

Fun with Linux and Devices

by Akkana Peck



DANGER

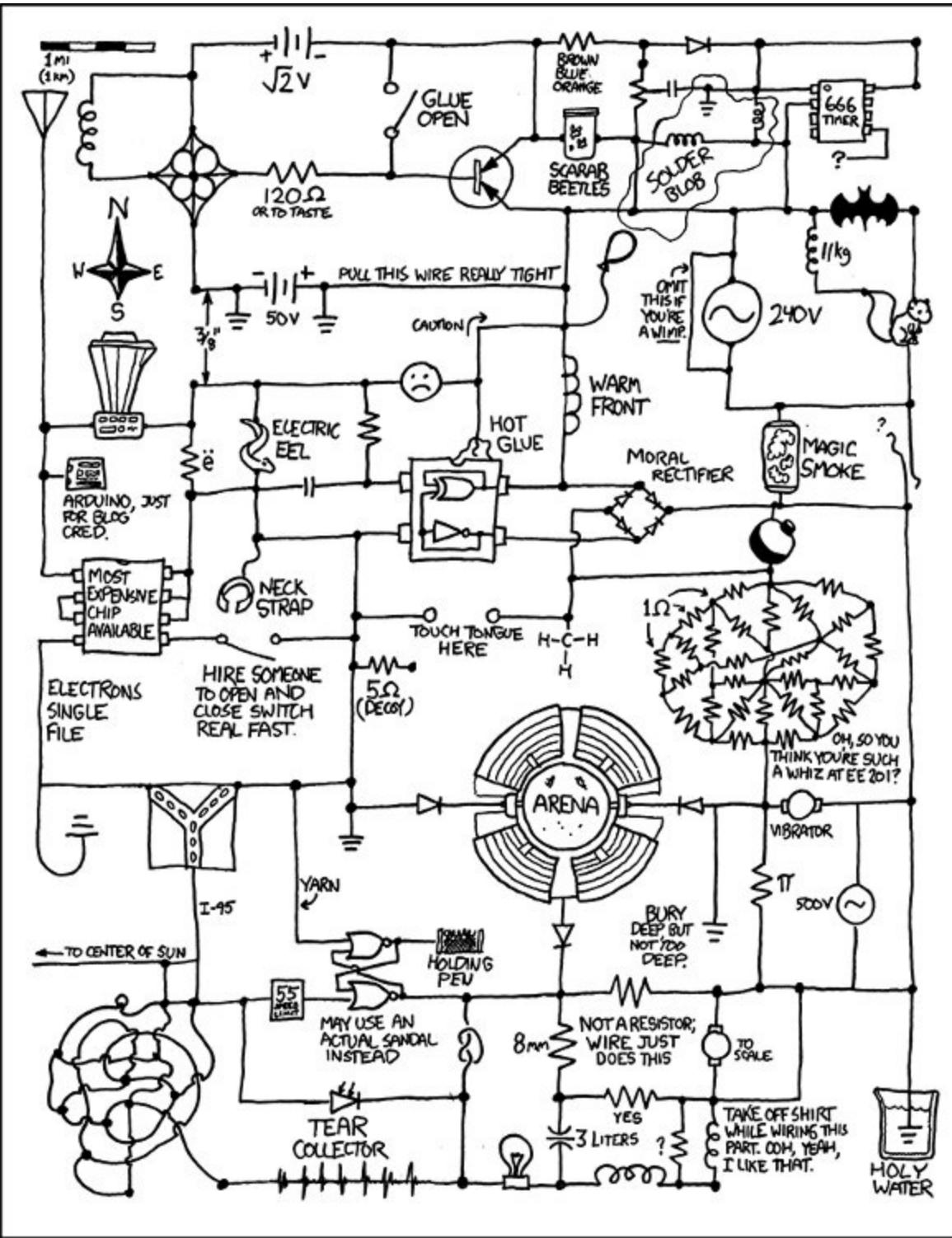
HIGH VOLTAGE

ABOVE

KEEP OFF

PACIFIC GAS AND ELECTRIC COMPANY





The Anthrax Killer:
Did They Get
the Wrong Guy?

The Cocaine
Smuggler's
Submarine

10 Cool New
Gadgets, Tested
and Rated

INSIDE
THE SHAKE-UP
AT GOOGLE

WIRED

The DIY
Revolution
Starts Now

HOW TO **Make** **Stuff**

25 AWESOME PROJECTS

under construction | APR 2011

If You
Can
Think It,
You Can
Build It!

