



Fun with Linux and Devices

by Akkana Peck

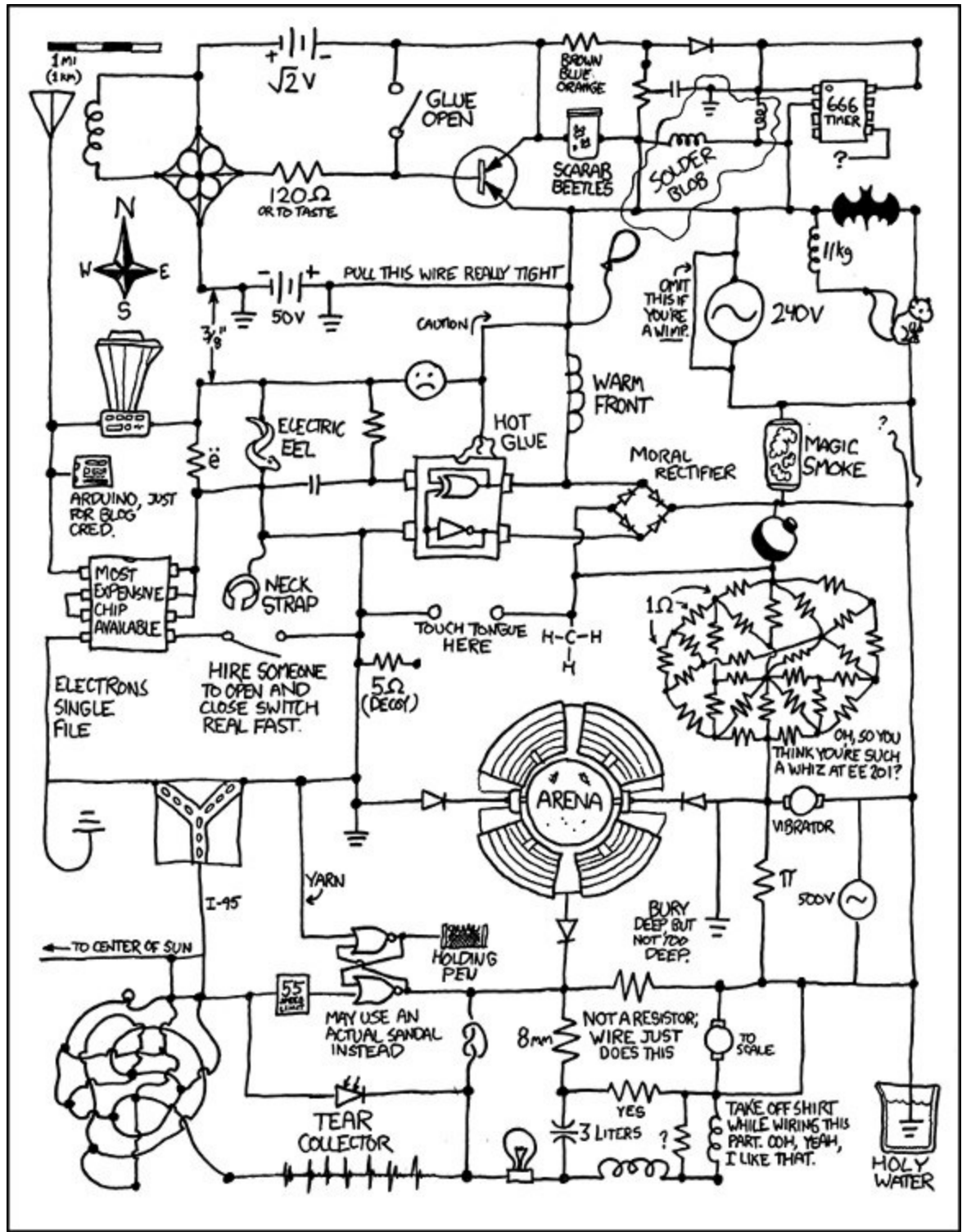


DANGER

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 | apw.wos.1

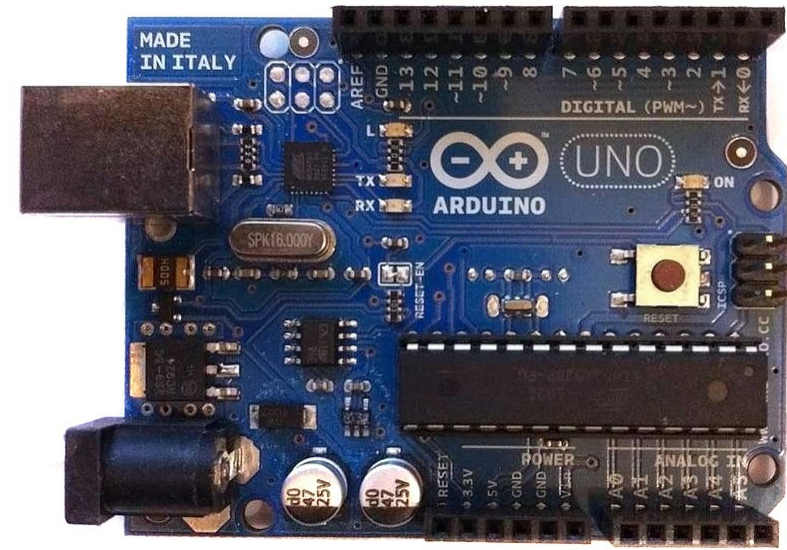
If You
Can
Think It,
You Can
Build It!

