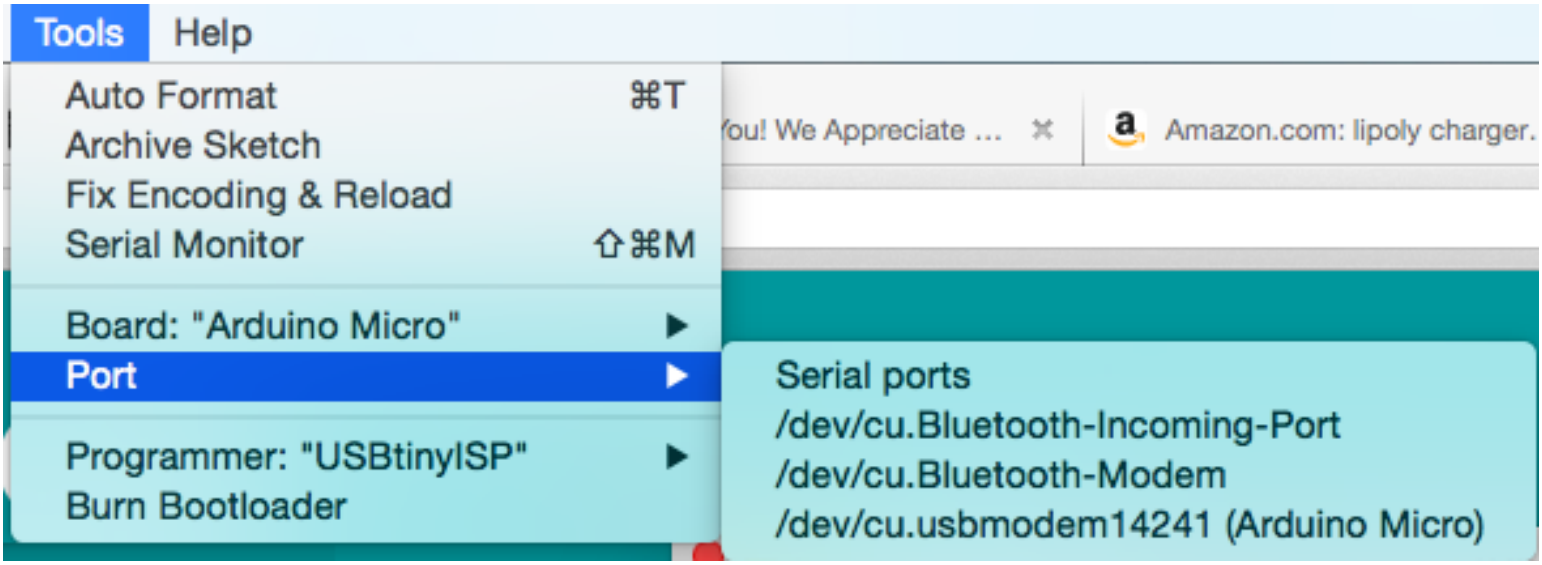