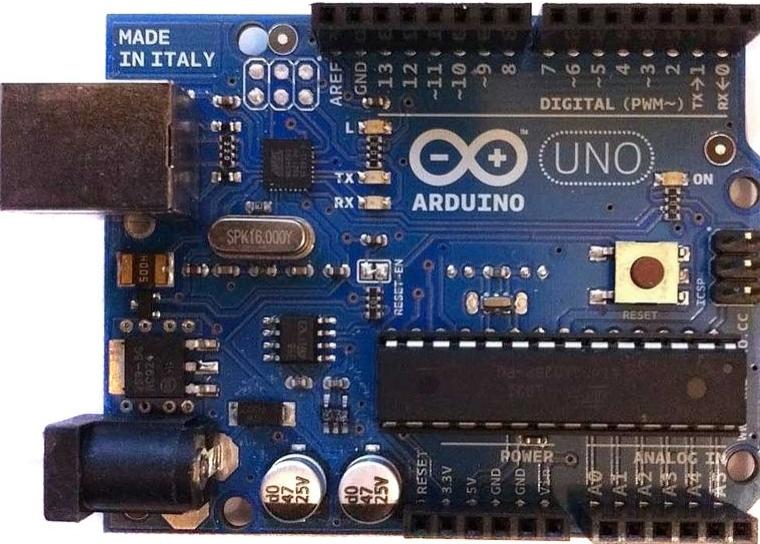


Maker hero
Liam Field

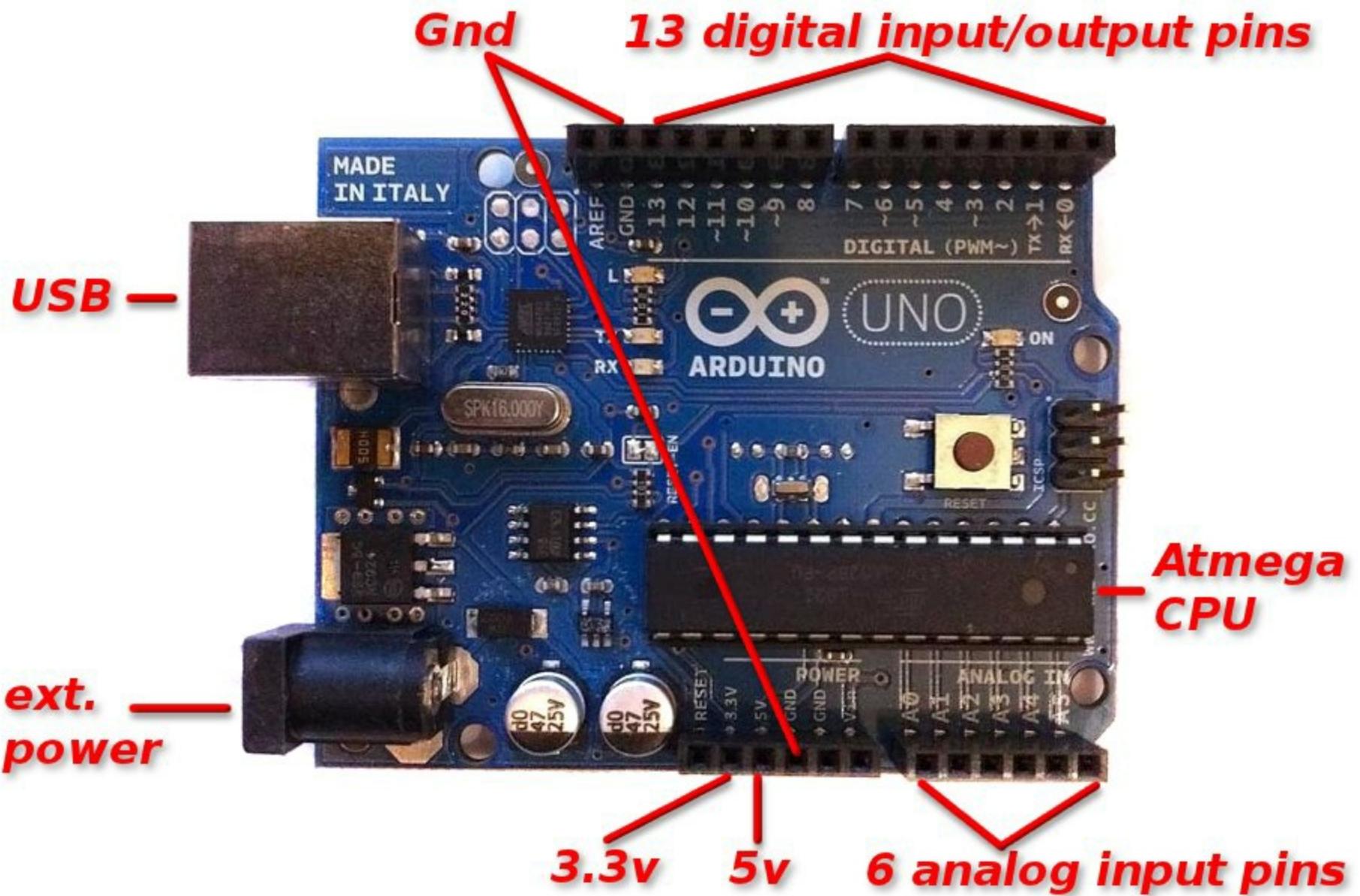


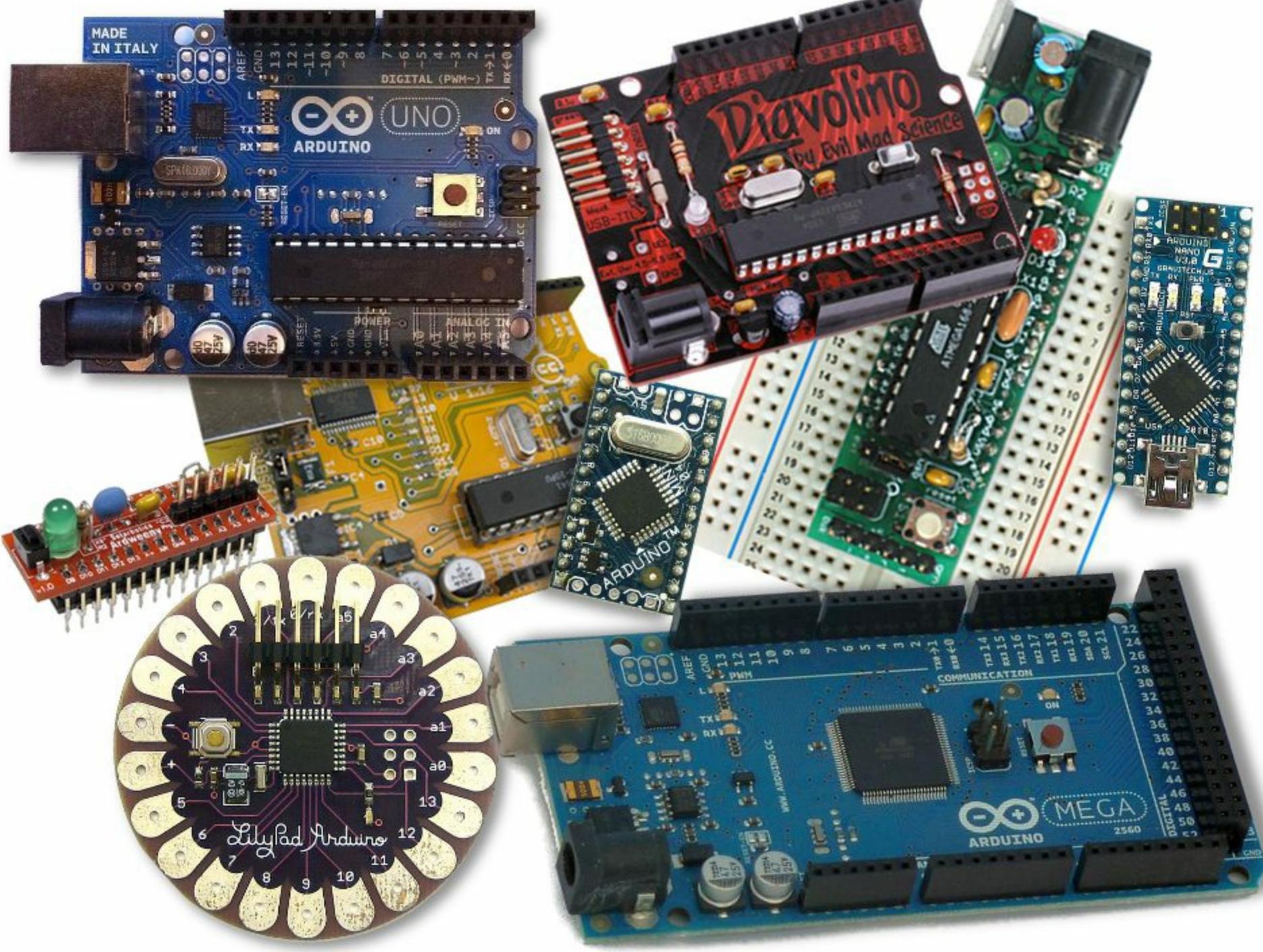


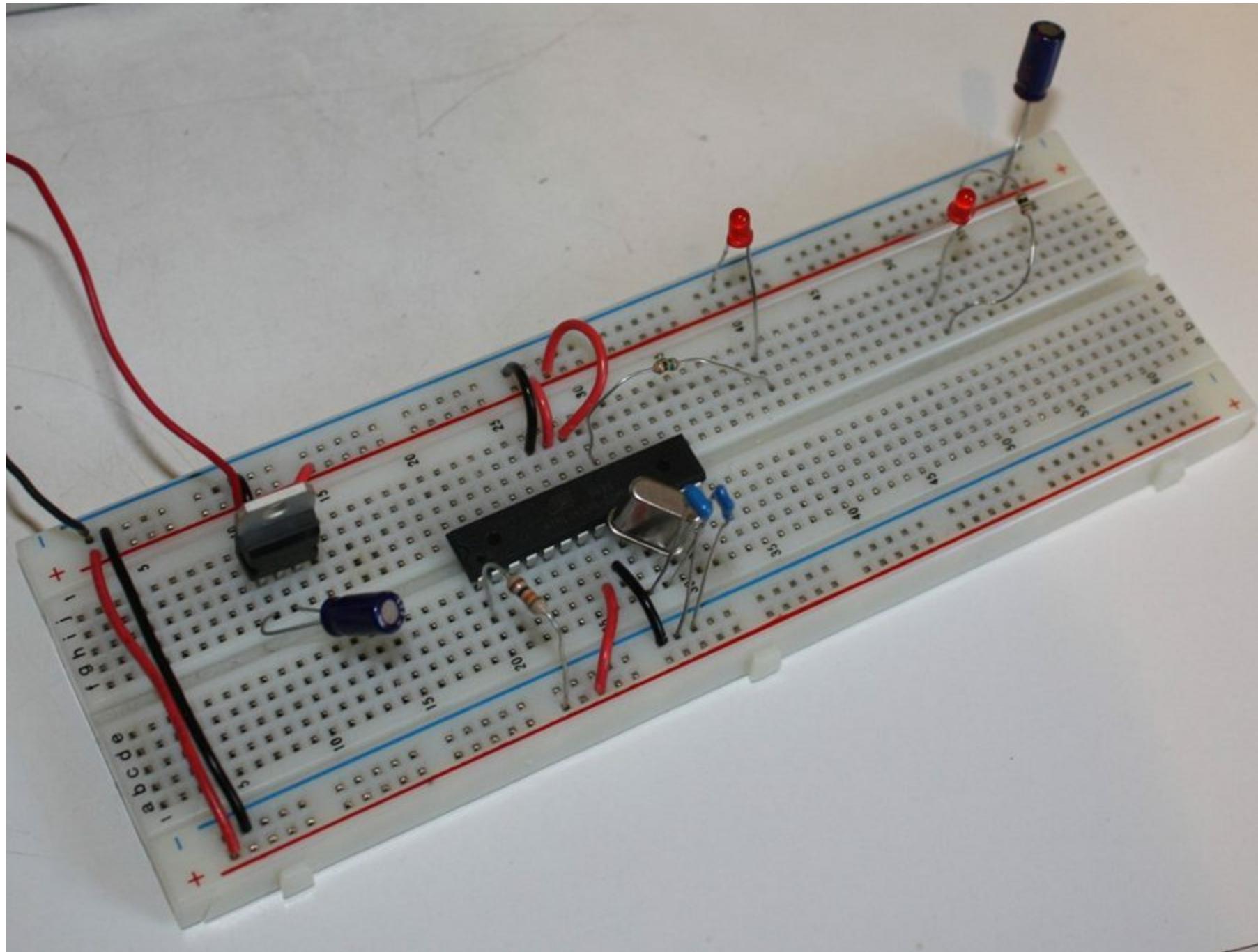
Arduino

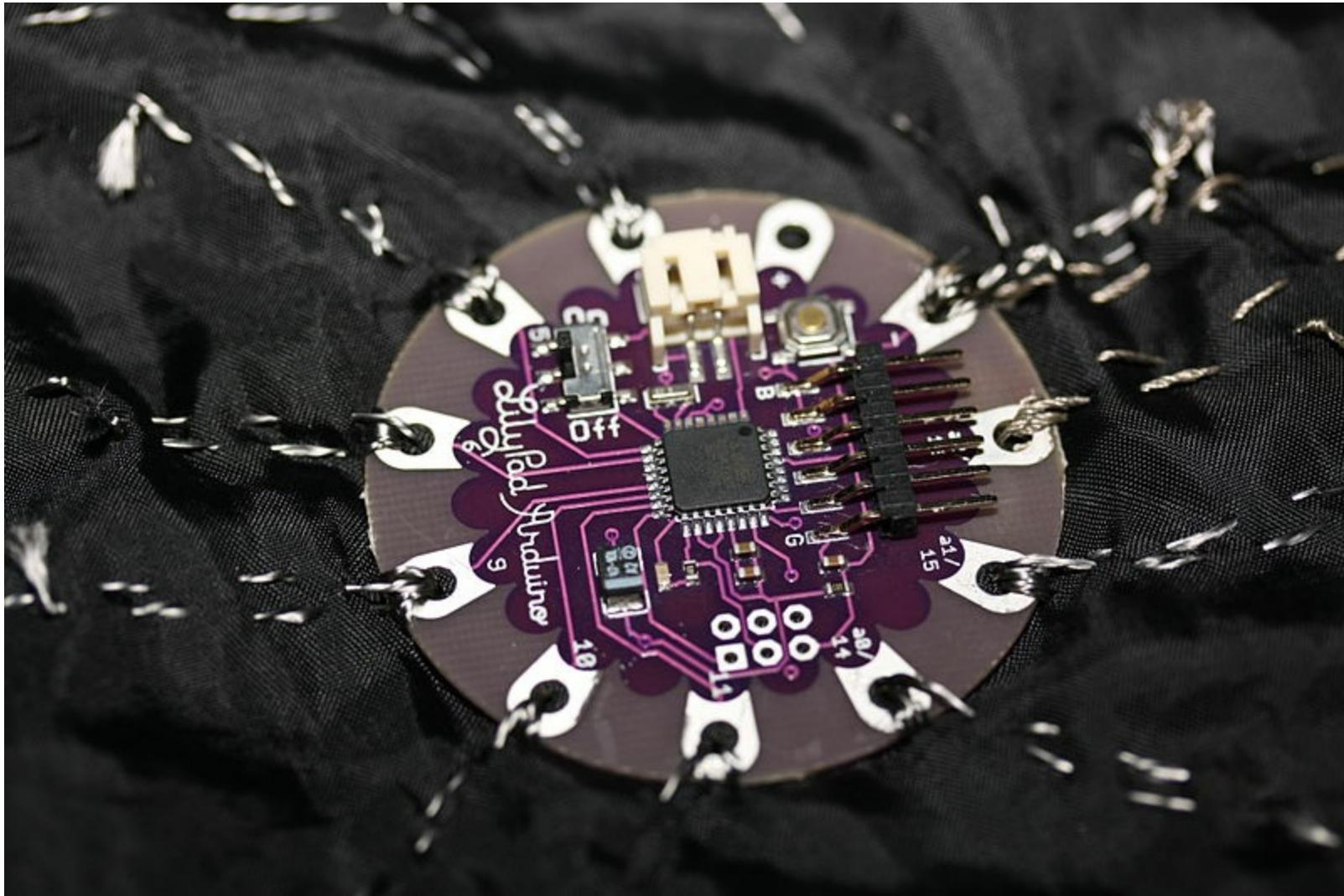


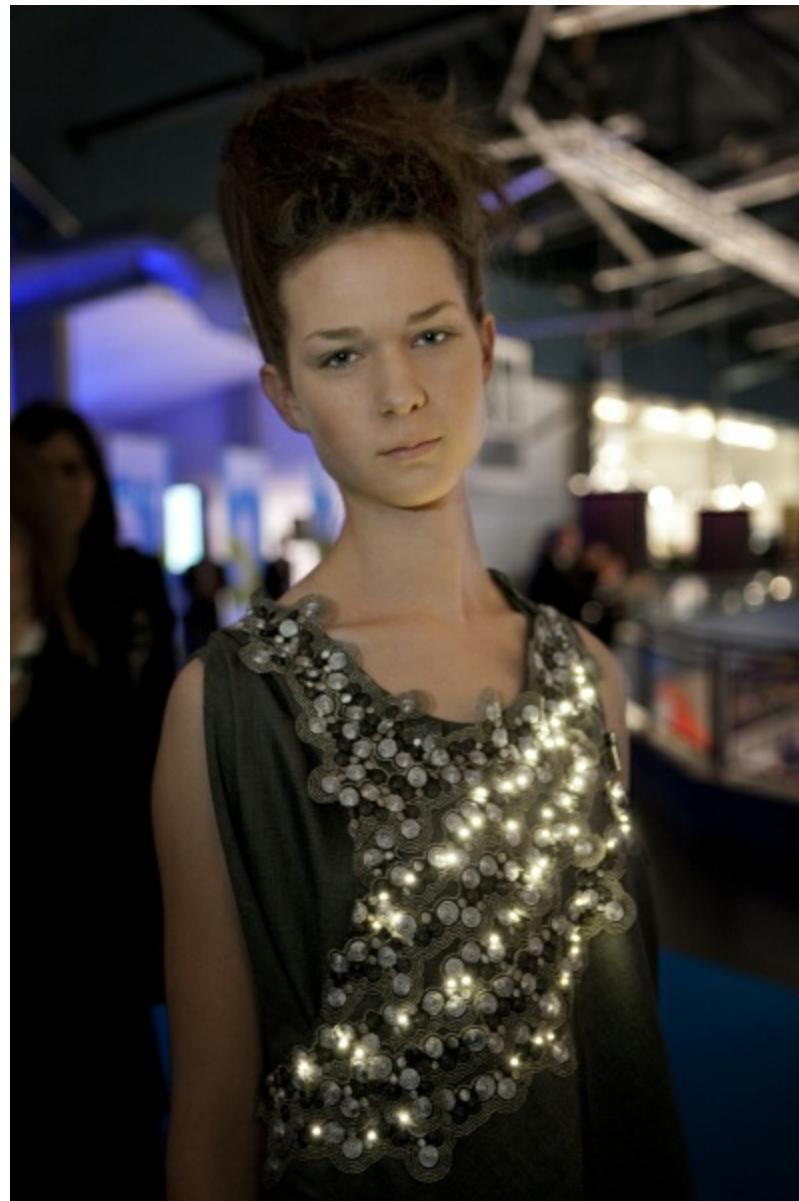
- Digital/analog I/O
- \$30 for base model
- Open-source hardware