Maker here
Lance Fried

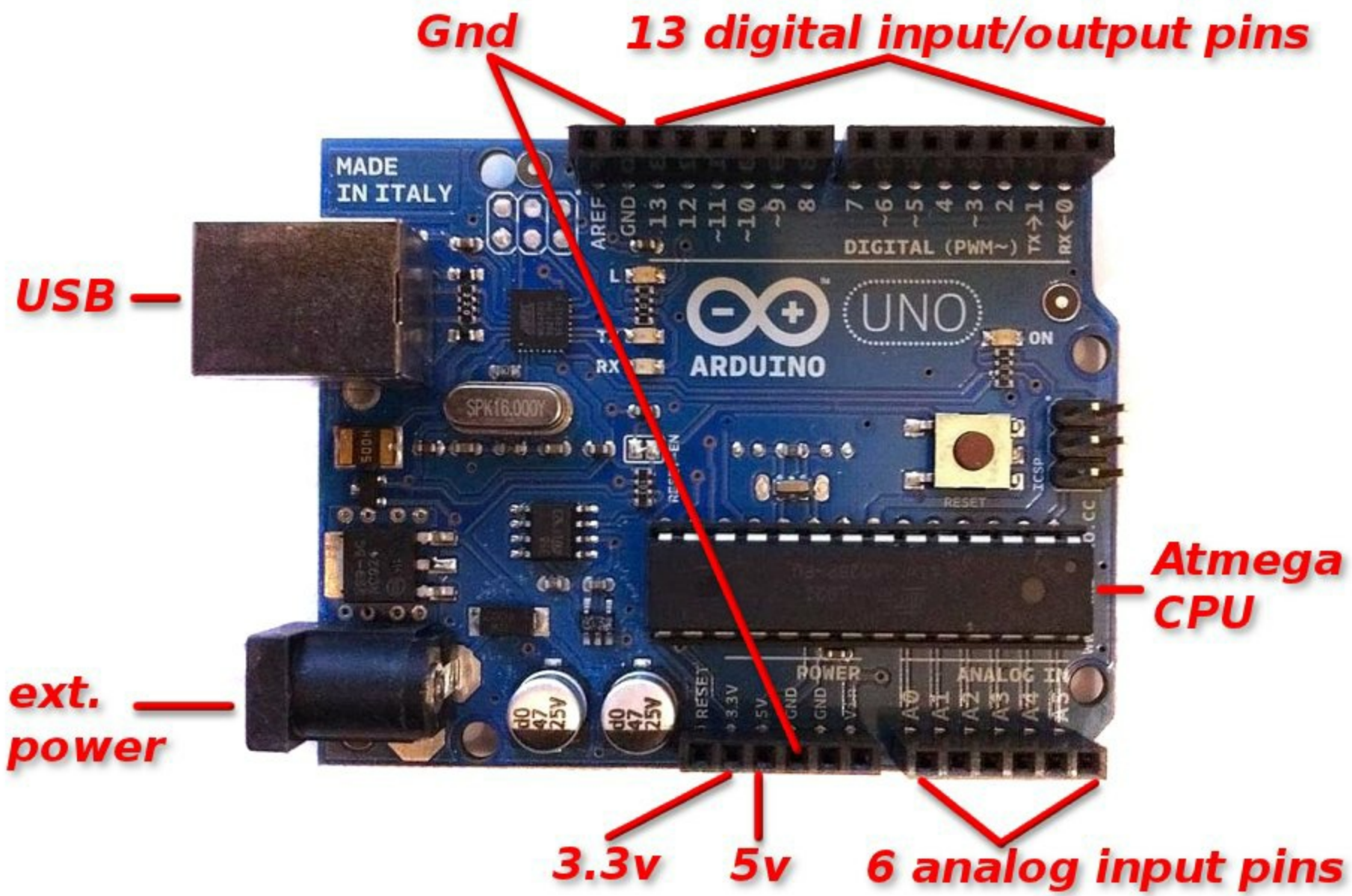


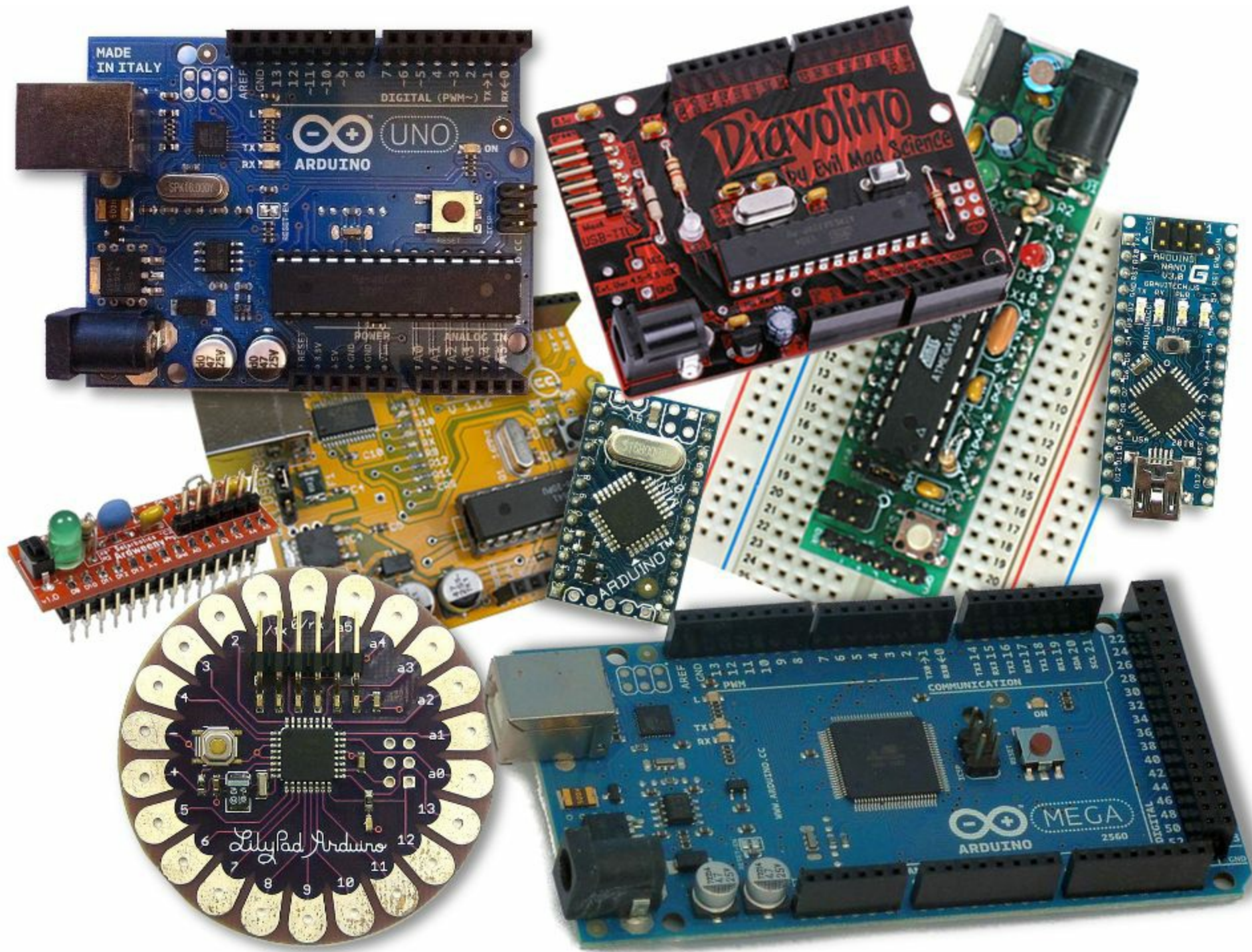


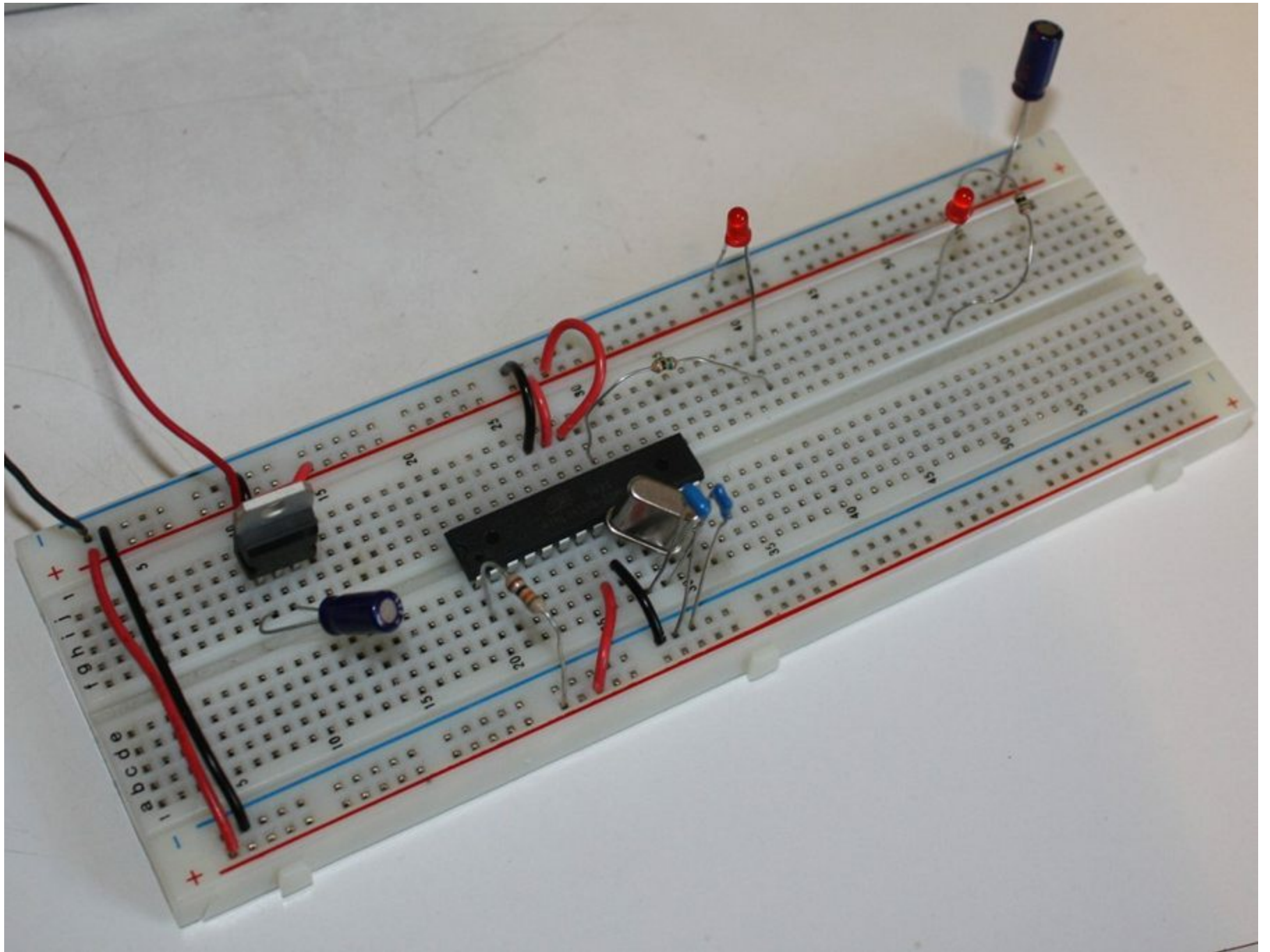
Arduino

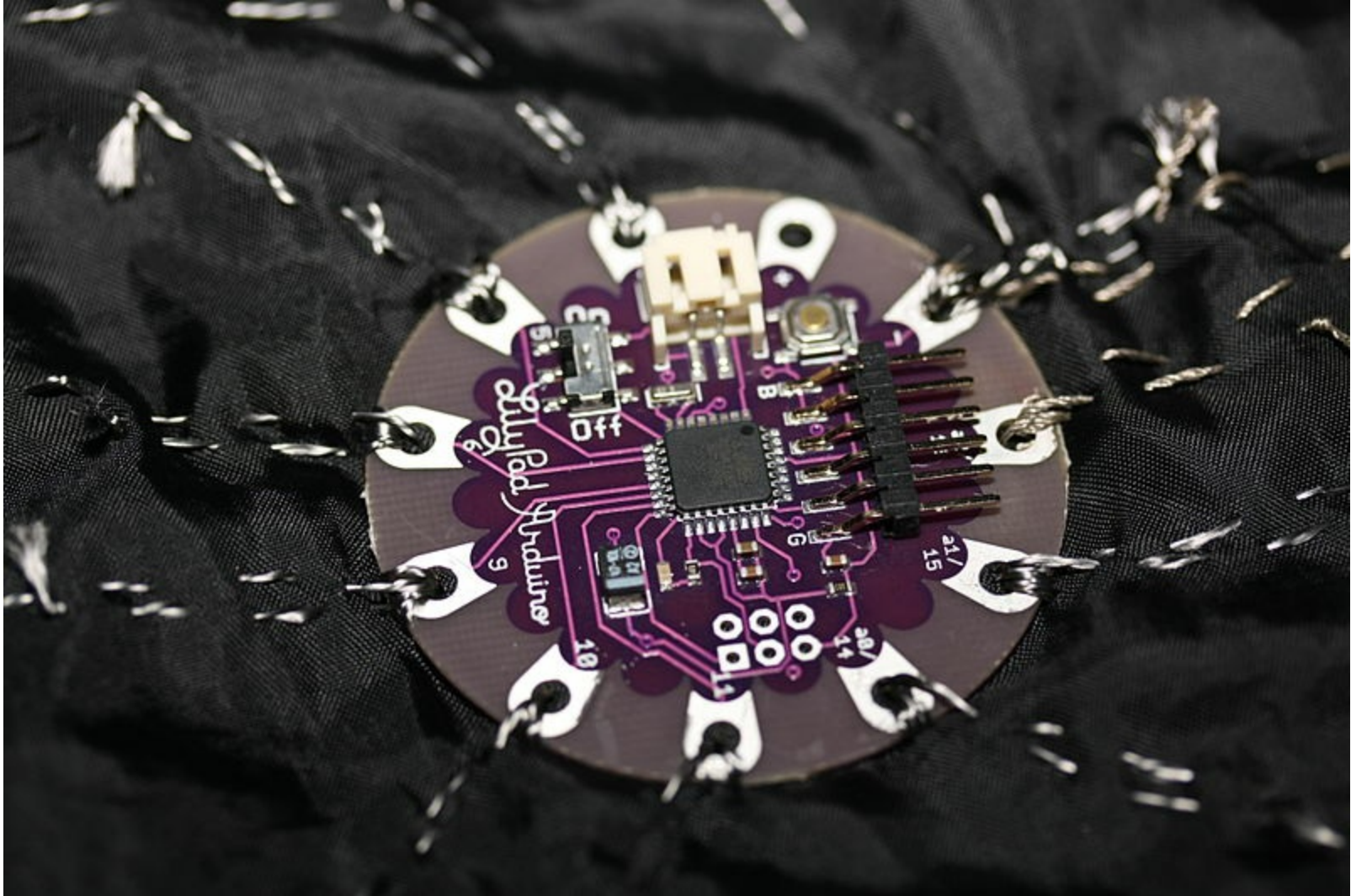


- Digital/analog I/O
- \$30 for base model