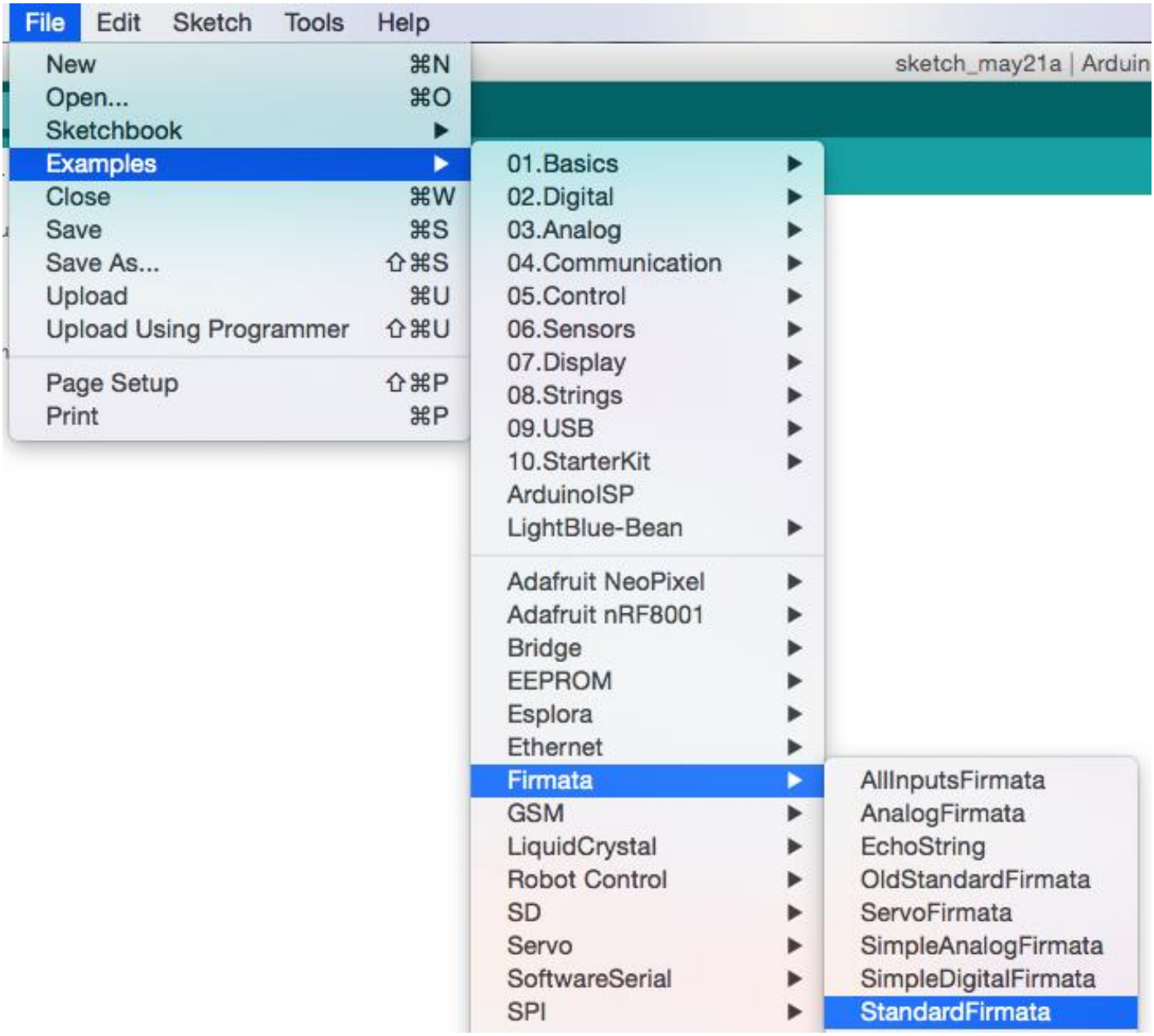
1