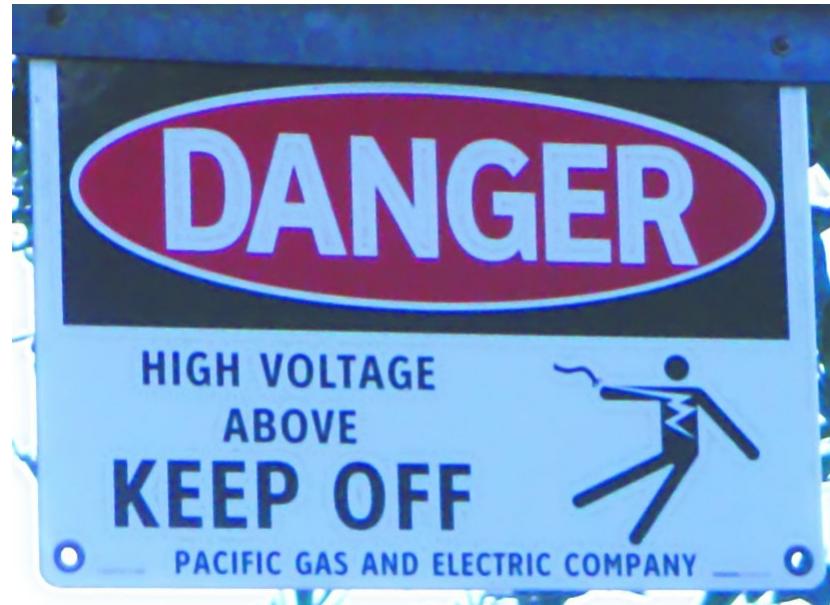




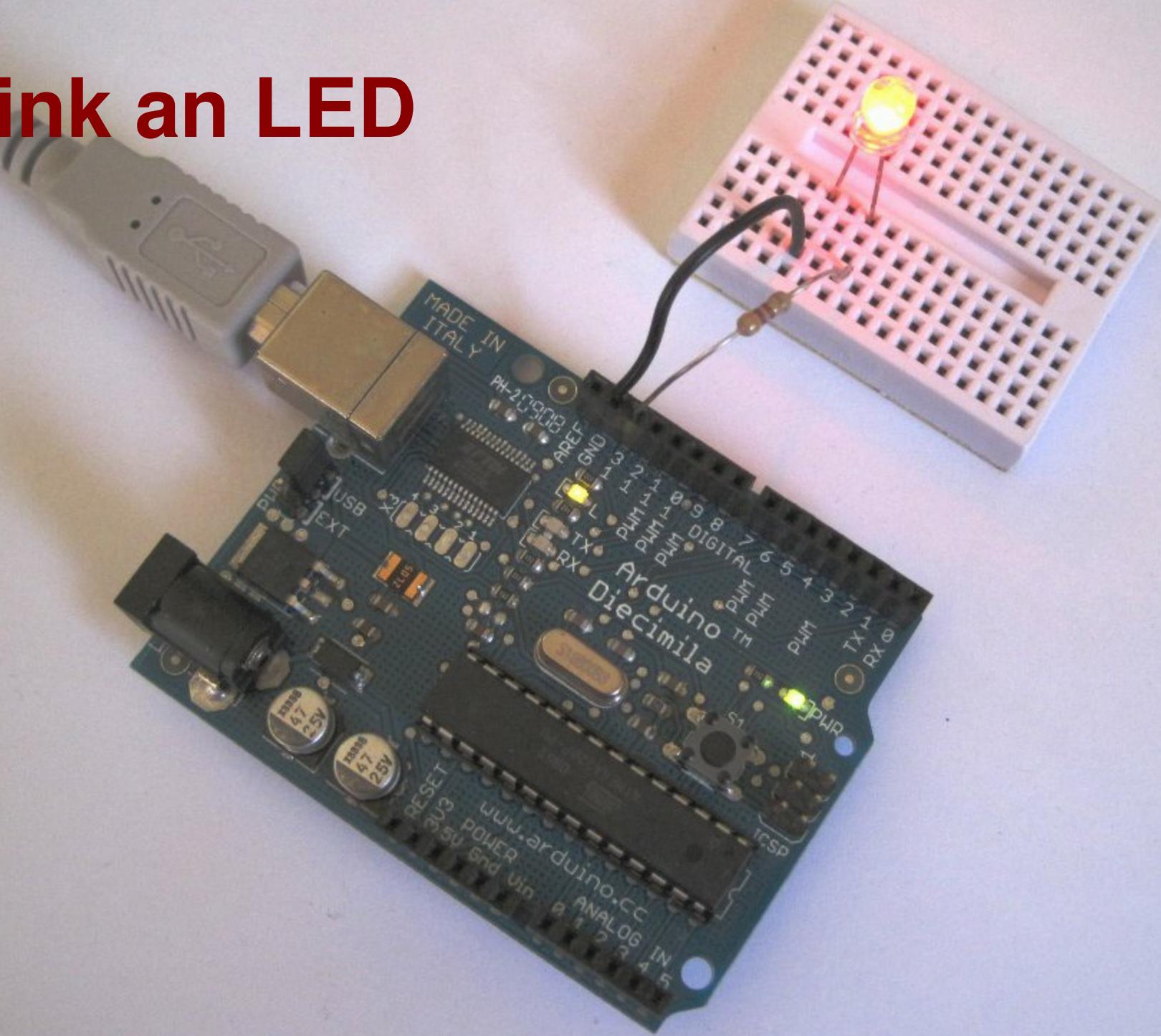




Getting started



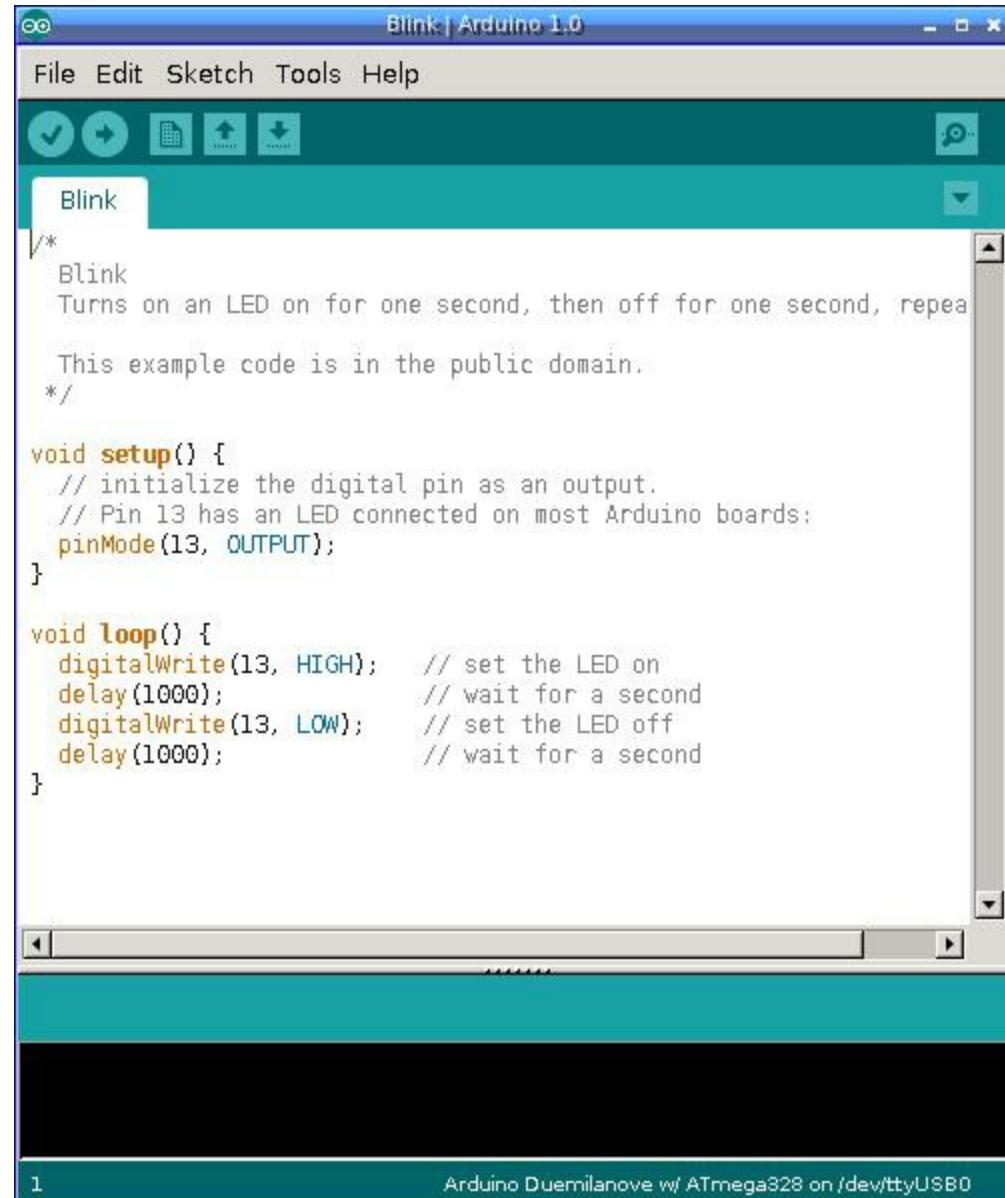
Blink an LED



The Arduino IDE

Lots of examples.

Start with:
File
↳ *Examples*
↳ *Basic*
↳ *Blink*



The screenshot shows the Arduino IDE interface with the title bar "Blink | Arduino 1.0". The menu bar includes File, Edit, Sketch, Tools, and Help. Below the menu is a toolbar with icons for file operations. A central code editor window displays the "Blink" sketch. The code is as follows:

```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeating the process forever. This example code is in the public domain.

void setup() {
  // initialize the digital pin as an output.
  // Pin 13 has an LED connected on most Arduino boards:
  pinMode(13, OUTPUT);
}

void loop() {
  digitalWrite(13, HIGH);      // set the LED on
  delay(1000);                // wait for a second
  digitalWrite(13, LOW);       // set the LED off
  delay(1000);                // wait for a second
}
```

The status bar at the bottom indicates "Arduino Duemilanove w/ ATmega328 on /dev/ttyUSB0".

