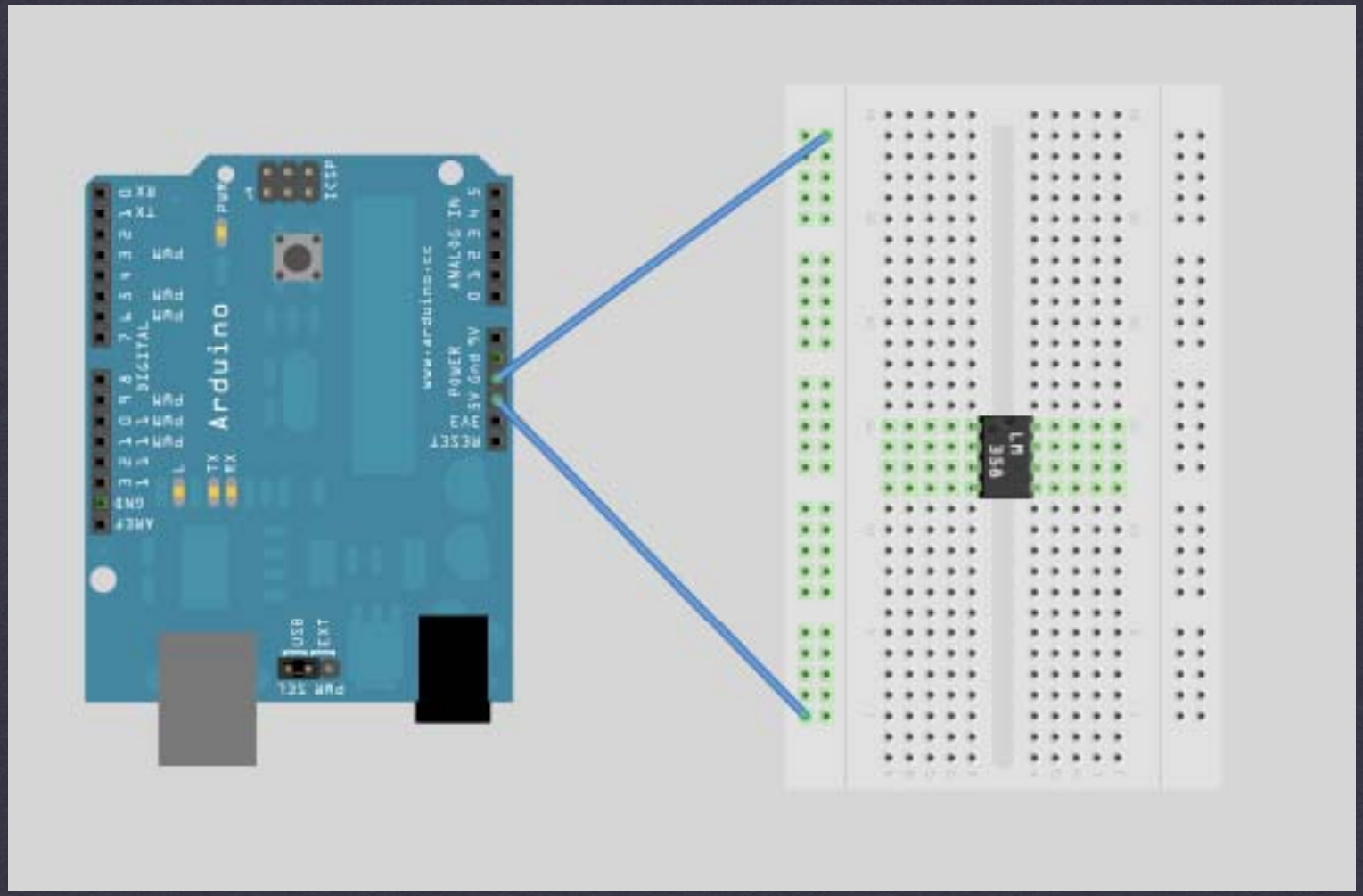
- We need to shine a light through a finger
- We need to measure light intensity



Courtesy of SparkFun Electronics. Used with permission.