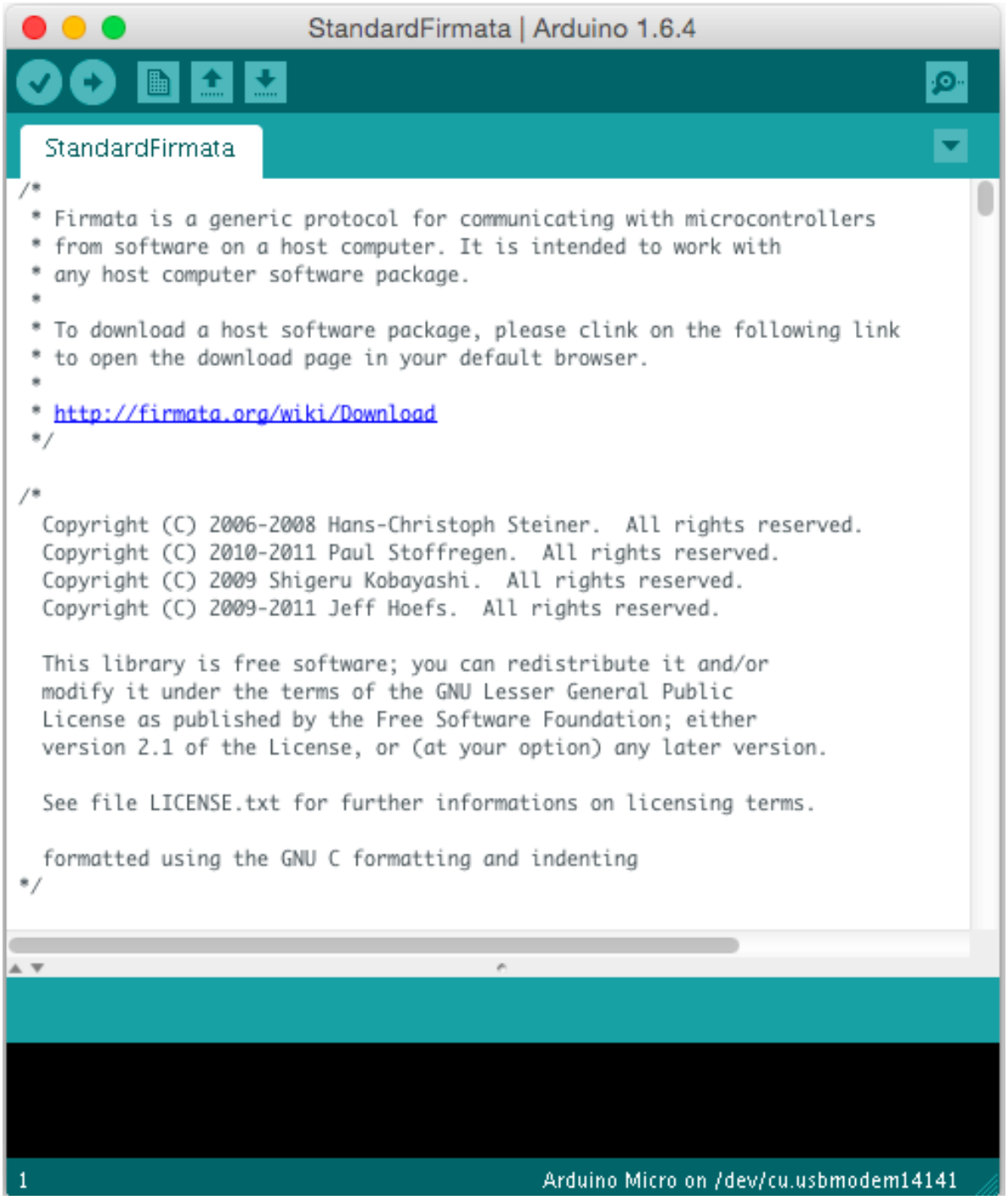
Getting Started with JS Robotics

Setting up your development environment

Connecting your Microcontroller and installing Firmata



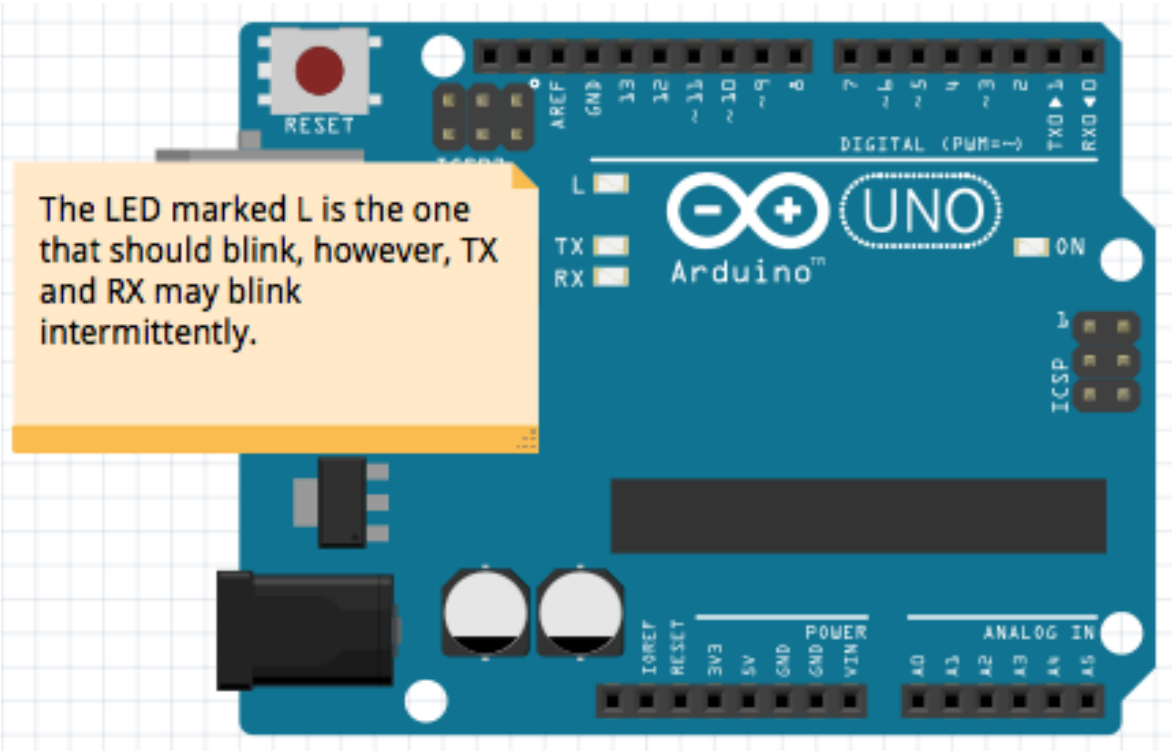

File
Edit
Sketch
Tools
Help
New ⌘N
Open... ⌘O
Sketchbook
Examples
Close ⌘W
Save ⌘S
Save As... ⇧⌘S
Upload ⌘U
Upload Using Programmer ⇧⌘U
Page Setup ⇧⌘P
Print ⌘P
sketch_may21a | Arduin
01.Basics
02.Digital
03.Analog
04.Communication
05.Control
06.Sensors
07.Display
08.Strings
09.USB
10.StarterKit
ArduinoISP
LightBlue-Bean
Adafruit NeoPixel
Adafruit nRF8001
Bridge
EEPROM
Esplora
Ethernet
Firmata
GSM
LiquidCrystal
Robot Control
SD
Servo
SoftwareSerial
SPI
AllInputsFirmata
AnalogFirmata
EchoString