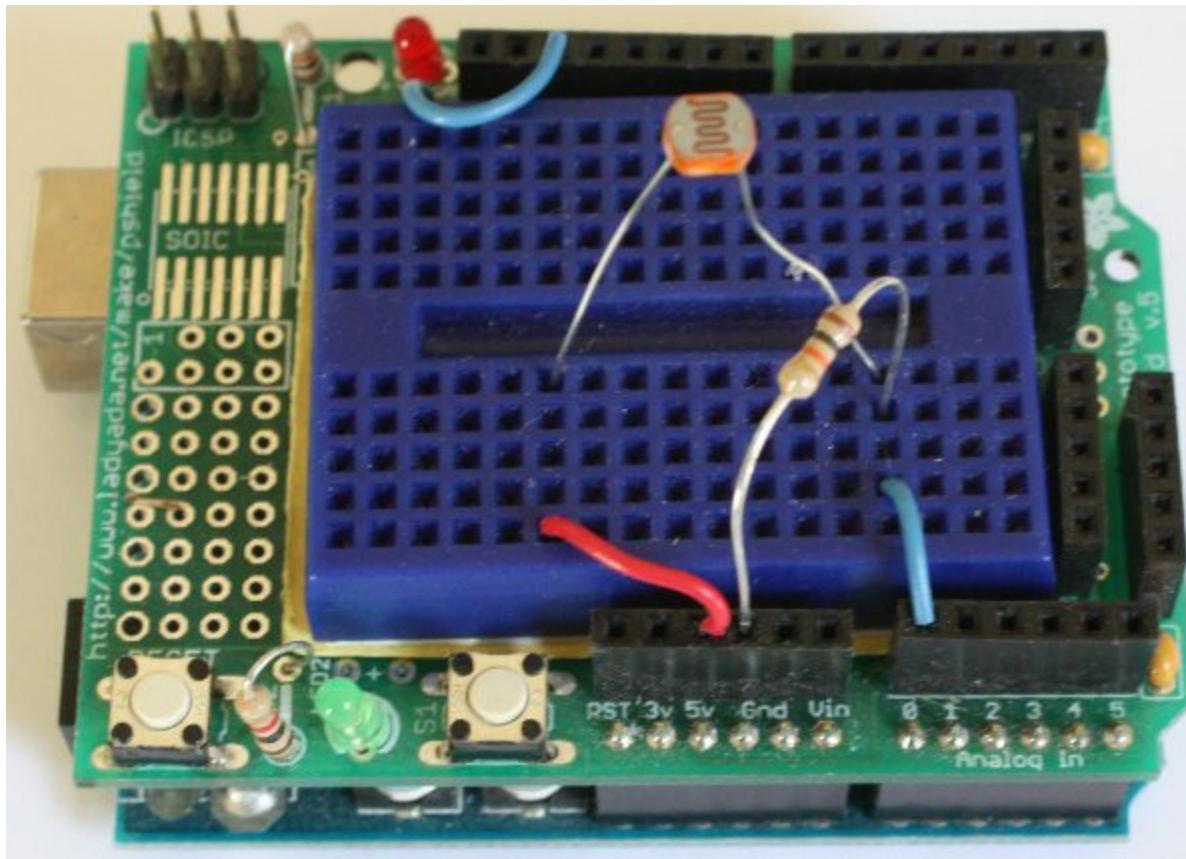
Powerswitch tail



Sensors

What kinds of devices
can you talk to?

Light sensor



Sonar rangefinder



Serial from Arduino

```
int sensorPin = 1;

void setup()
{
    Serial.begin(9600);
}

void loop()
{
    int val = analogRead(sensorPin);
    Serial.println(val);
    delay(500);
}
```

Serial pins

Arduino uses digital pins
0 and 1 for serial.

Don't use them for something else!

(when doing serial I/O)

Command-line development

Packages:

*gcc-avr, avr-libc, binutils-avr
avrdude*

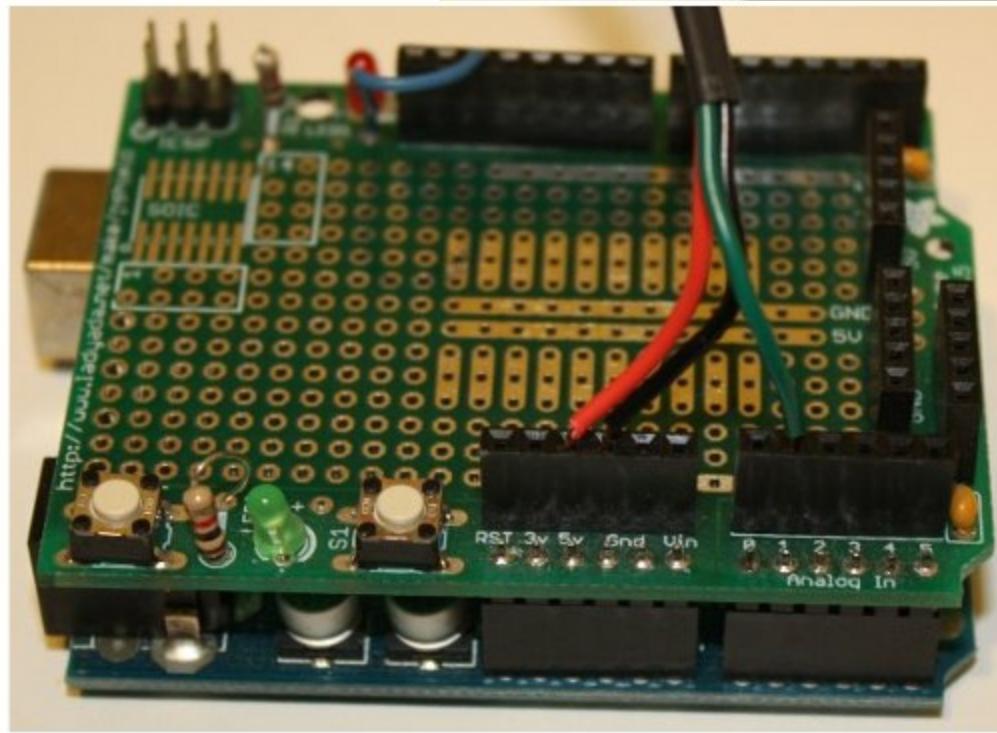
Need a Makefile and the Arduino
libraries.

Serial from Python

```
import serial

ard = serial.Serial("/dev/ttyACM0",
                    9600)
# Also try ttyACM1, ttyUSB0, etc.

while True :
    print ard.readline()
```





USB

fswebcam



python *USB*



Graphical output

Arduinoscope!

```
void setup() {  
    Serial.begin(115200);  
}  
  
void loop() {  
    // read all analog ports, split by " "  
    for (int i=0; i<6; i++) {  
        Serial.print(analogRead(i));  
        Serial.print(" ");  
    }  
    Serial.println();  
}
```

Graphical output

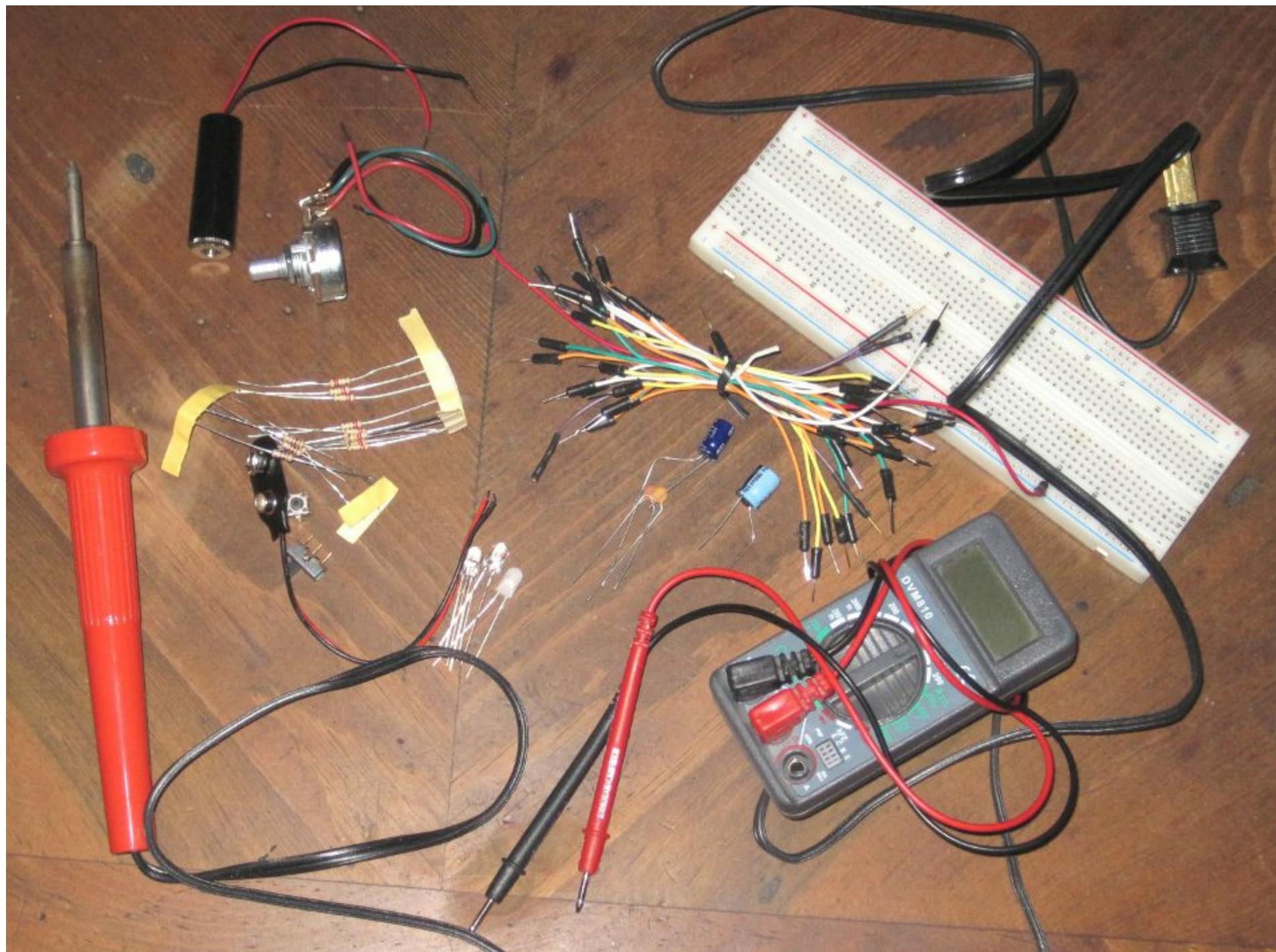
Processing.org:
most common
way.

Anything works!
C, python, ruby,
gnuplot etc.