Measuring the light

how we did it



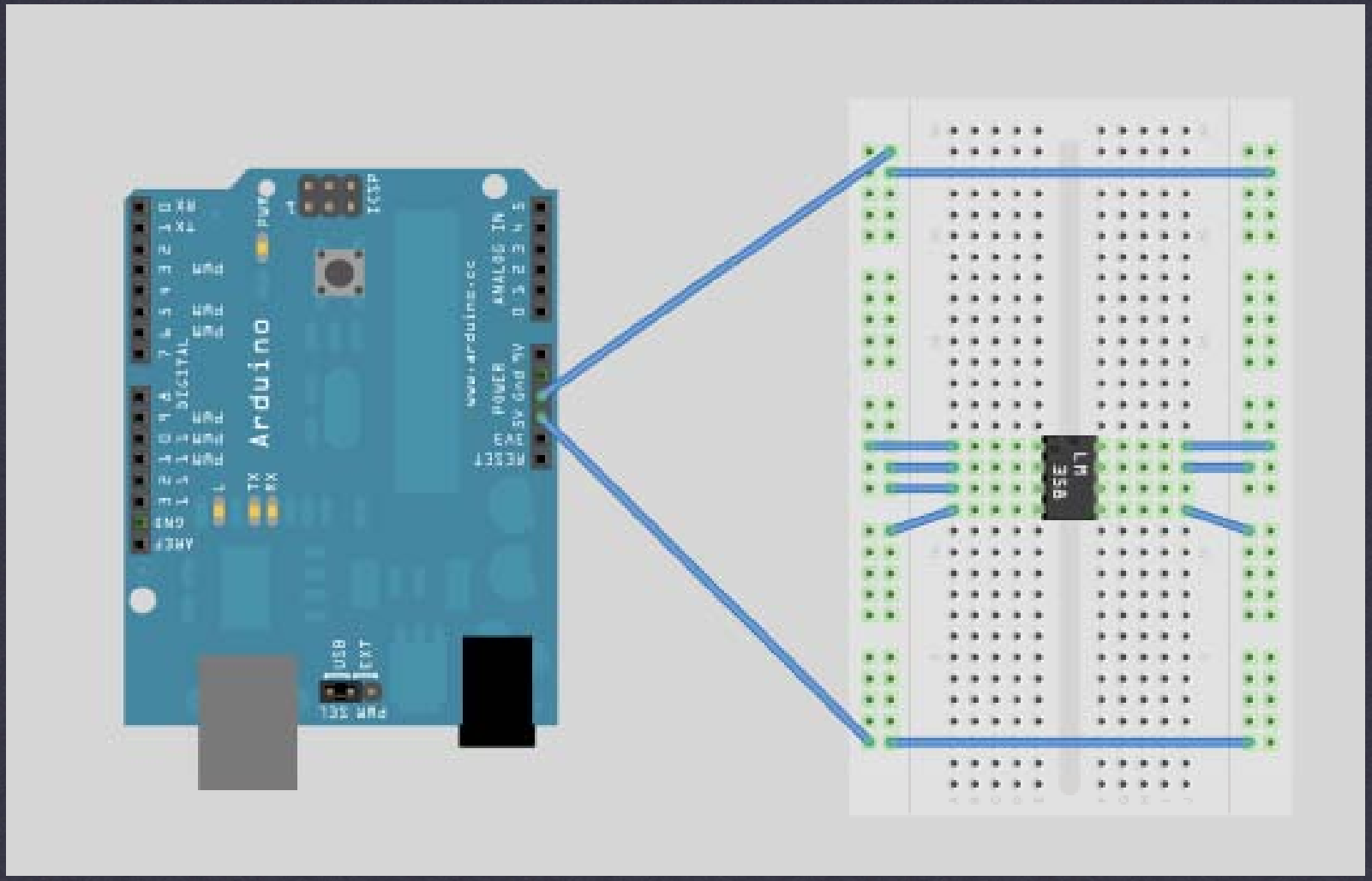
Measuring the light

how we did it

Excerpts from TAOS Inc. product spec sheets removed due to copyright restrictions.
See Programmable Light-to-Frequency Converters spec sheets TSL230R-LF, TSL230AR-LF, and TSL230BR-LF.