OldStandardFirmata
ServoFirmata
SimpleAnalogFirmata
SimpleDigitalFirmata
StandardFirmata



Hello, World! – Blinking an onboard LED

Running the script

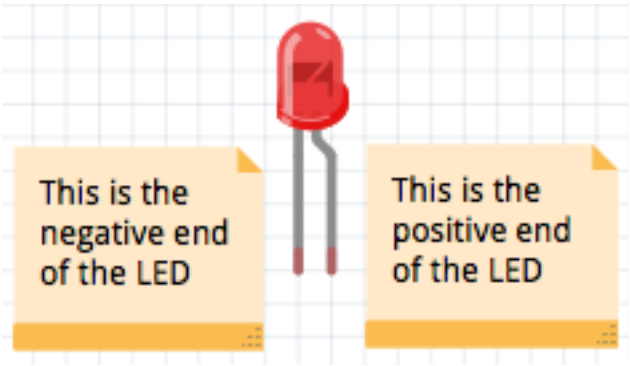
```
nodebotanist@Kassandras-MacBook-Air ~/Writing/packt-j5-book/chapter1/code node hello-world.js
1432242187981 Looking for connected device
1432242226377 Device(s) /dev/cu.usbmodem14131
1432242226406 Connected /dev/cu.usbmodem14131
1432242229711 Repl Initialized
>>
```


The LED marked L is the one that should blink, however, TX and RX may blink intermittently.
RESET
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM=~)
L
TX
RX
Arduino™
UNO
ON
ICSP
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN

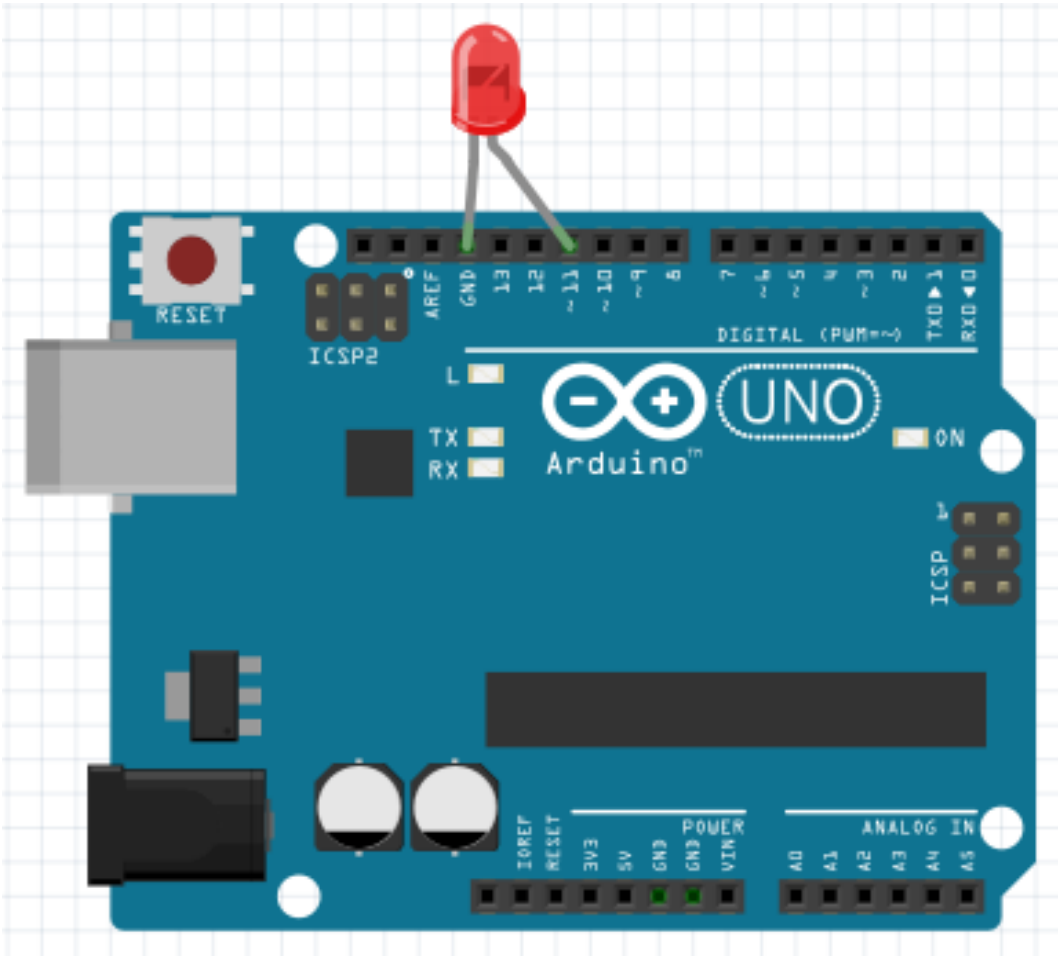
2
Working with Johnny-Five

Wiring up an external LED

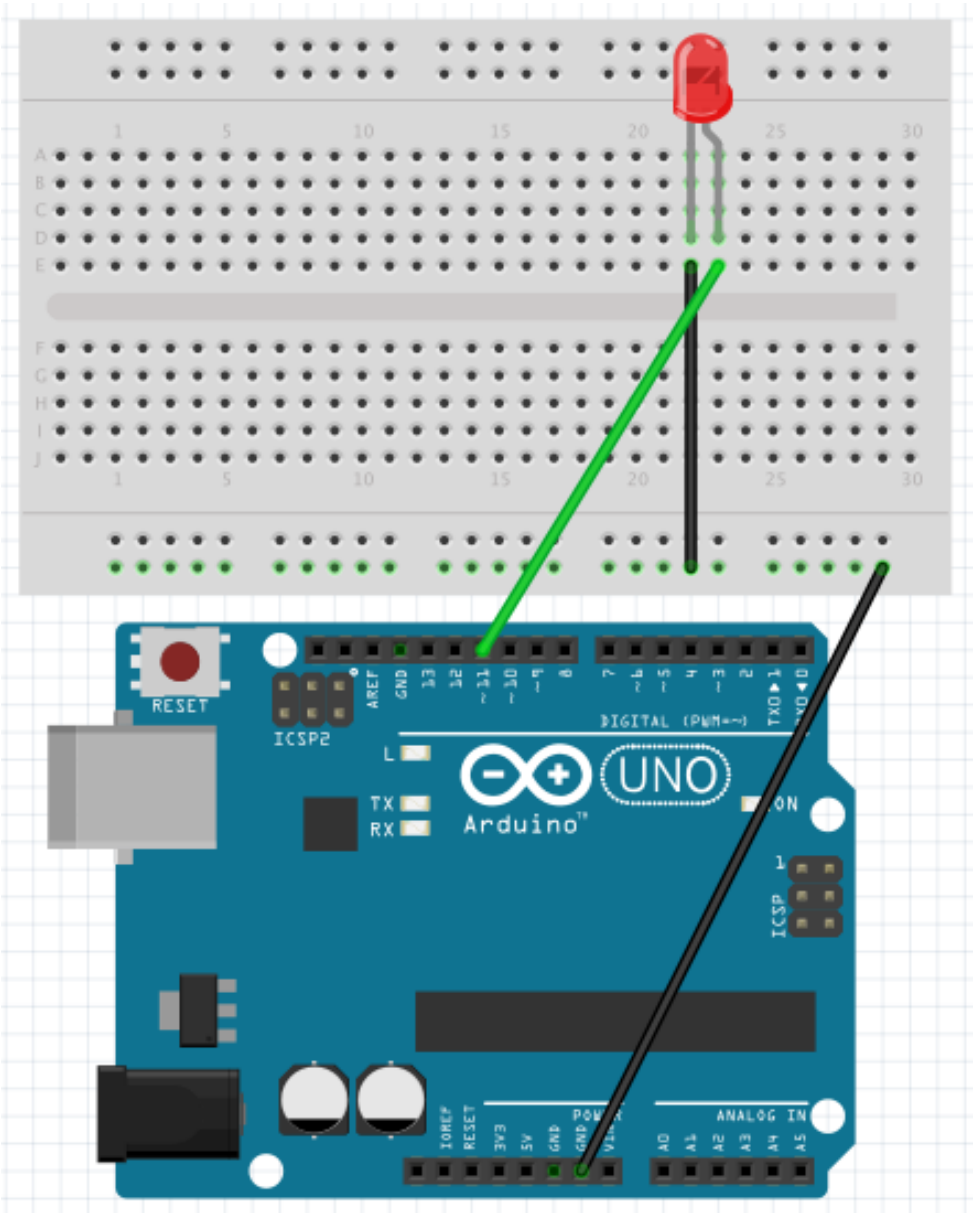
Setting up the hardware



Determining the positive and negative ends of an LED



Wiring up our LED



Wiring an LED with a breadboard

Using the Read-Eval-Print-Loop (REPL)

Using the REPL

```
nodebotanist@Kassandras-MacBook-Air ~/Writing/packt-j5-book/chapter1/code node hello-world.js