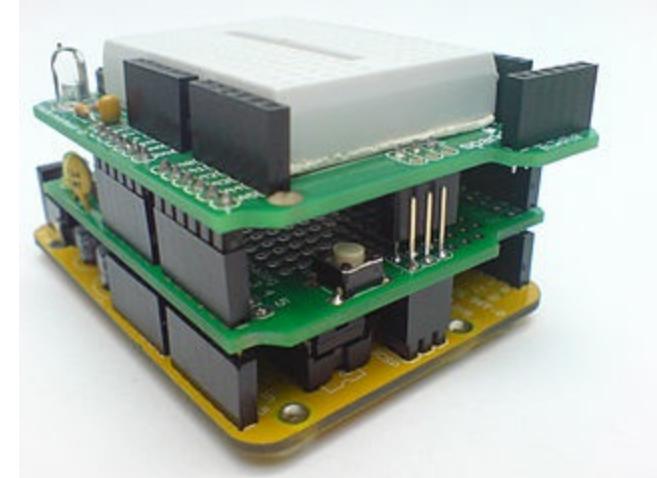


You're just reading/plotting serial data.

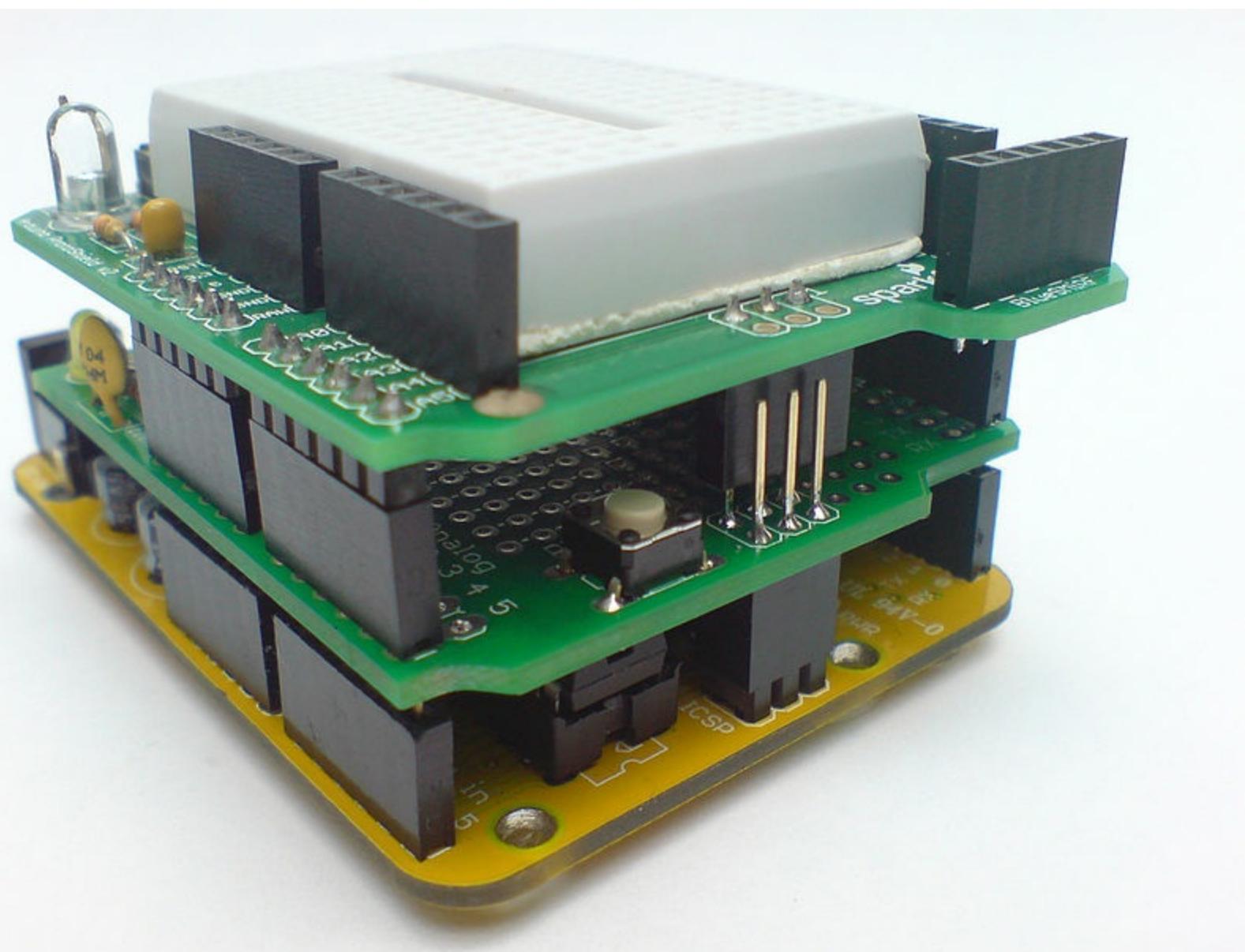
Cool hardware



Special-purpose shields



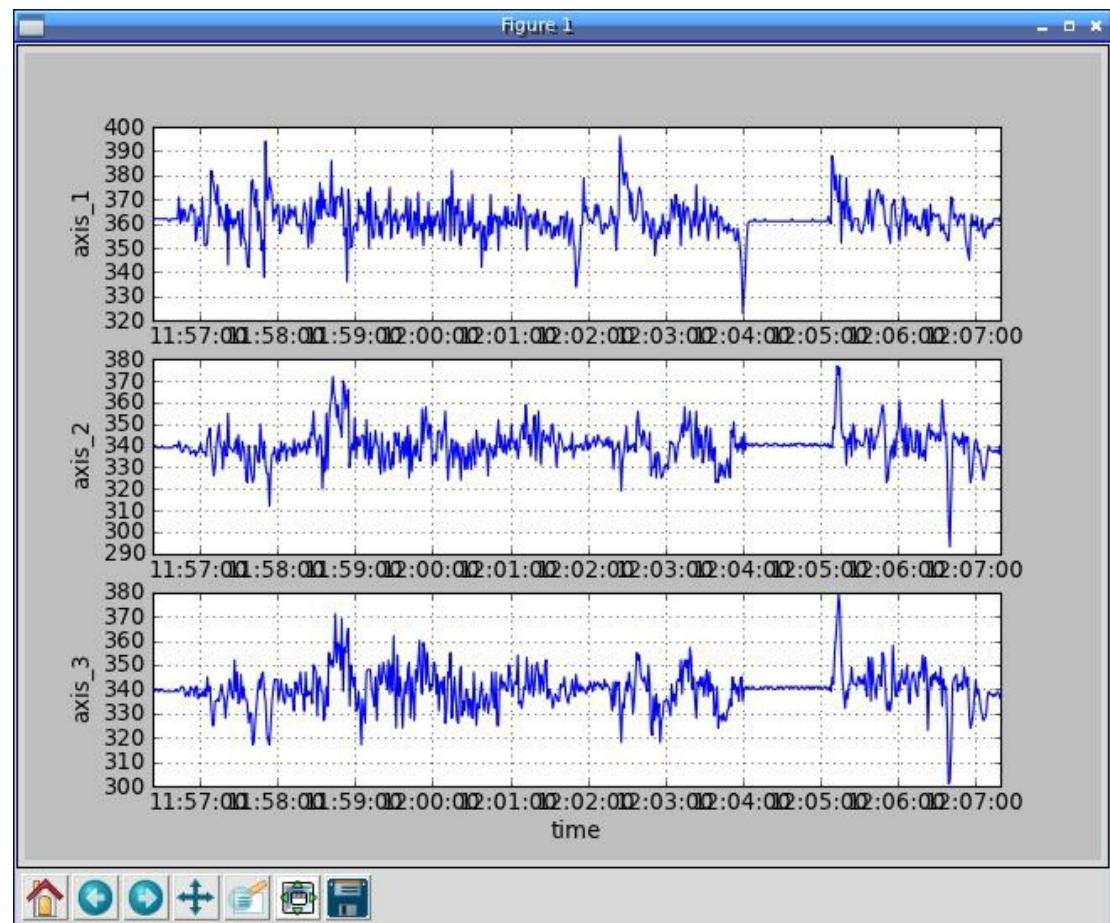
- displays
- networking
- gaming
- GPS
- motor
- data logging
- sound/voice
- prototyping





Plotting data

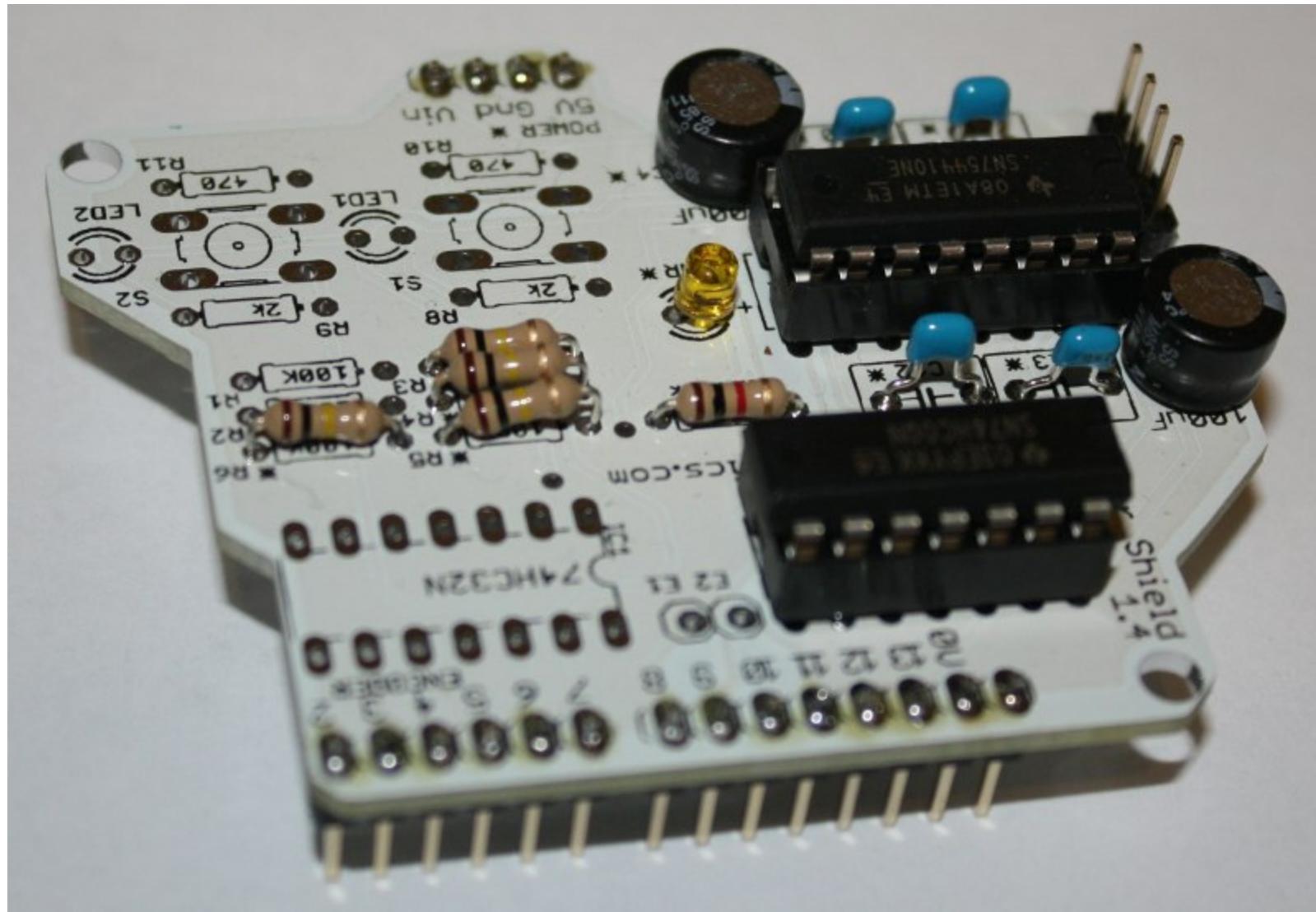
```
import pylab  
pylab.plotfile('logger00.csv', (0, 1, 2, 3))  
pylab.show()
```



Connecting motors

You *could* ... plug one wire into output pin, other into ground.