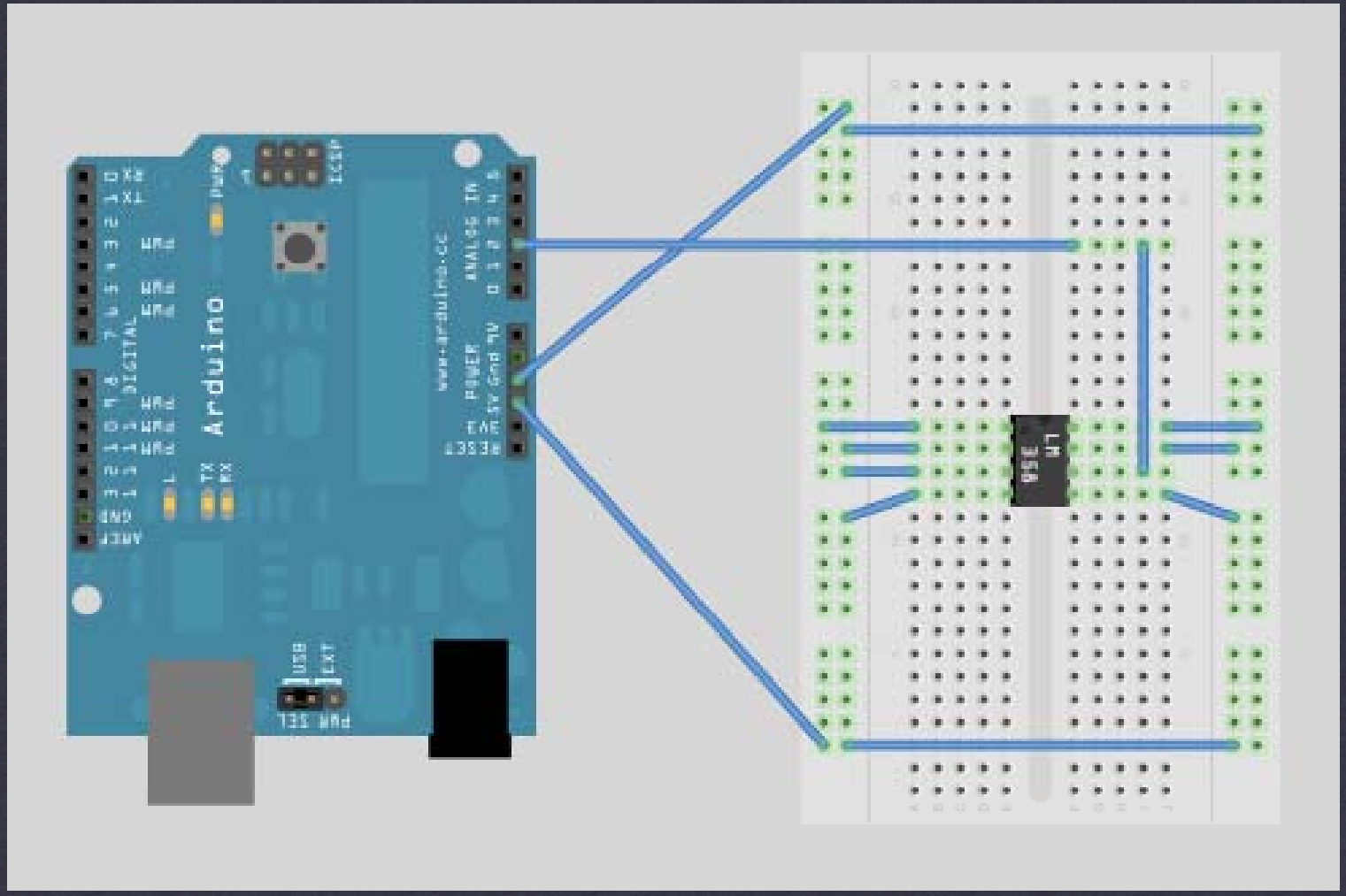
Measuring the light

how we did it



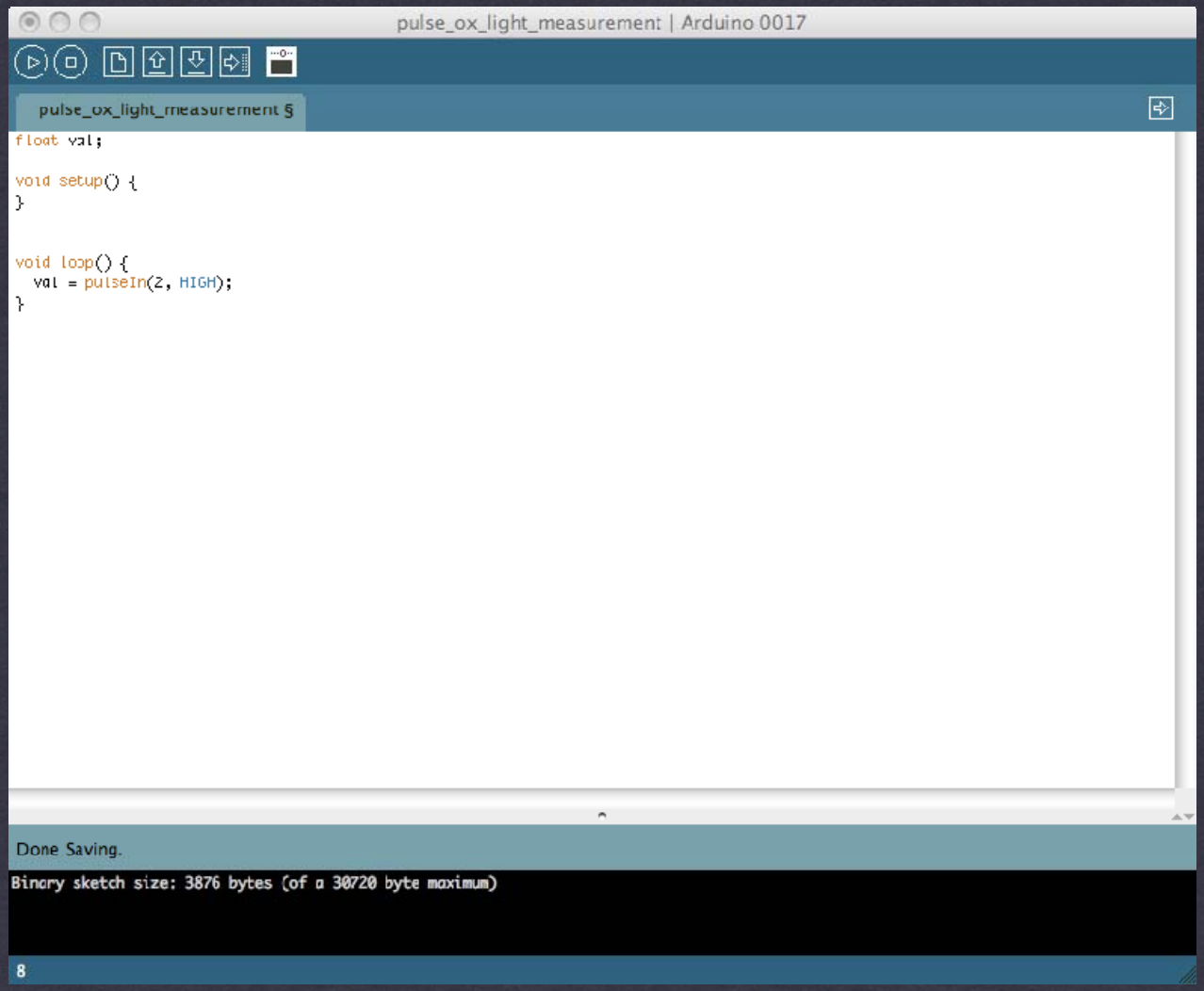
Measuring the light