1432242187981 Looking for connected device
1432242226377 Device(s) /dev/cu.usbmodem14131
1432242226406 Connected /dev/cu.usbmodem14131
1432242229711 Repl Initialized
>>
```

Terminal setup for Johnny-Five REPL prompt

The output of your myLed object in the REPL

The output from myLed.stop();

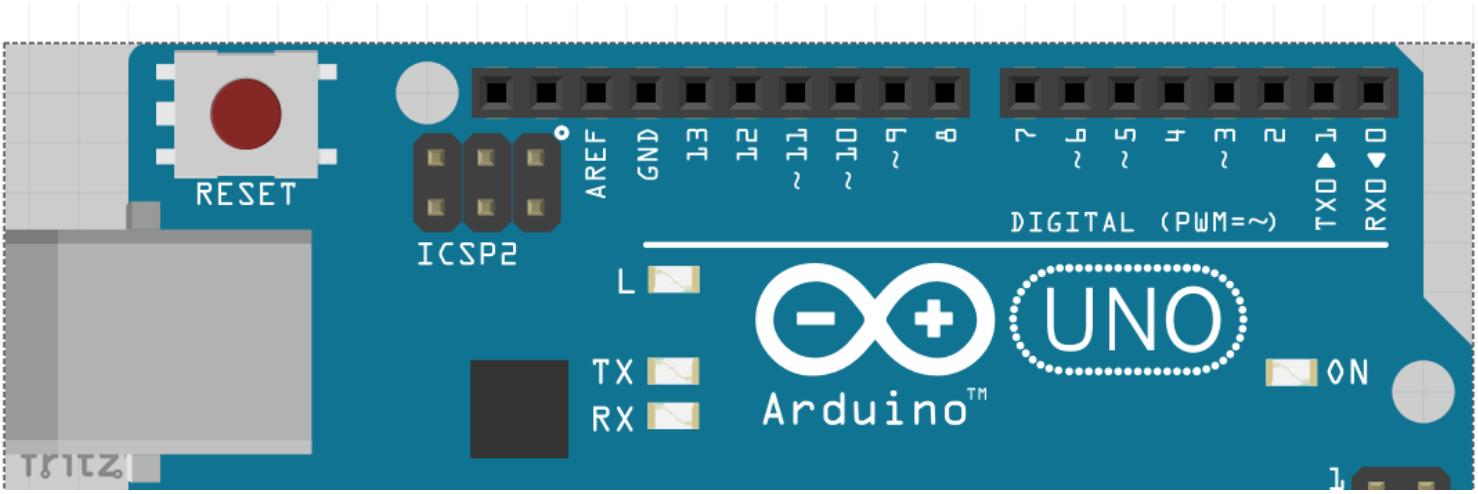
Using chainable function calls in the REPL