- Open-source hardware





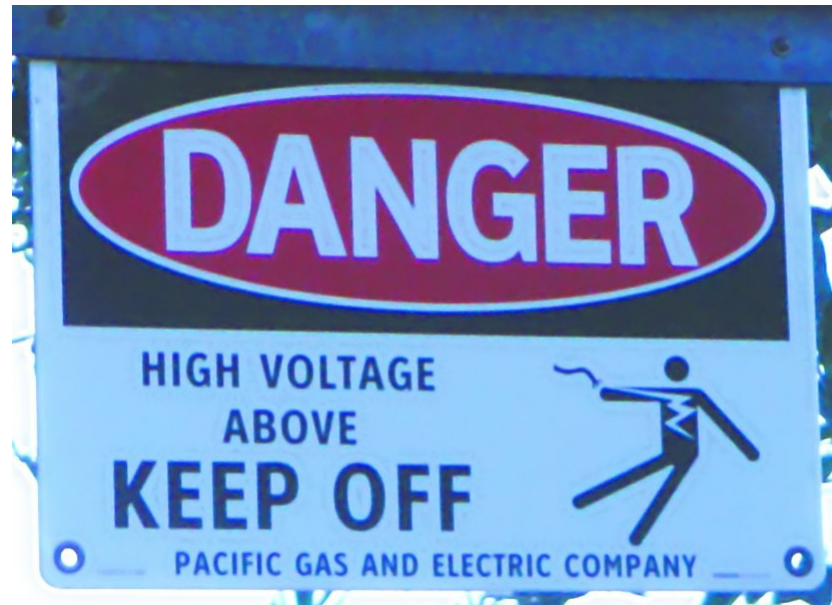




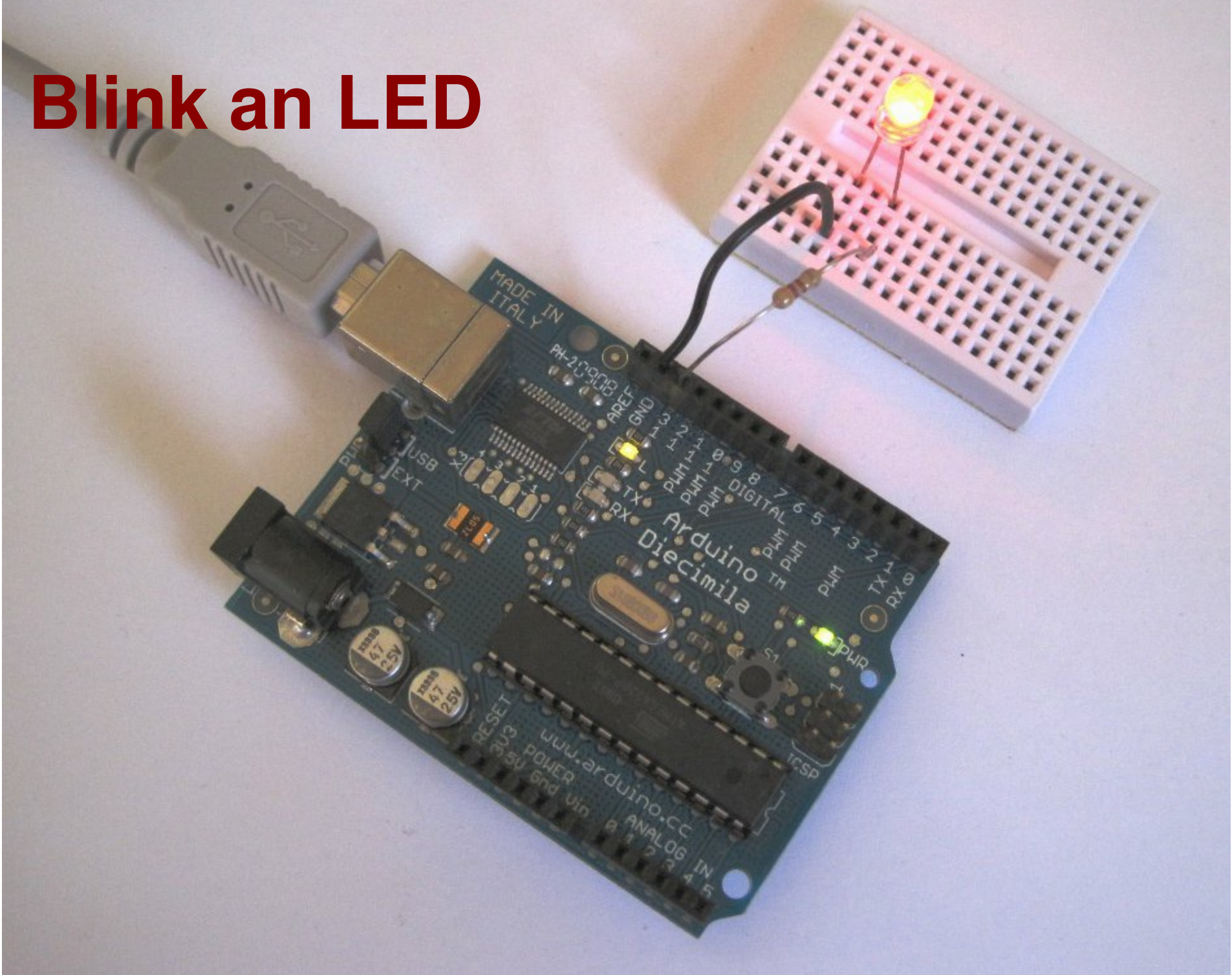




Getting started



Blink an LED



The Arduino IDE

Lots of examples.

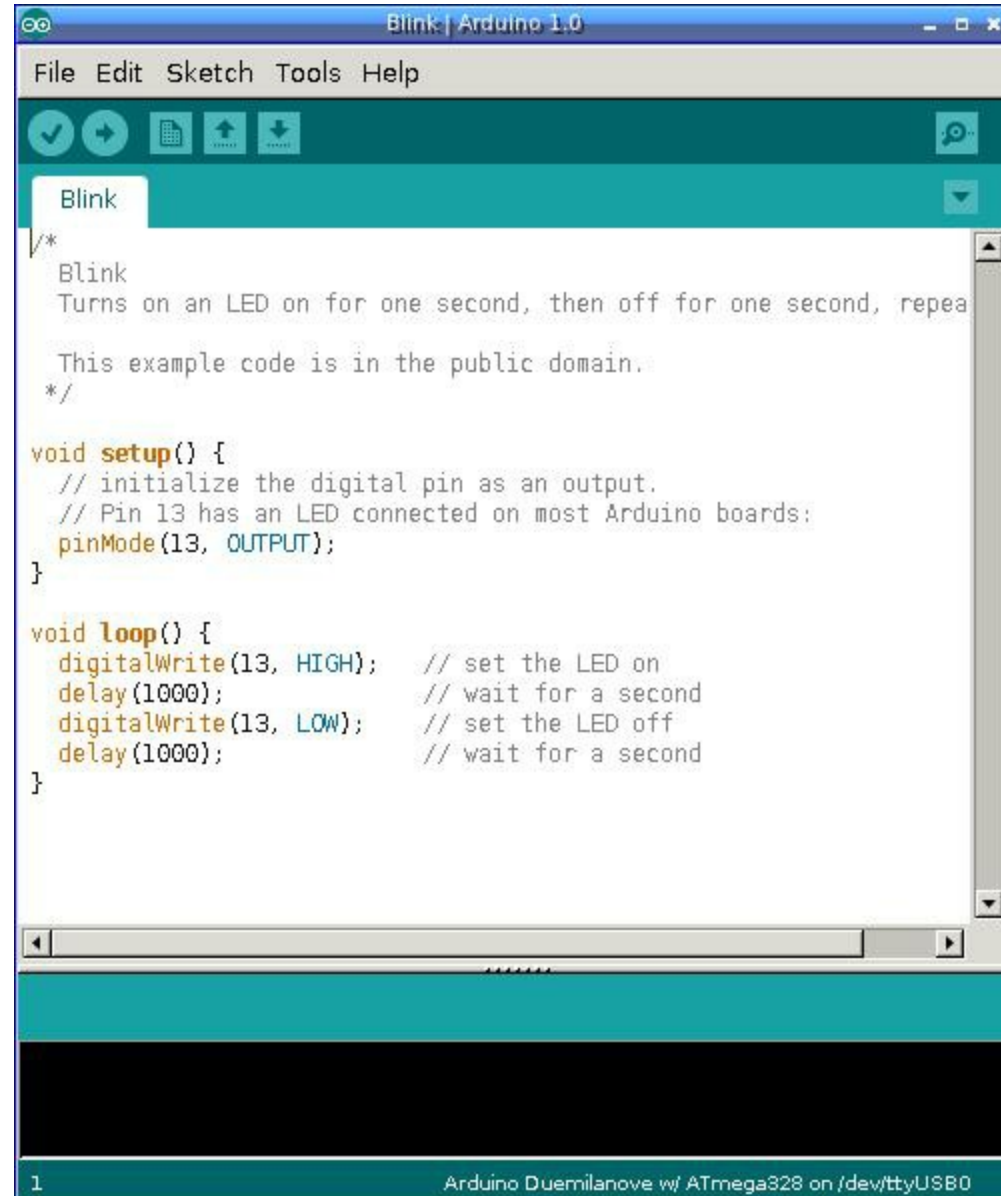
Start with:

File

↳ *Examples*

↳ *Basic*

↳ *Blink*

A screenshot of the Arduino IDE interface. The window title is "Blink | Arduino 1.0". The menu bar includes "File", "Edit", "Sketch", "Tools", and "Help". Below the menu bar is a toolbar with icons for opening files, saving, and running. A dropdown menu is open, showing "Blink" as the selected option. The main text area contains the following code:

```
/*  
 * Blink  
 * Turns on an LED on for one second, then off for one second, repeats.  
 *  
 * 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 shows "1" on the left and "Arduino Duemilanove w/ ATmega328 on /dev/ttyUSB0" on the right.

Powerswitch tail

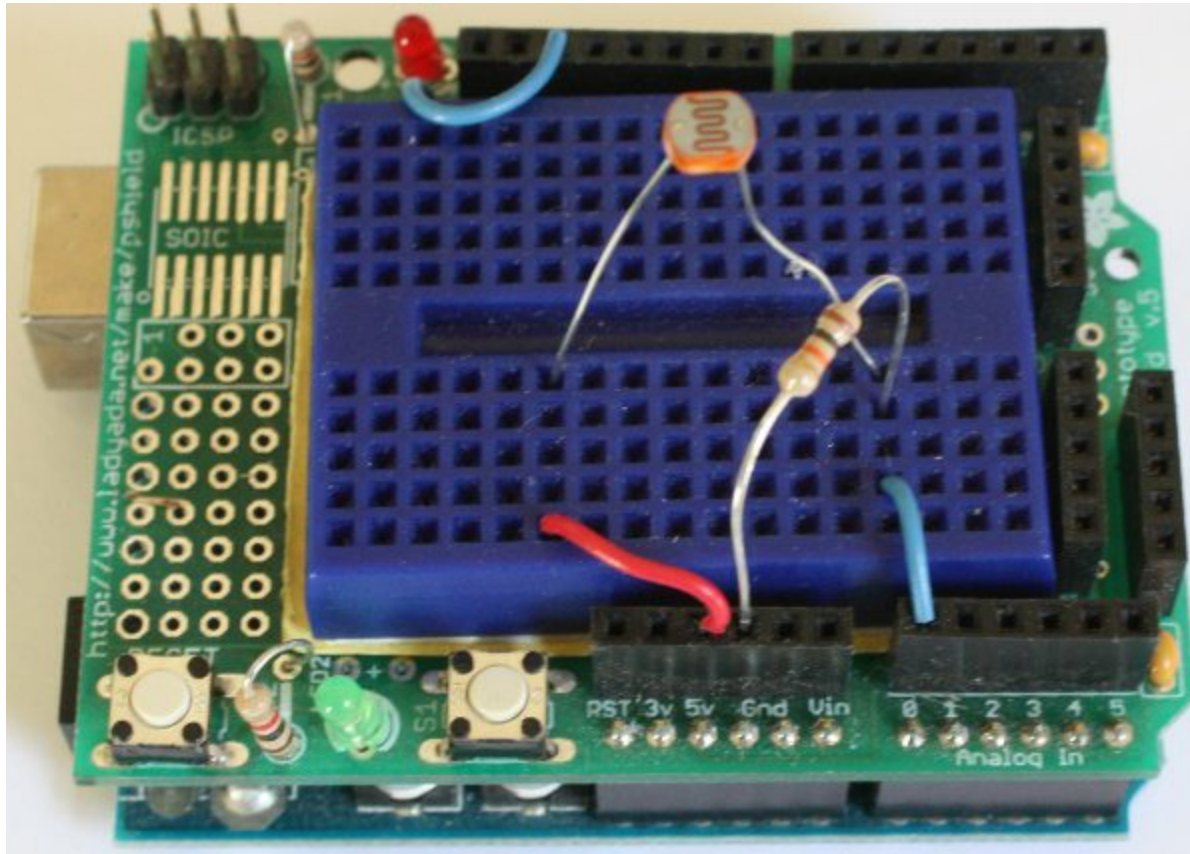


PowerSwitch Tail II
10/240V AC Activated AC Power Switch
1.25A, 3.125W, 3.500mA
SWITCH: 15A/250V @ 10Hz/60Hz
Made in USA
www.PowerSwitchTail.com
1: +in 2: -in 3: Ground

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*

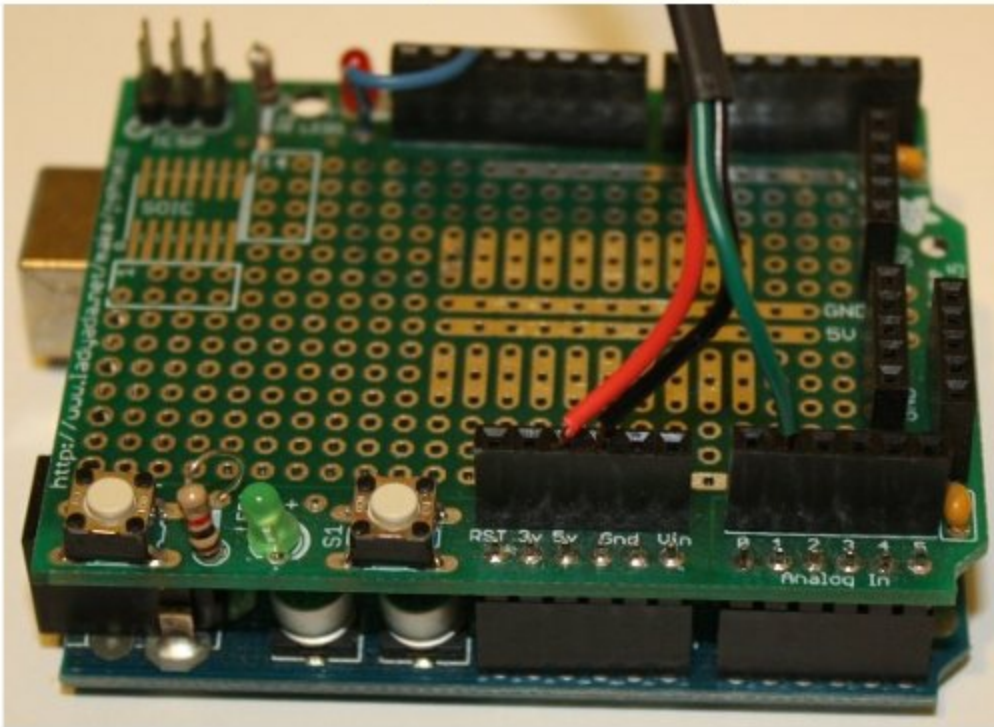
Need a Makefile and the Arduino libraries.

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

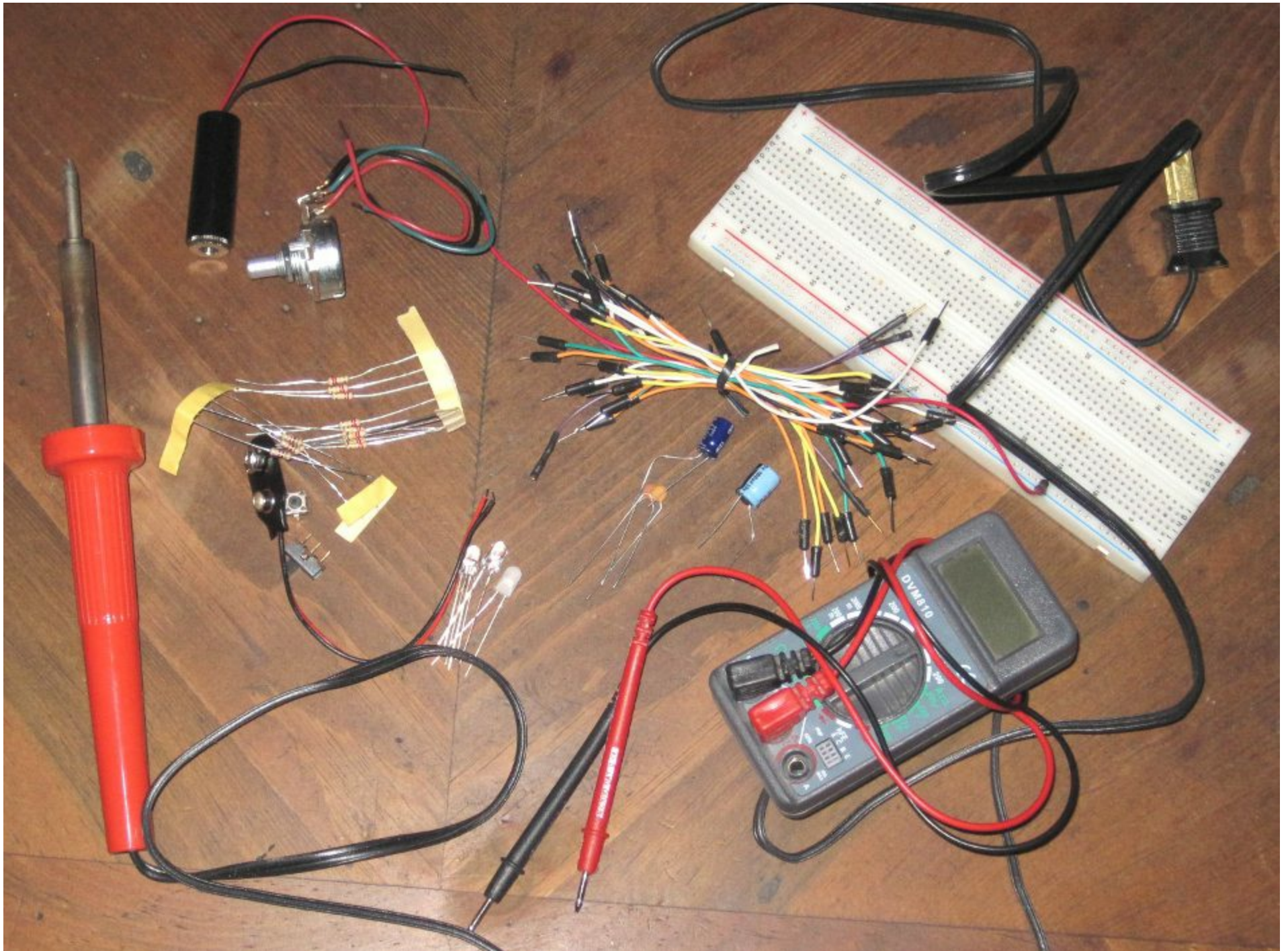
Processing.org:
most common
way.

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

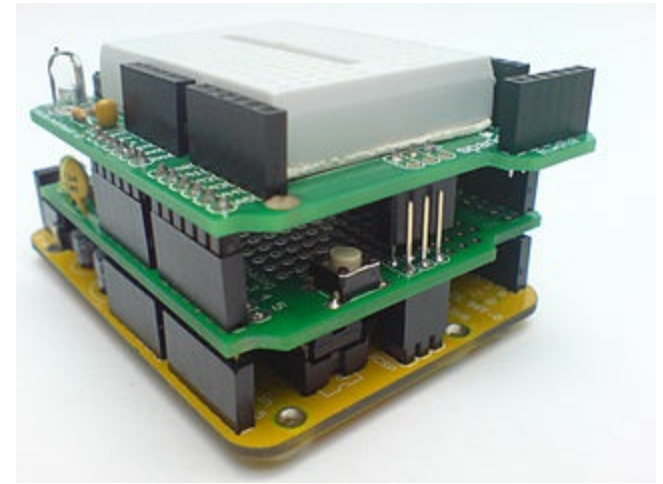