how we did it



Measuring the light

how we did it



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how we did it

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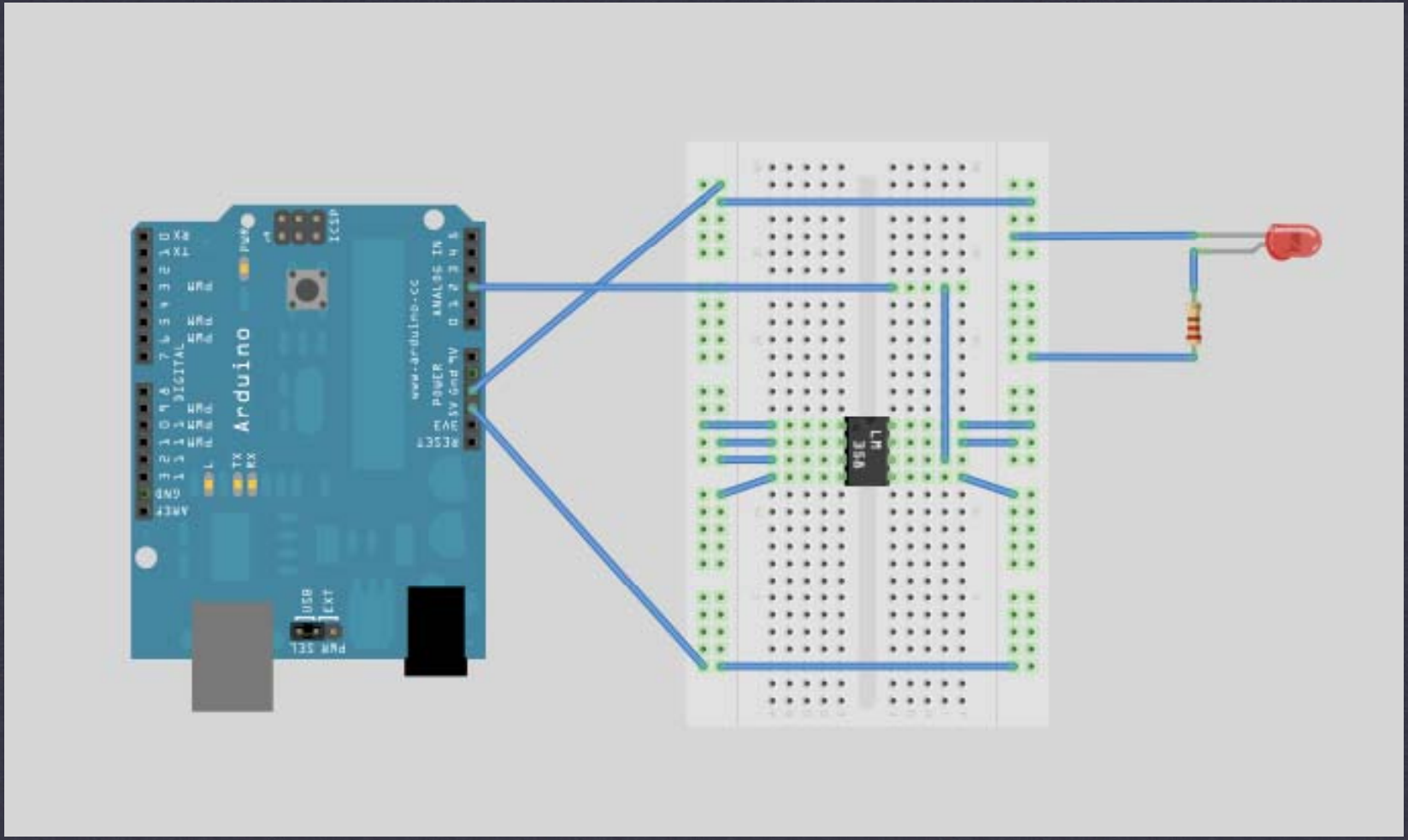
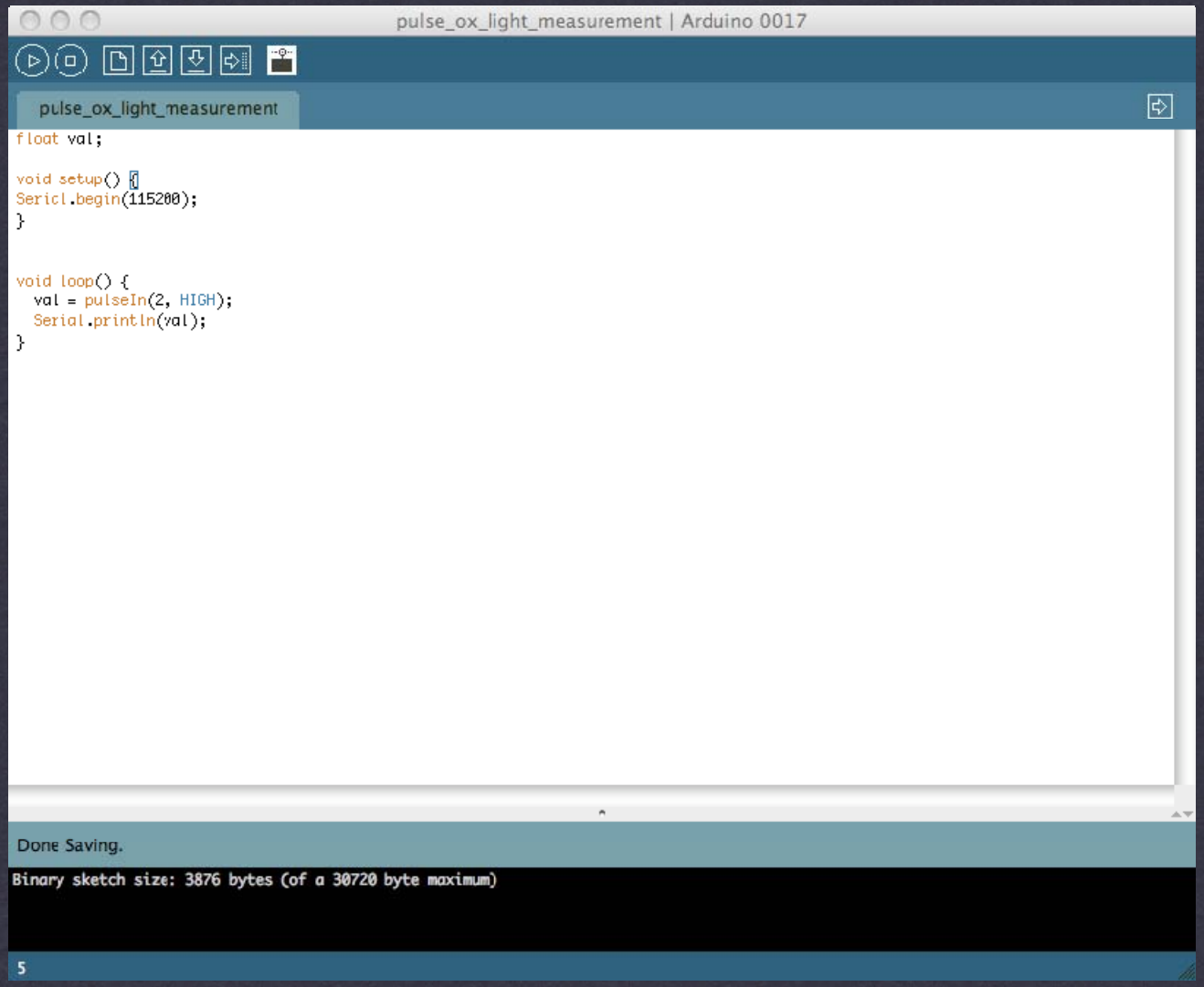