6

5

4

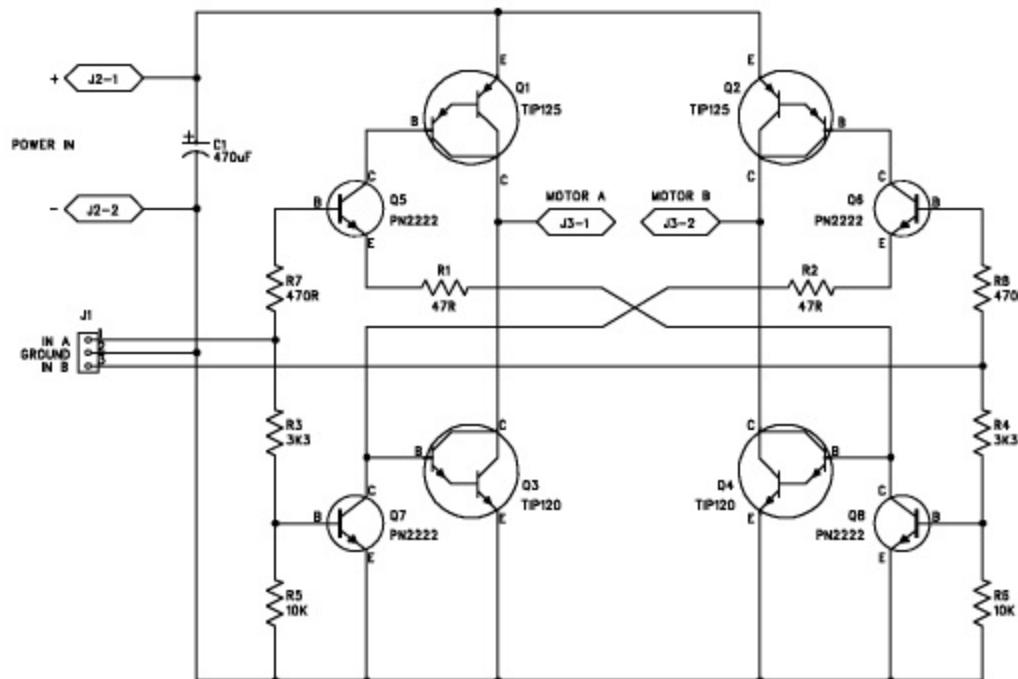
3

2

1

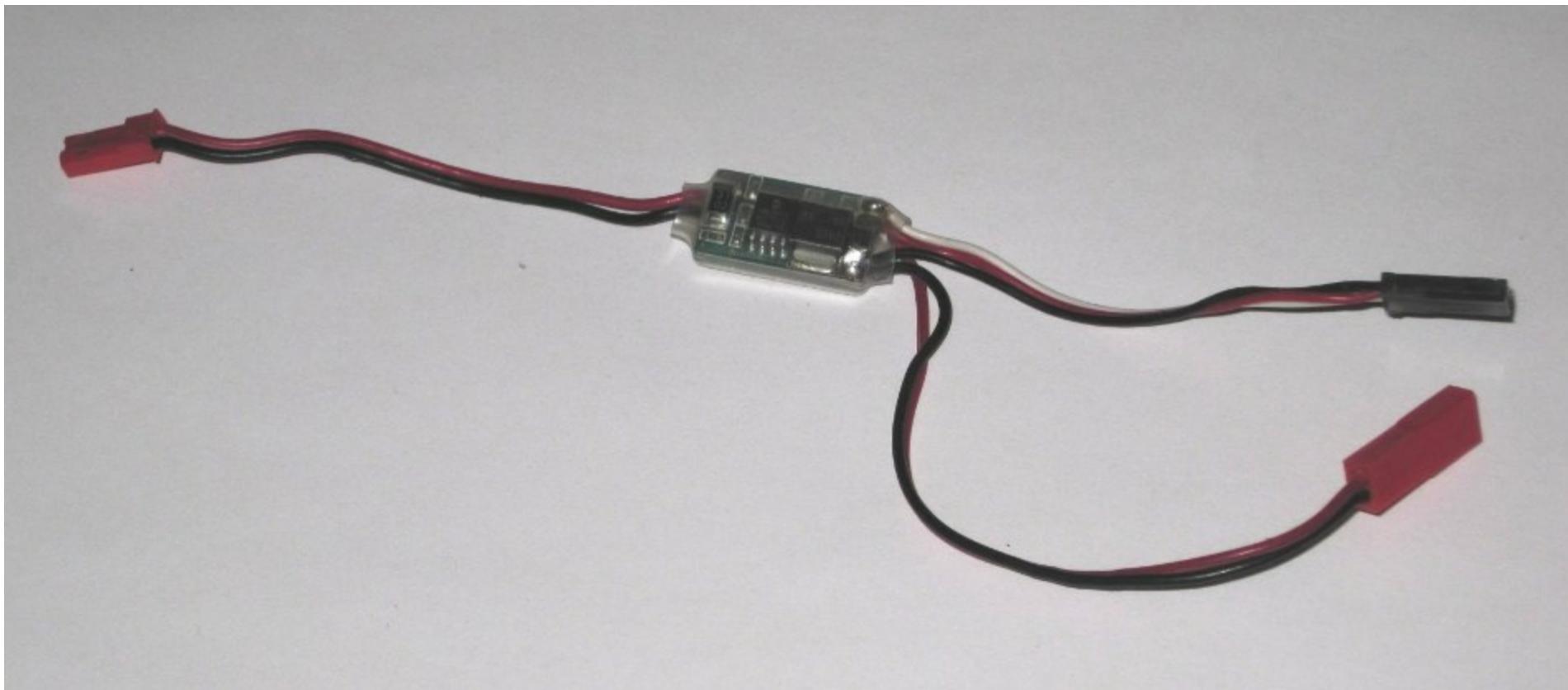
REVISION RECORD

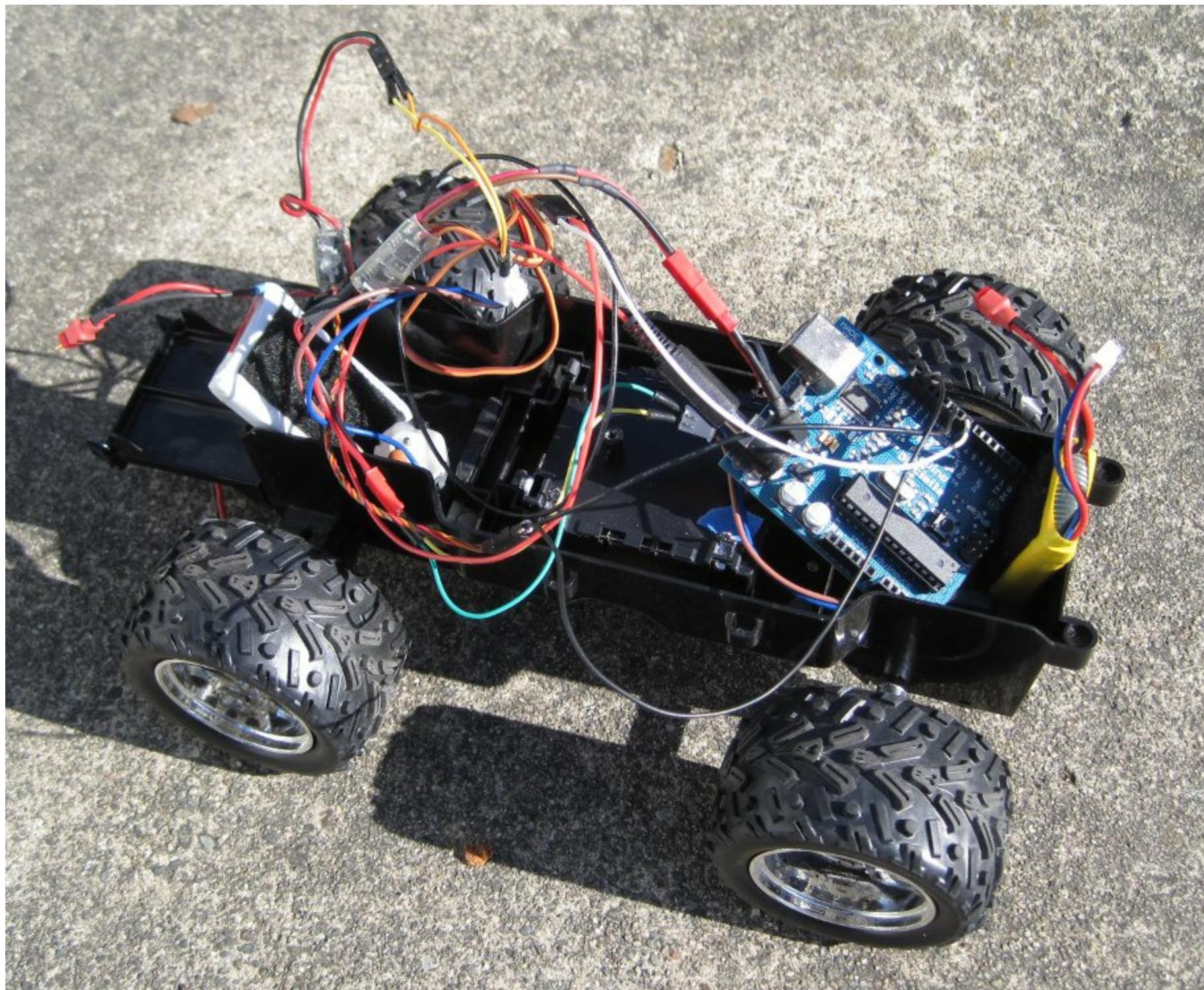
| LTR | ECO NO: | APPROVED: | DATE: |
|-----|---------|-----------|-------|
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| | | | |
|--------------------------------------|-------------------------|-------------|-----------|
| COMPANY: | | | |
| TITLE: H Bridge (c)1998 Bob Blick | | | |
| DRAWN: Bob Blick | DATED: SEPT 08, 1998 | CODE: | SIZE: |
| CHECKED: | DATED: | DRAWING NO: | |
| QUALITY CONTROL: | DATED: | REV: | |
| RELEASED: | DATED: | SCALE: | SHEET: 0F |