You're just reading/plotting serial data.

Cool hardware



Special-purpose shields



- displays

- gaming

- motor

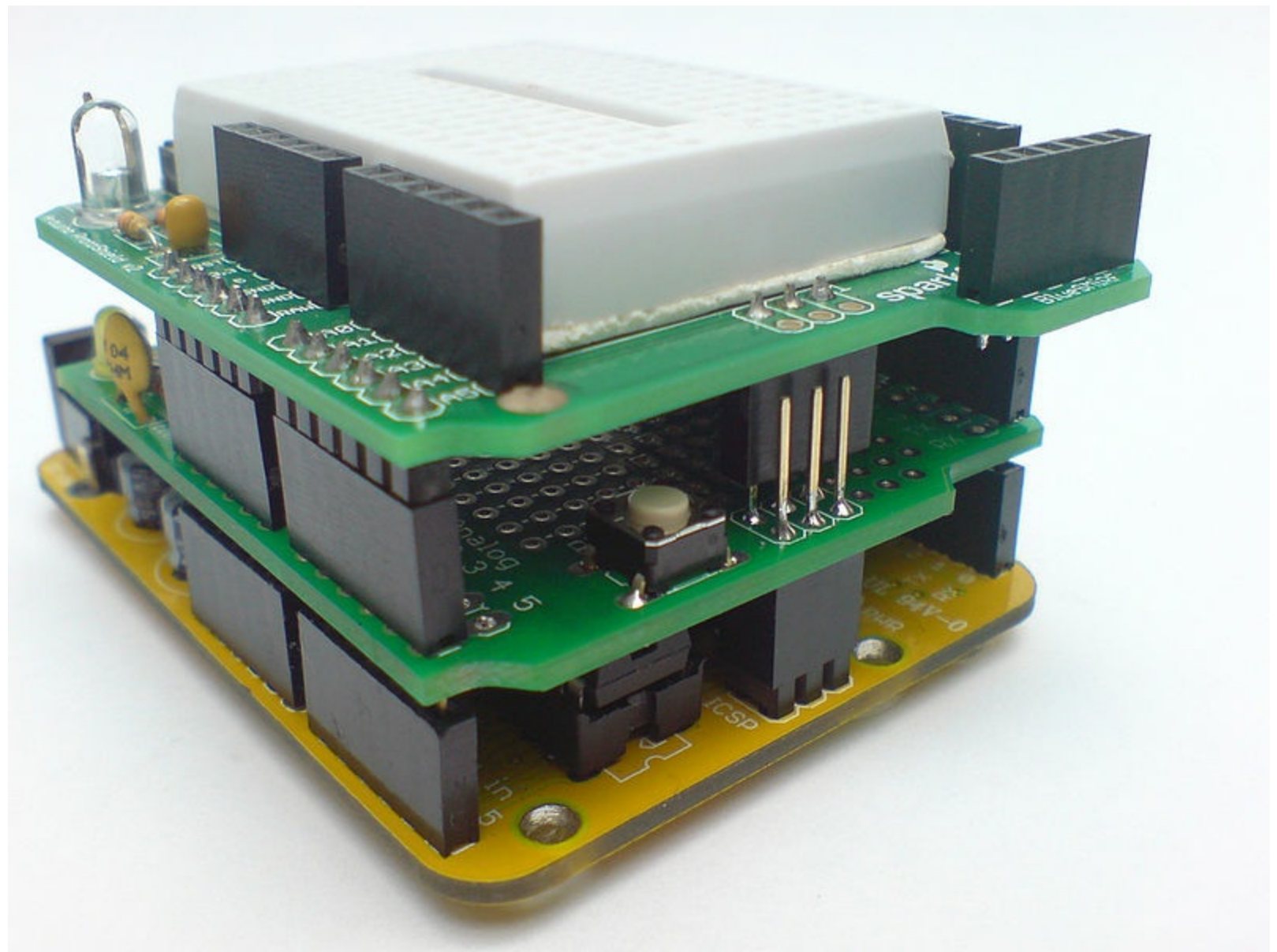
- sound/voice

- networking

- GPS

- data logging

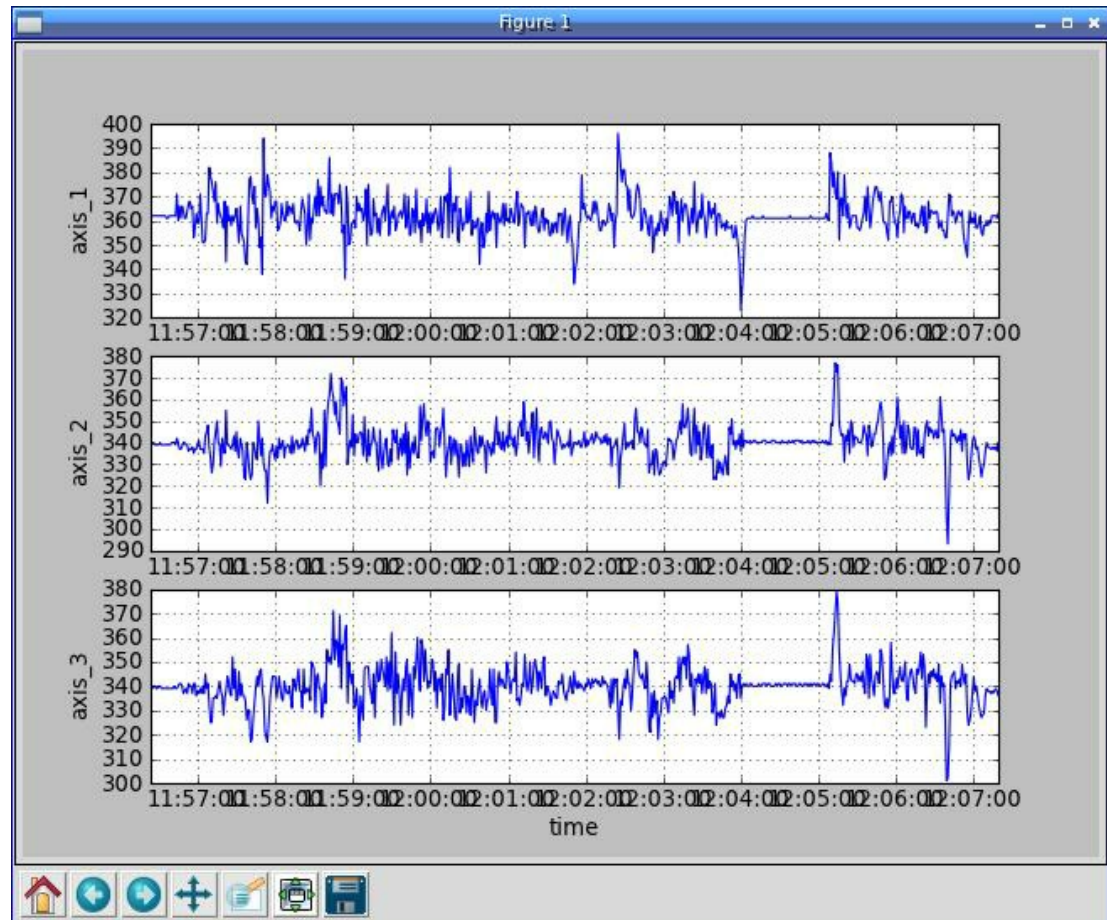
- prototyping





Plotting data

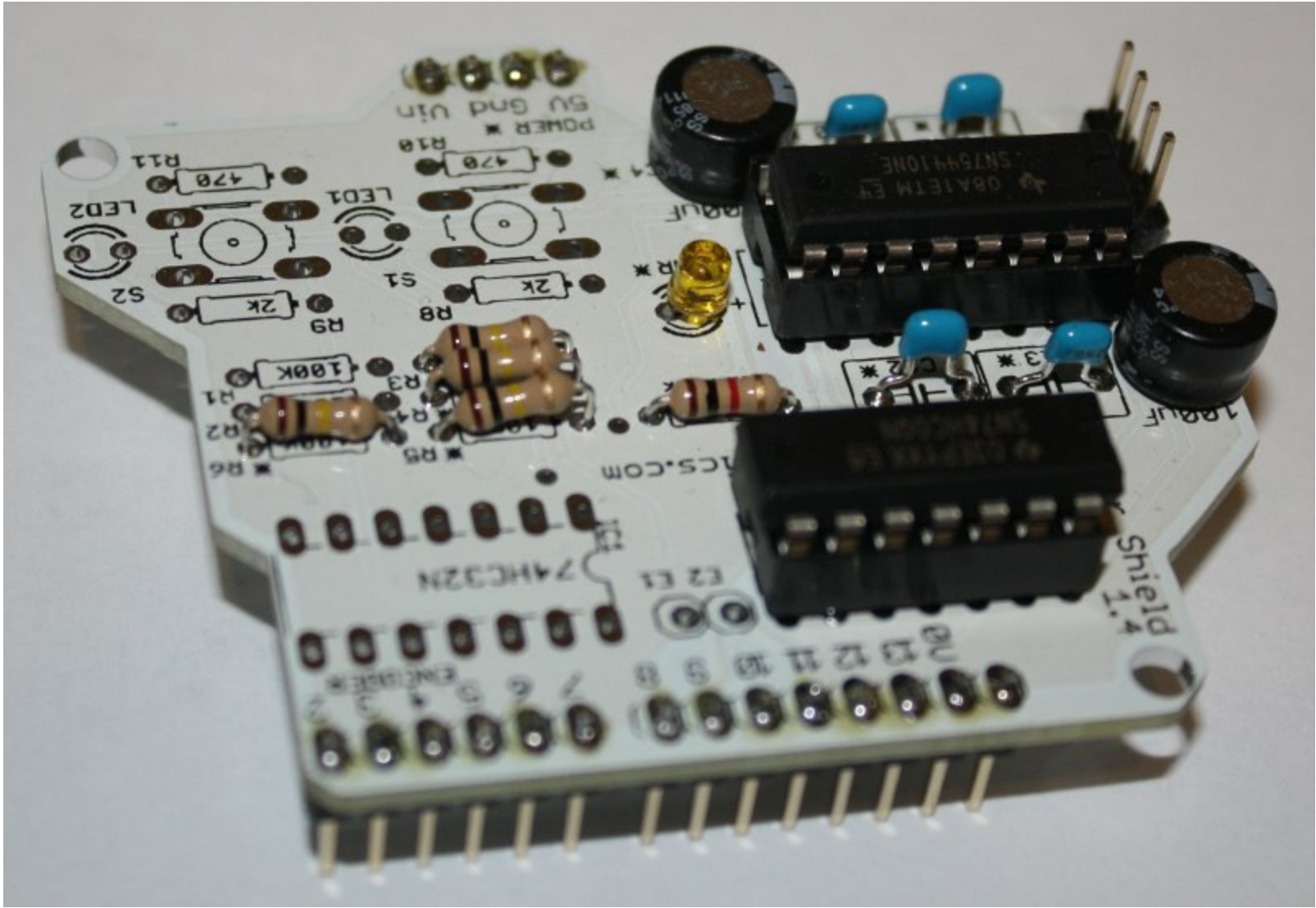
```
import pylab
pylab.plotfile('logger00.csv', (0, 1, 2, 3))
pylab.show()
```



Connecting motors

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





6

5

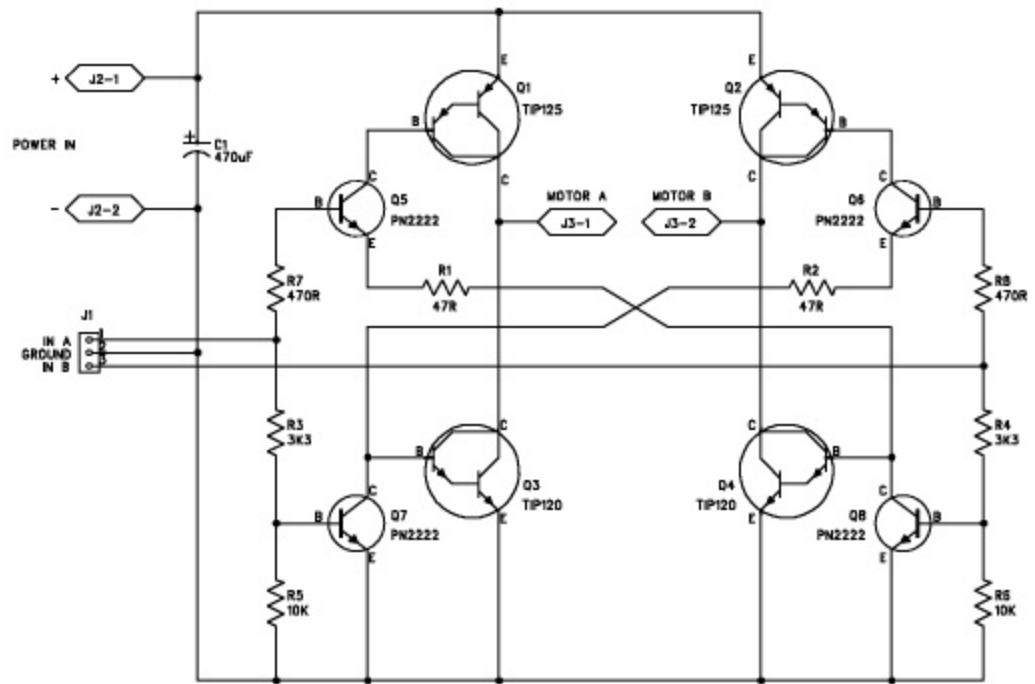
4

3

2

1

REVISION RECORD			
LTR	ECD NO:	APPROVED:	DATE:



COMPANY:			