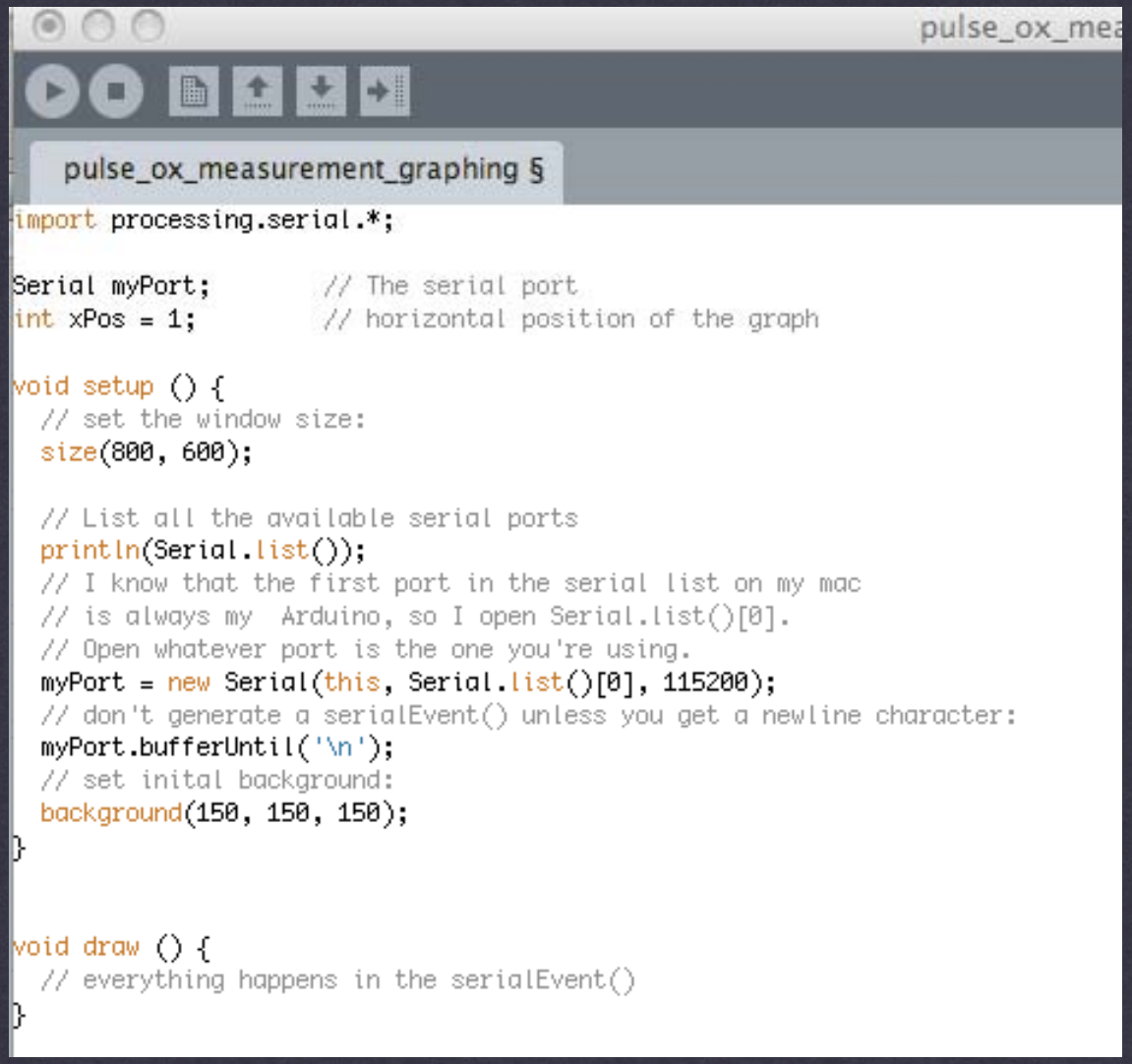
graphing and storing

how we did it



graphing and storing

how we did it



graphing and storing

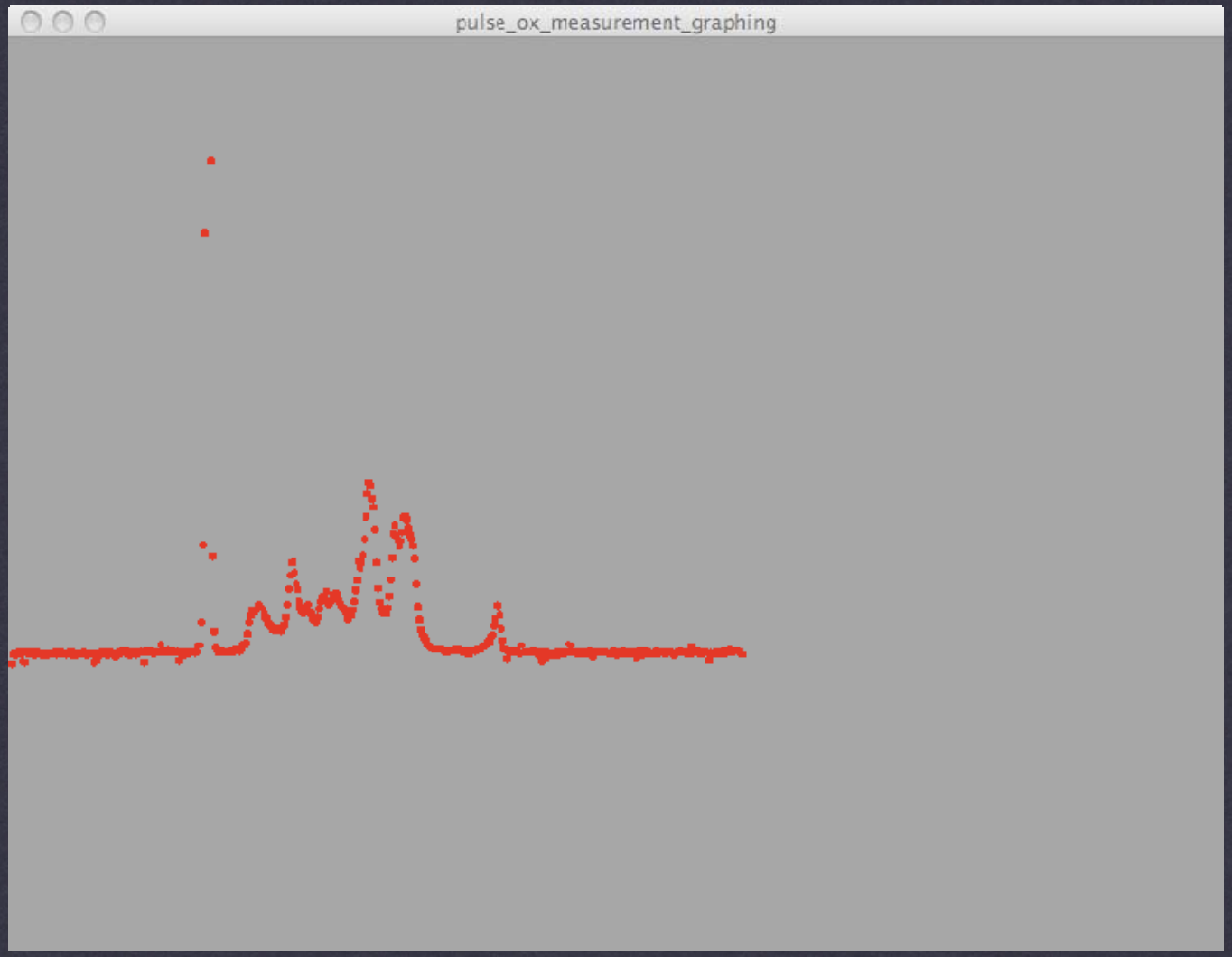
how we did it

```
void serialEvent (Serial myPort) {
  // get the ASCII string:
  String inString = myPort.readStringUntil('\n');

  if (inString != null) {
    // trim off any whitespace:
    inString = trim(inString);
    // convert to an int and map to the screen height:
    float inByte = float(inString);
    inByte = map(inByte, 0, 1023, 0, height);
    inByte = inByte/60;
    // draw the line:
    stroke(255,0,0);
    strokeWeight(4);
    strokeJoin(ROUND);
    strokeCap(ROUND);
    line(xPos, height - inByte, xPos, height - inByte);

    // at the edge of the screen, go back to the beginning:
    if (xPos >= width) {
      xPos = 0;
      background(150, 150, 150);
    }
    else {
      // increment the horizontal position:
      xPos++;
    }
  }
}
```

```
Done Saving.
[4] "/dev/tty.Bluetooth-Modem"
[5] "/dev/cu.Bluetooth-Modem"
Experimental:  JNI_OnLoad called.
26
```

graphing and storing

how we did it



graphing and storing

how we did it

So what do we need?