Electronic Speed Controller





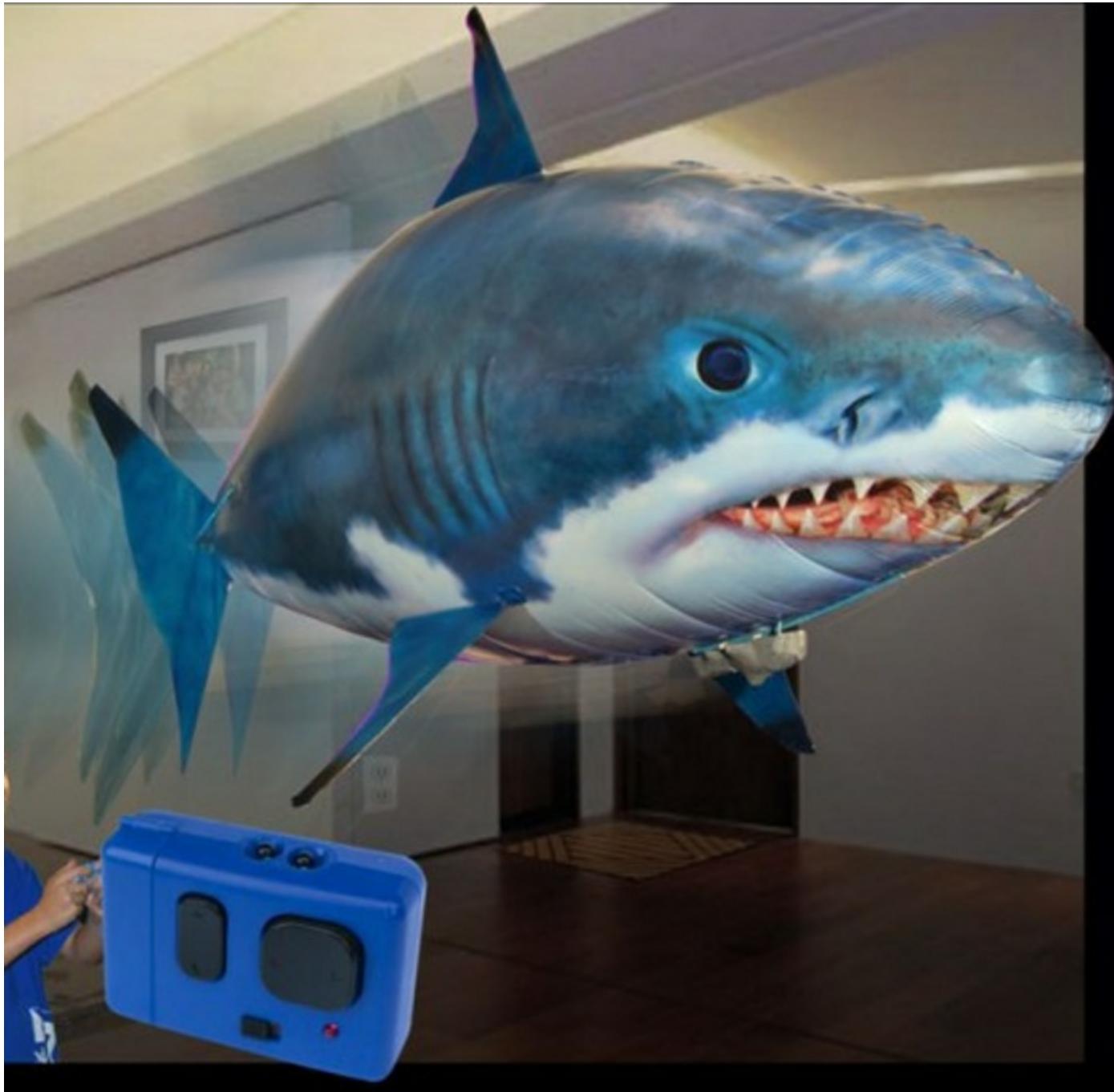
Writing to the Arduino

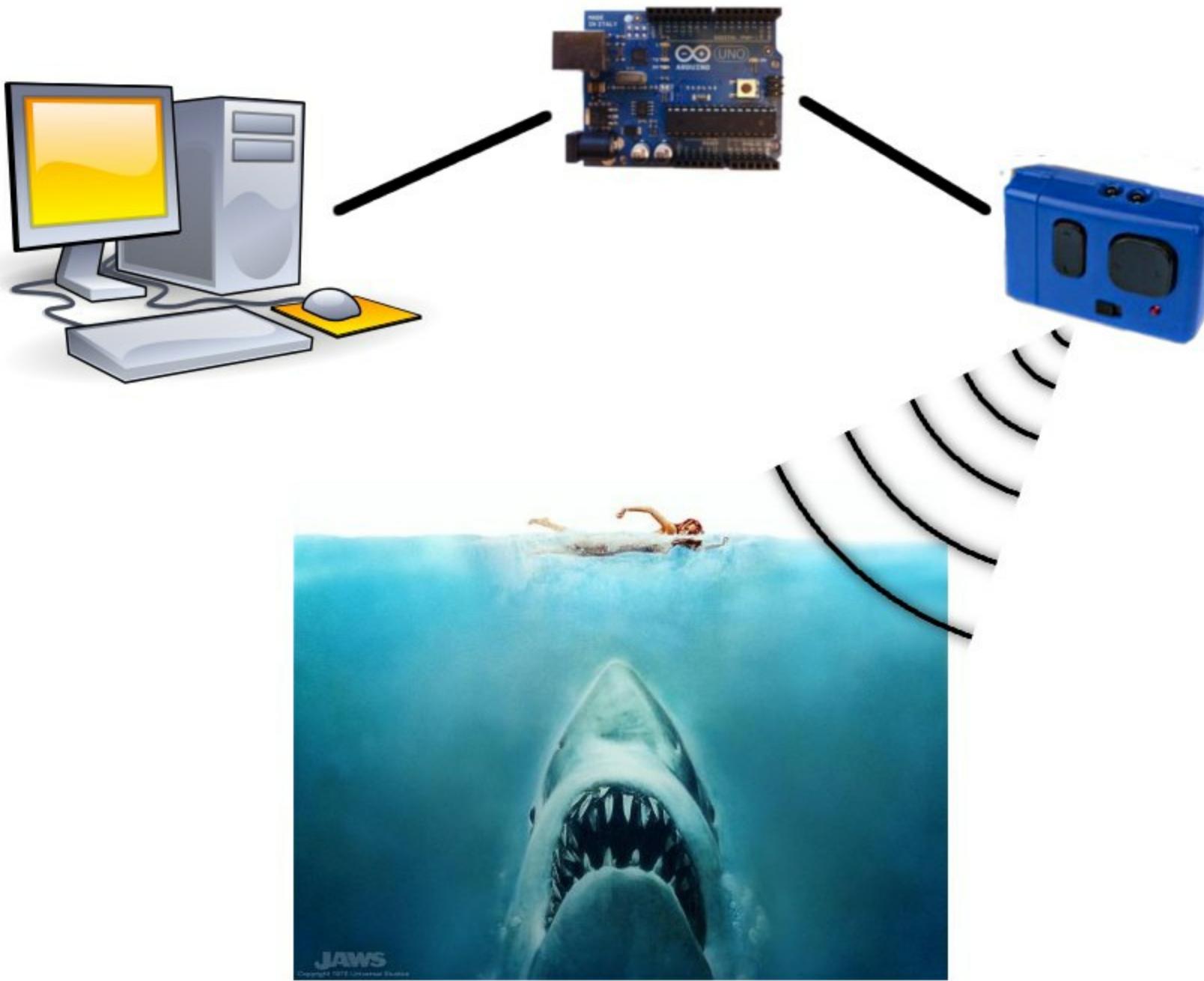
On the Arduino:

```
int nchars = Serial.available();  
char c = Serial.read();
```

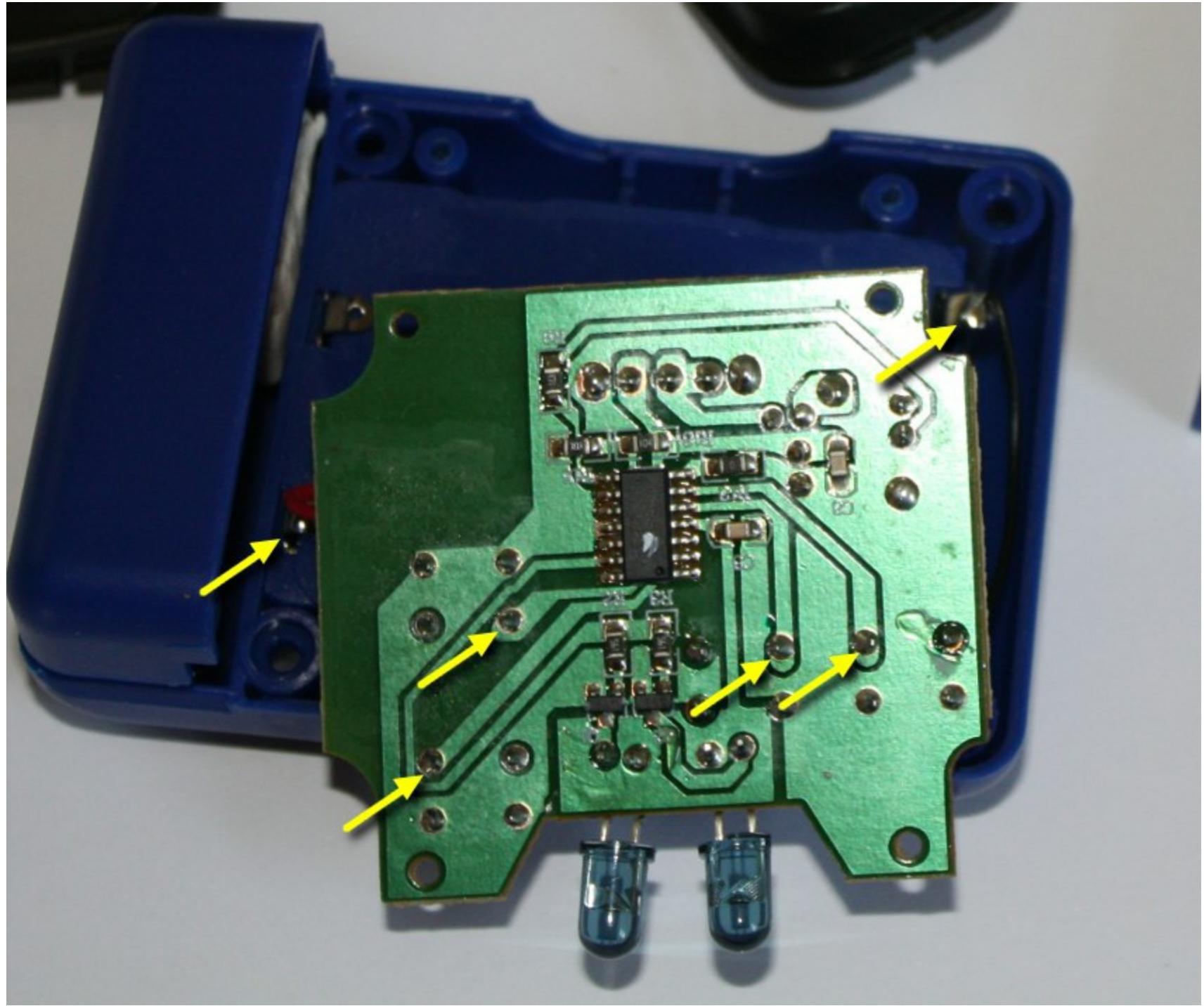
In Python:

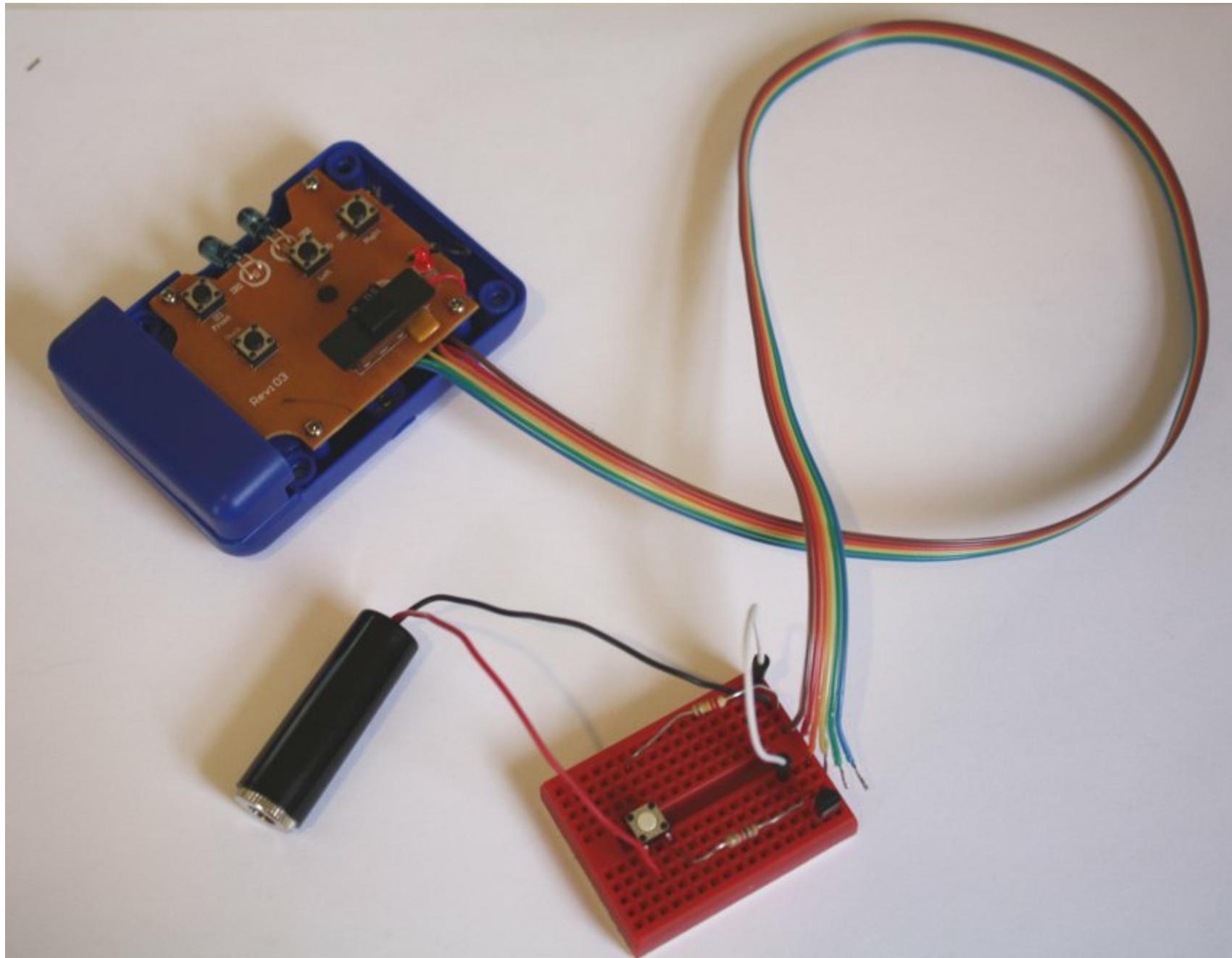
```
import serial  
ser = serial.Serial(port, 9600)  
ser.write(line)
```





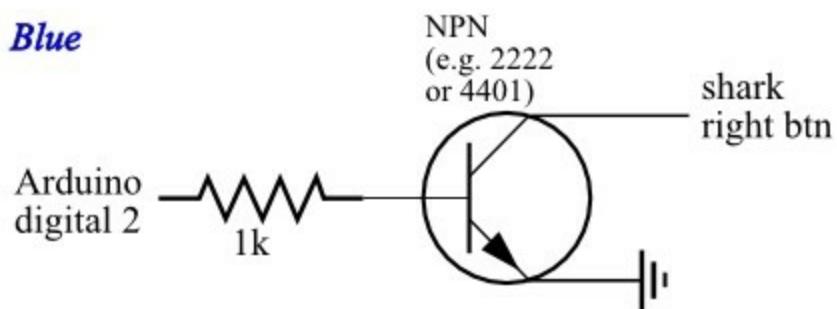




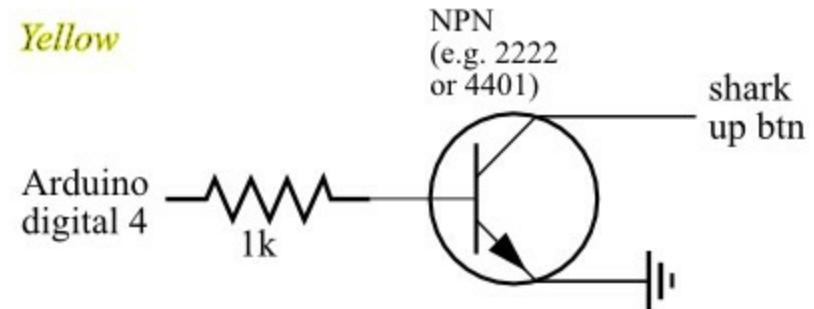


Arduino / Air Swimmers Shark transmitter interface

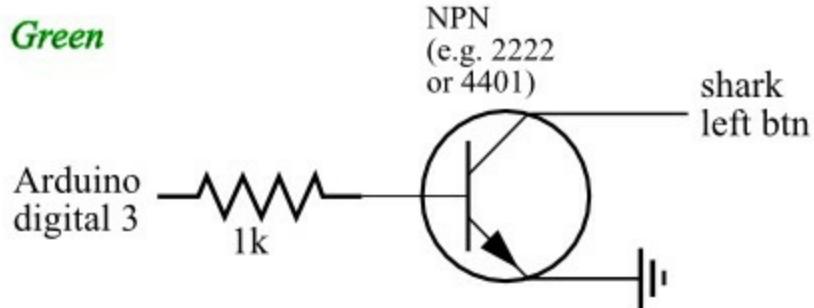
Blue



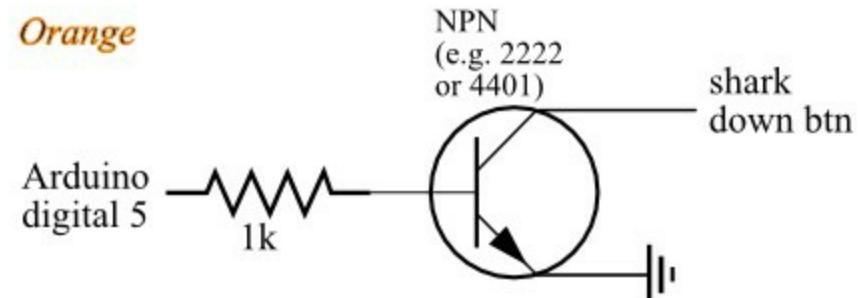
Yellow



Green

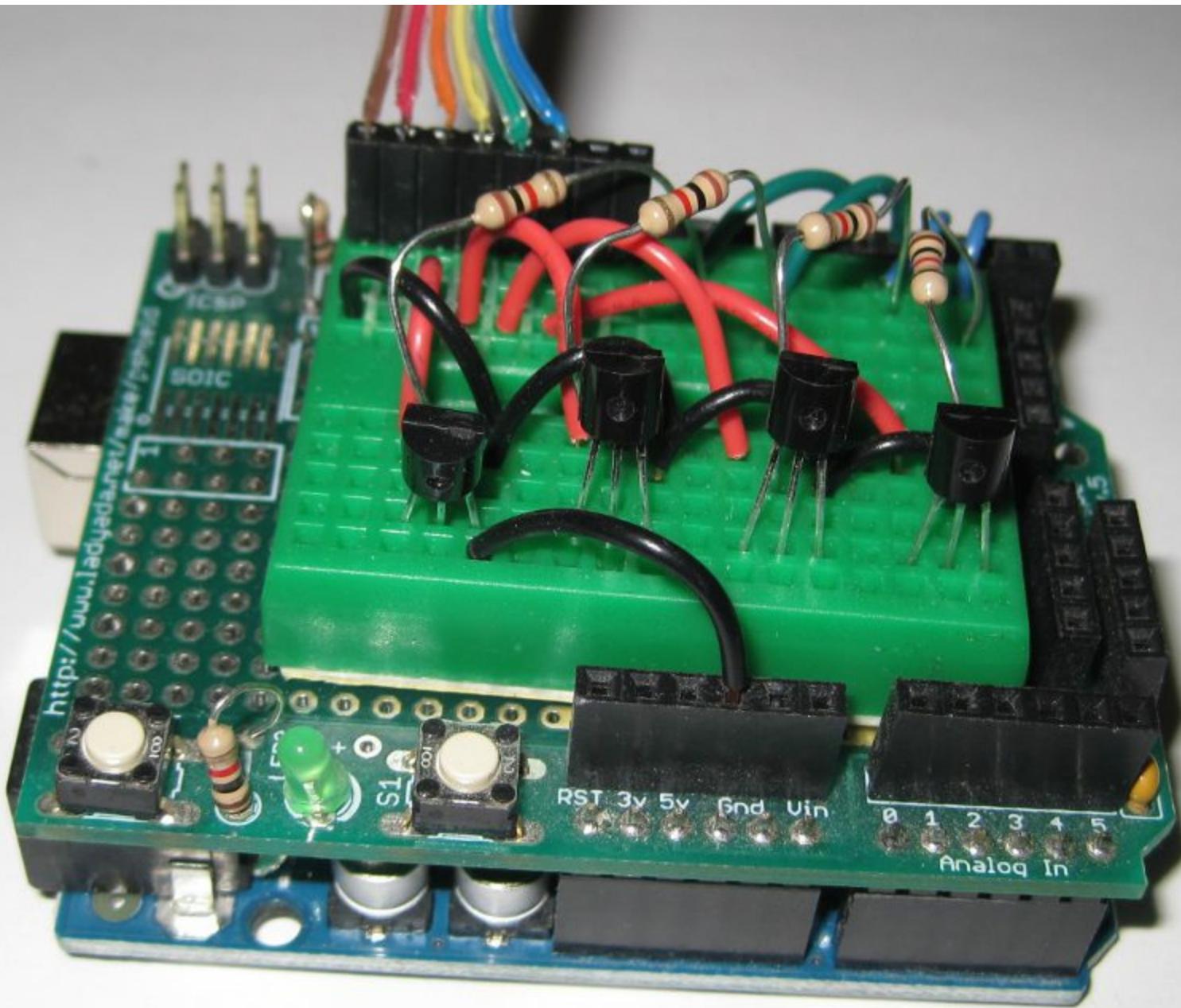


Orange



Brown: ground

Red: not used



STOP USING THE
AISLE BEHIND MY
CUBICLE. IT'S
DISTRACTING.



DilbertCartoonist@gmail.com

EVERYTHING WITHIN
TWELVE FEET OF MY
CUBICLE ARE MY
TERRITORIAL WATERS.

YOU
CAN'T
ENFORCE
THAT.



1-9-12 © 2012 Scott Adams, Inc./Dilbert.com

TELL
THAT TO MY
ROBOSHARK.



Thank you ...

and have fun hacking!

Summary and notes at:
shallowsky.com/arduino