TITLE: H Bridge (c)1998 Bob Blick			
CODE:	SIZE:	DRAWING NO:	REV:
SCALE:		SHEET: OF	

DRAWN: Bob Blick	DATED: SEPT 08, 1998
CHECKED:	DATED:
QUALITY CONTROL:	DATED:
RELEASED:	DATED:

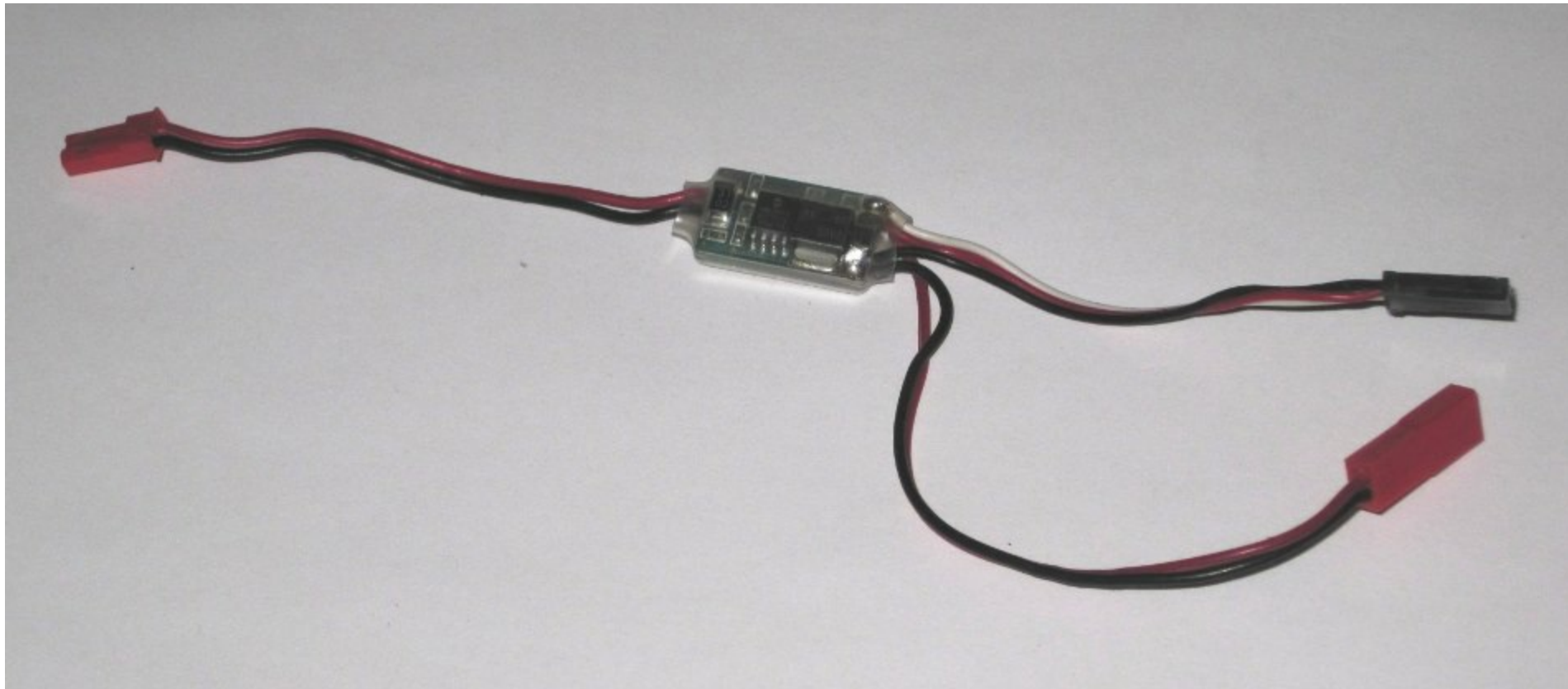
D

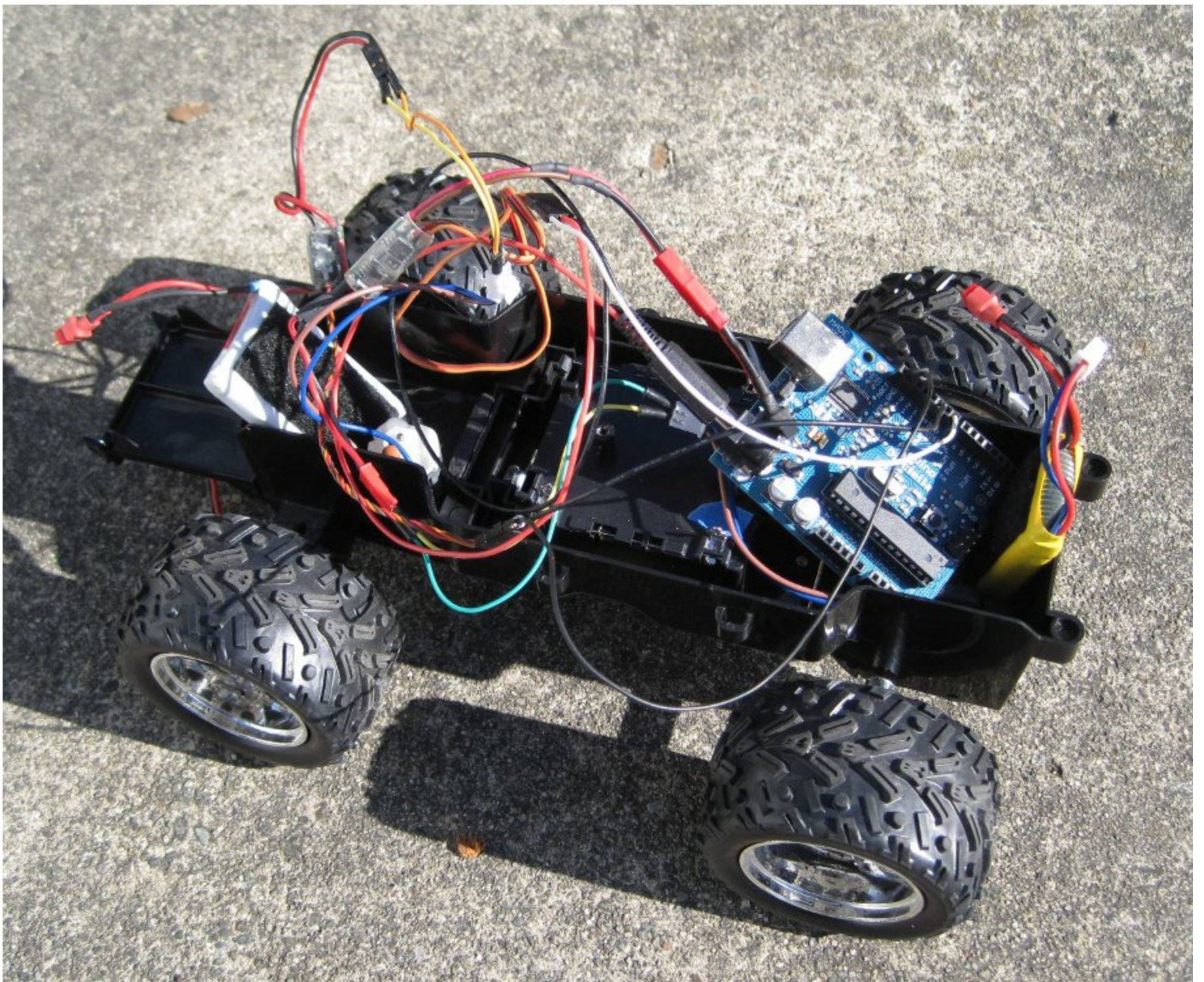
C

B

A

Electronic Speed Controller





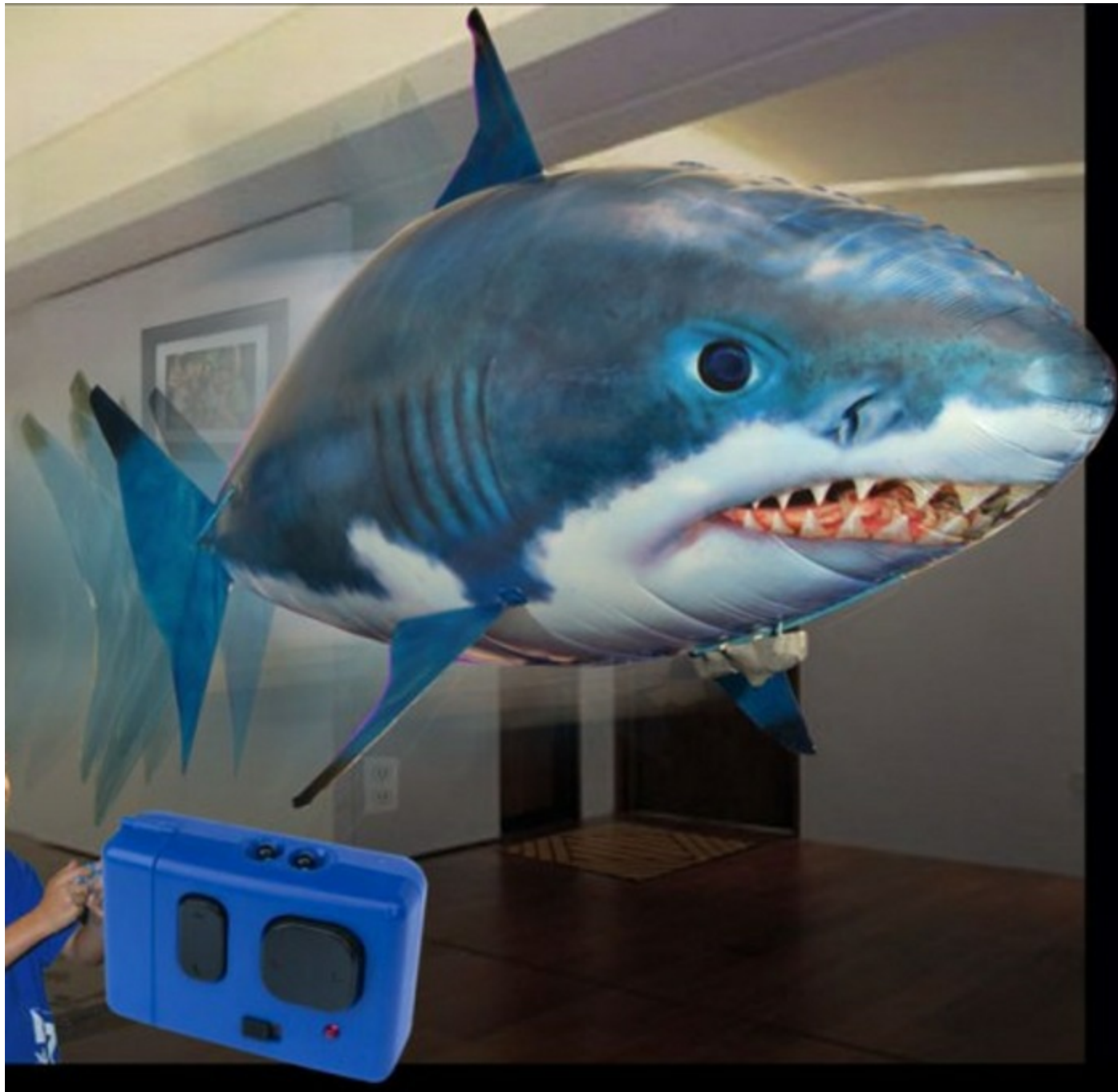
Writing to the Arduino

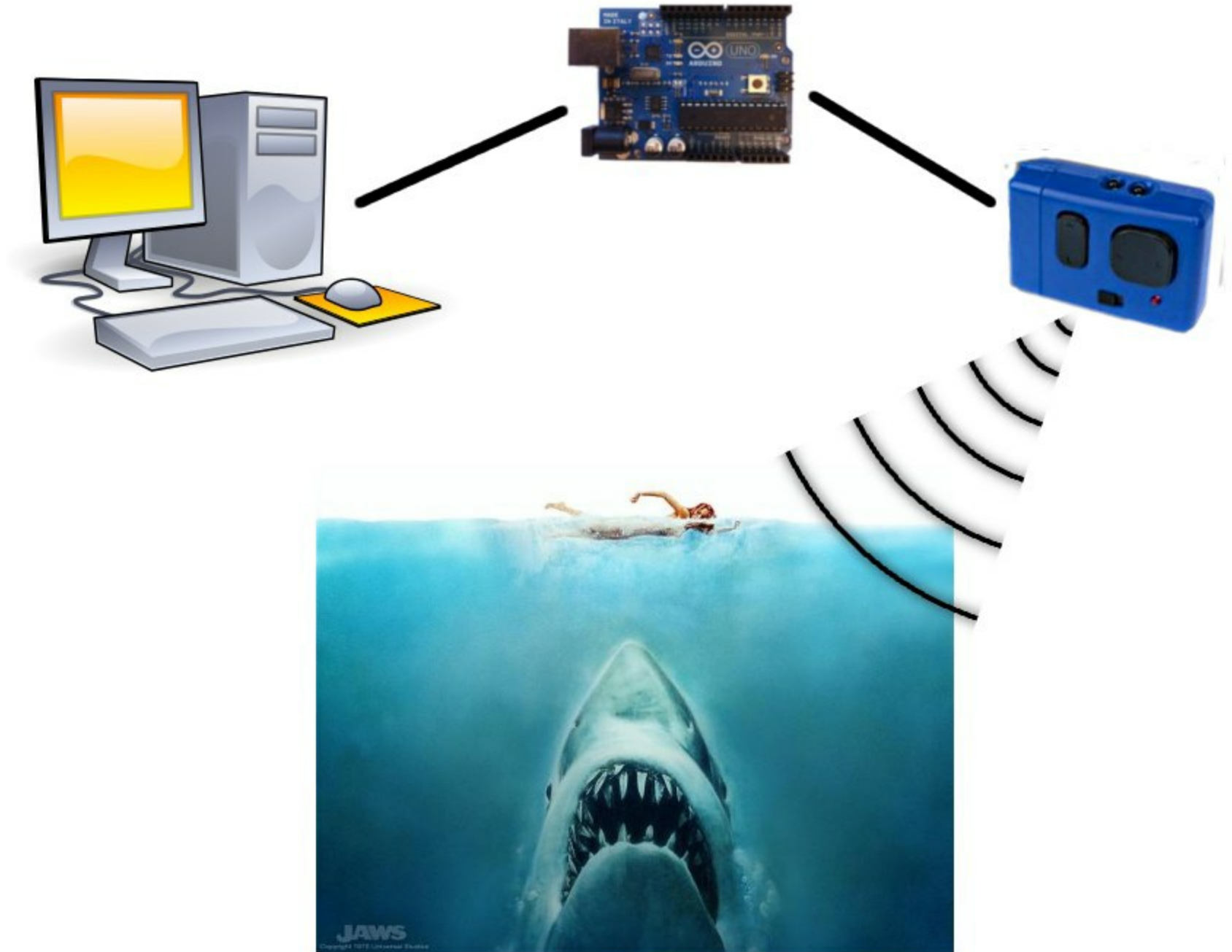
On the Arduino:

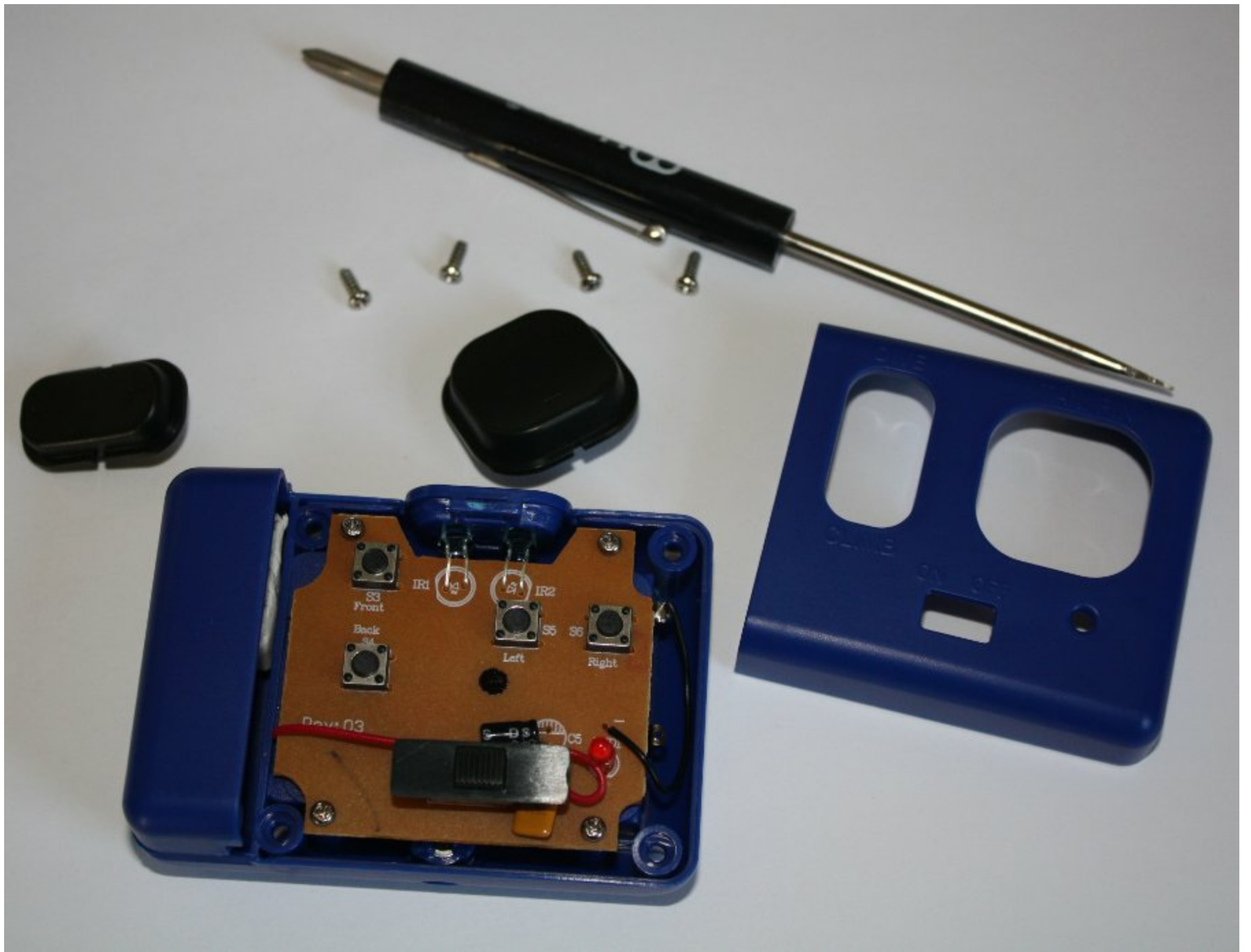
```
int nchars = Serial.available();  
char c = Serial.read();
```

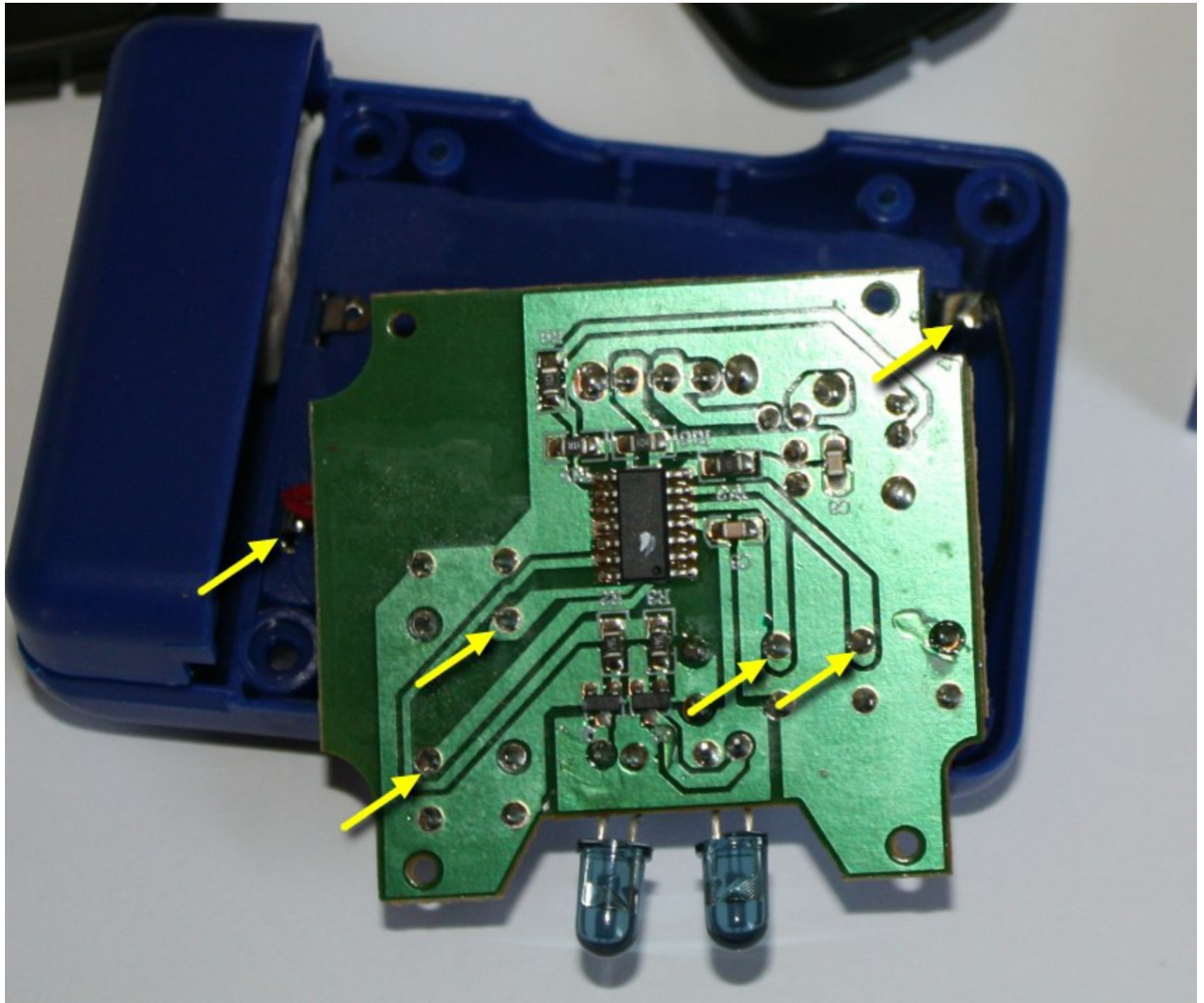
In Python:

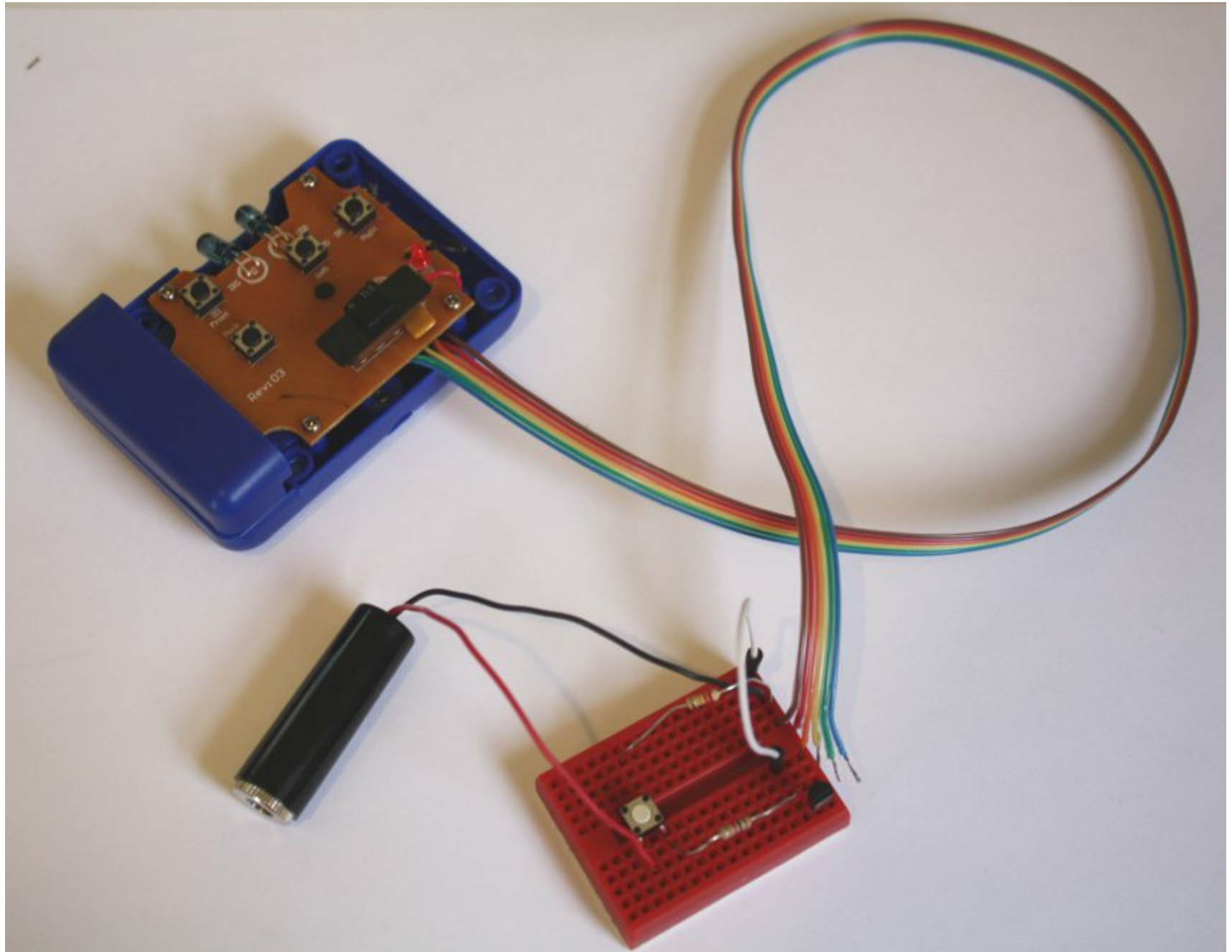
```
import serial  
ser = serial.Serial(port, 9600)  
ser.write(line)
```





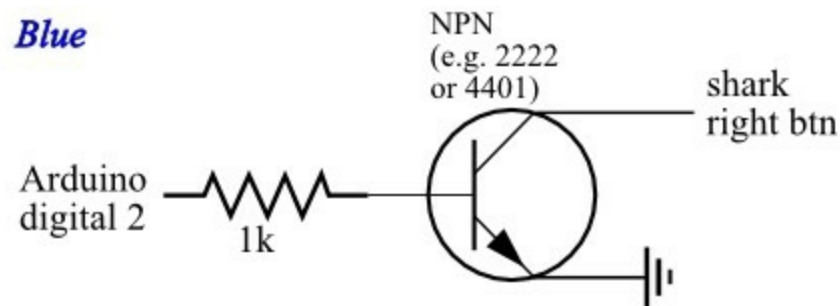




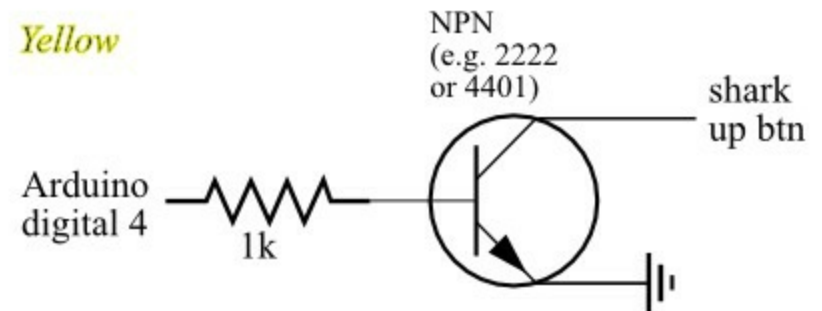


Arduino / Air Swimmers Shark transmitter interface

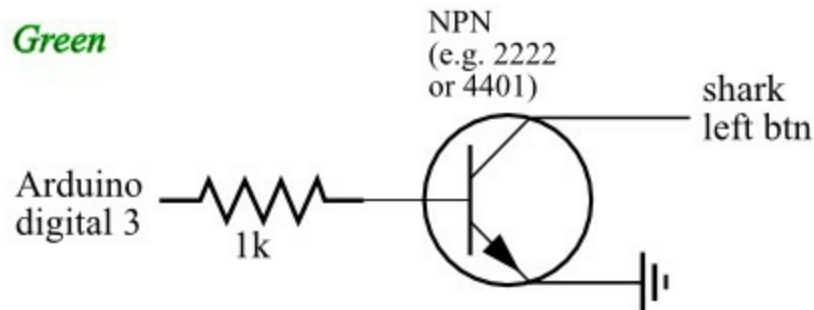
Blue



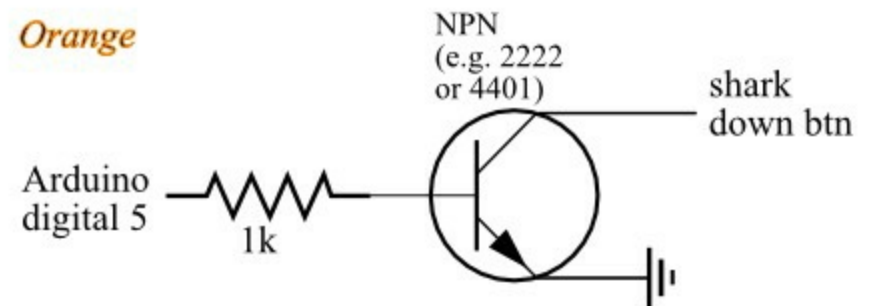
Yellow



Green

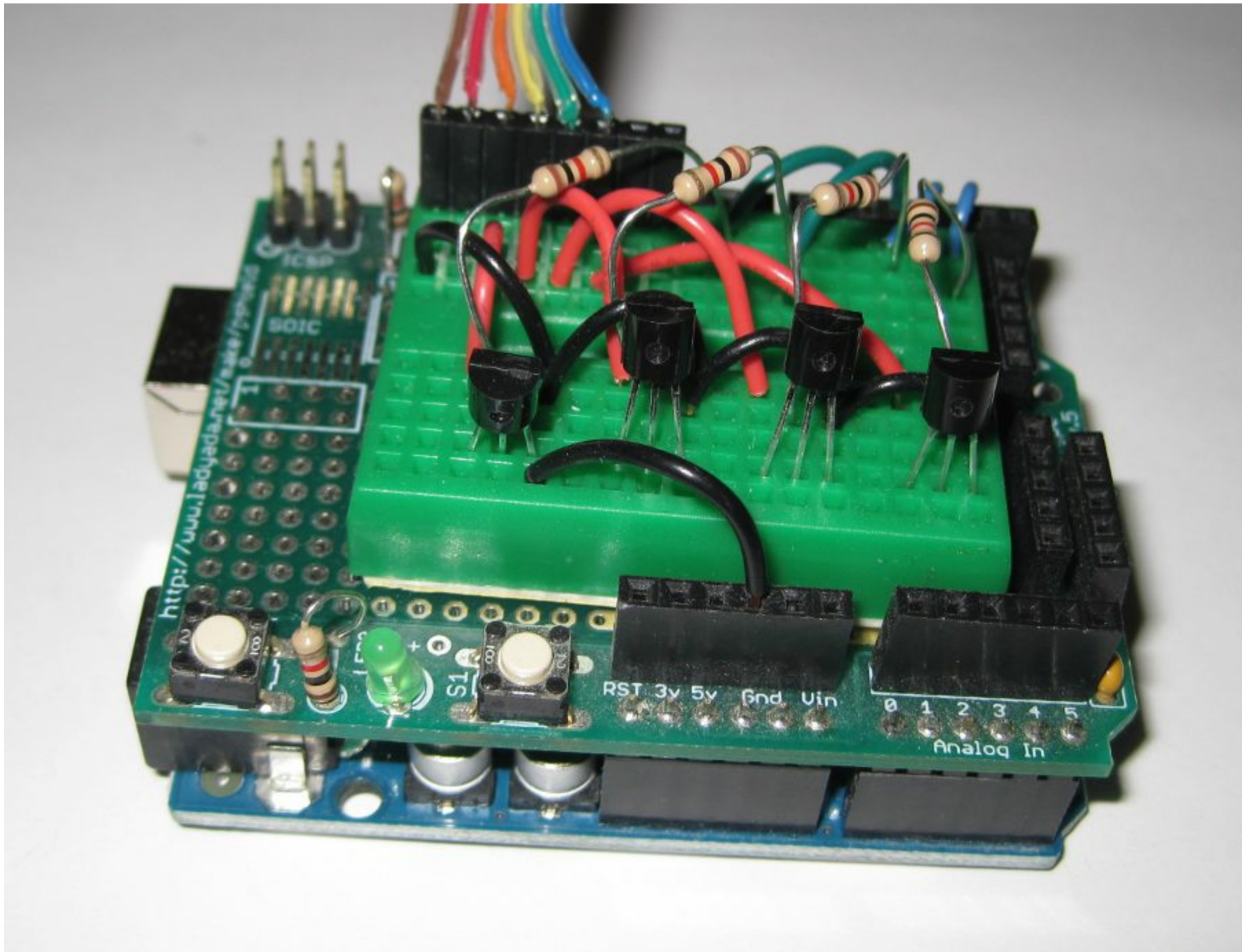


Orange



Brown: ground

Red: not used





Dilbert.com DilbertCartoonist@gmail.com



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Thank you ...

and have fun hacking!

Summary and notes at:
shallowsky.com/arduino