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How do we get the blood oxygen level?

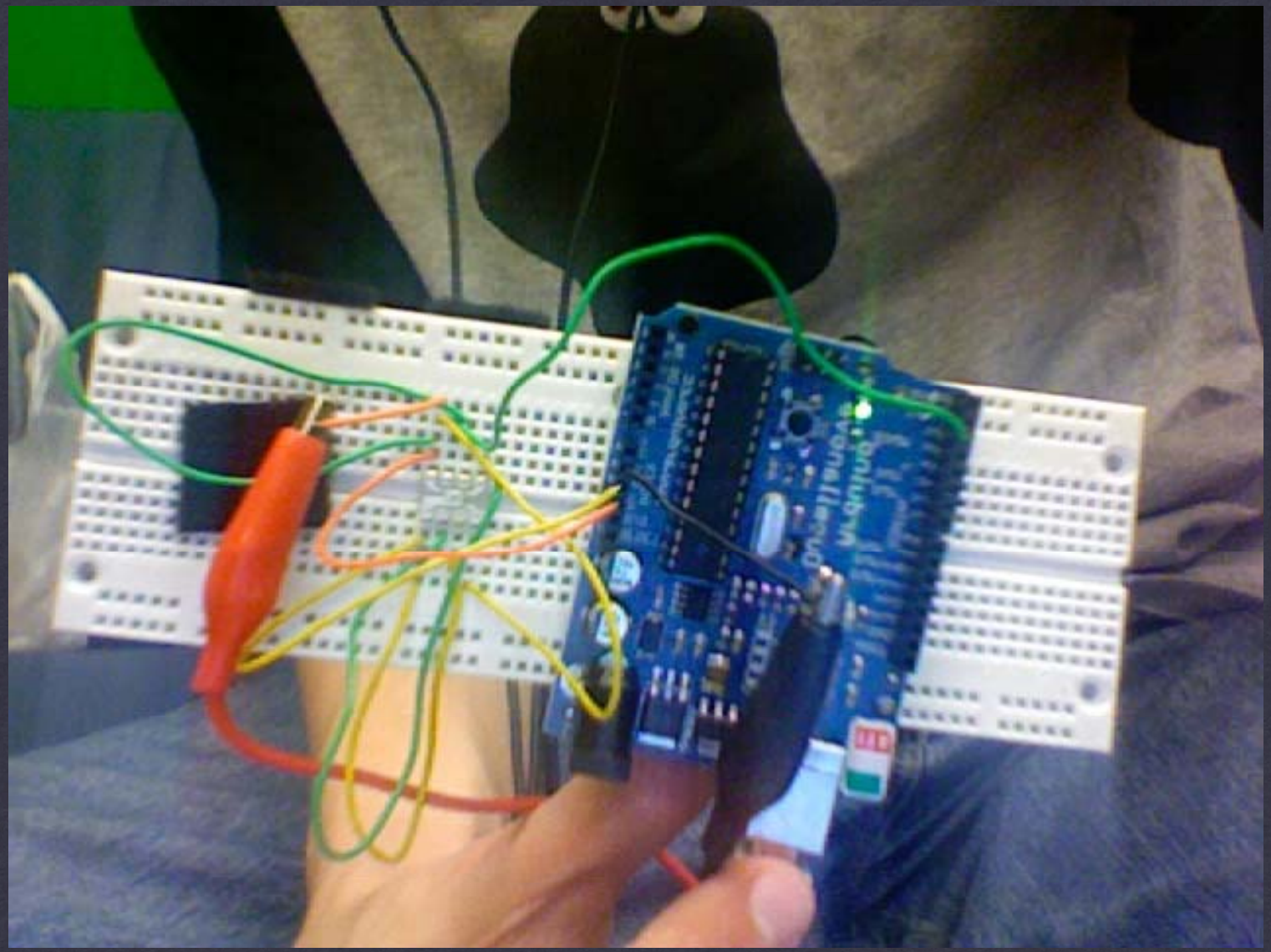
- Process the data!
- Conditional statements (if)
- Control statements (while, for)
- Translating the abstract problem into a logical one

How can I learn about programming?

- Websites (Processing, Python, C)
- Books (O’Reilly collection is free!)
- Ask a friend

Main Ideas

- Understand the problem
- Break down the problem
- Design each block
- Experiment!



Questions?

I can’t have possibly explained everything in the right way to everyone

SURPRISE!

Now you have to build the system

EC.710 D-Lab: Medical Technologies for the Developing World

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