3

Using Digital and PWM Output Pins

How GPIO pins work

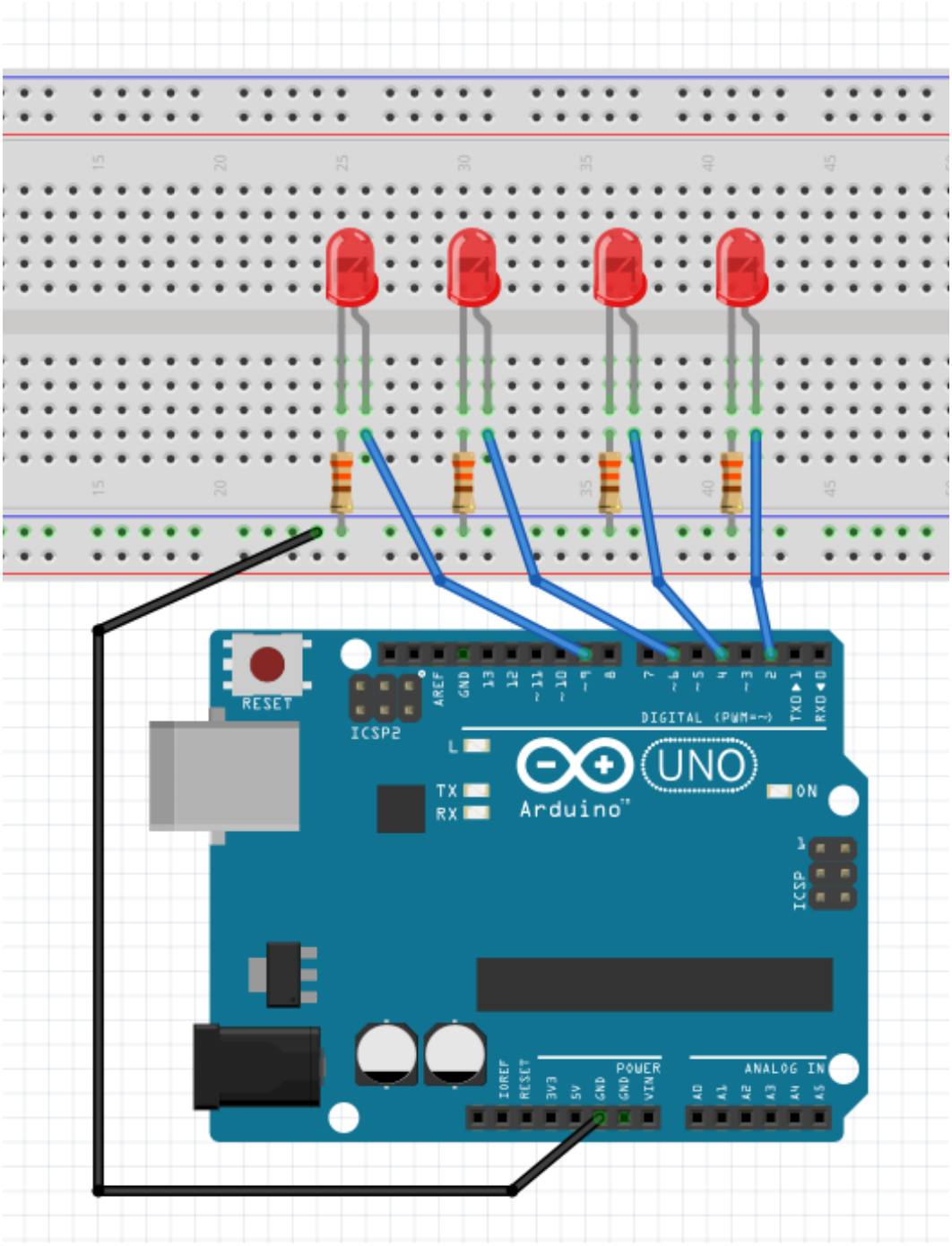
How to tell the difference between Digital and PWM pins



Determining the PWM pins on an Arduino Uno

Multiple pins with several LEDs

Setting up the hardware for the project



Wiring for our multiple LEDs project

Exploring more about Led objects in Johnny-Five

Error when using a PWM method on a digital pin

```
>> myLed2.on().isOn
true
```

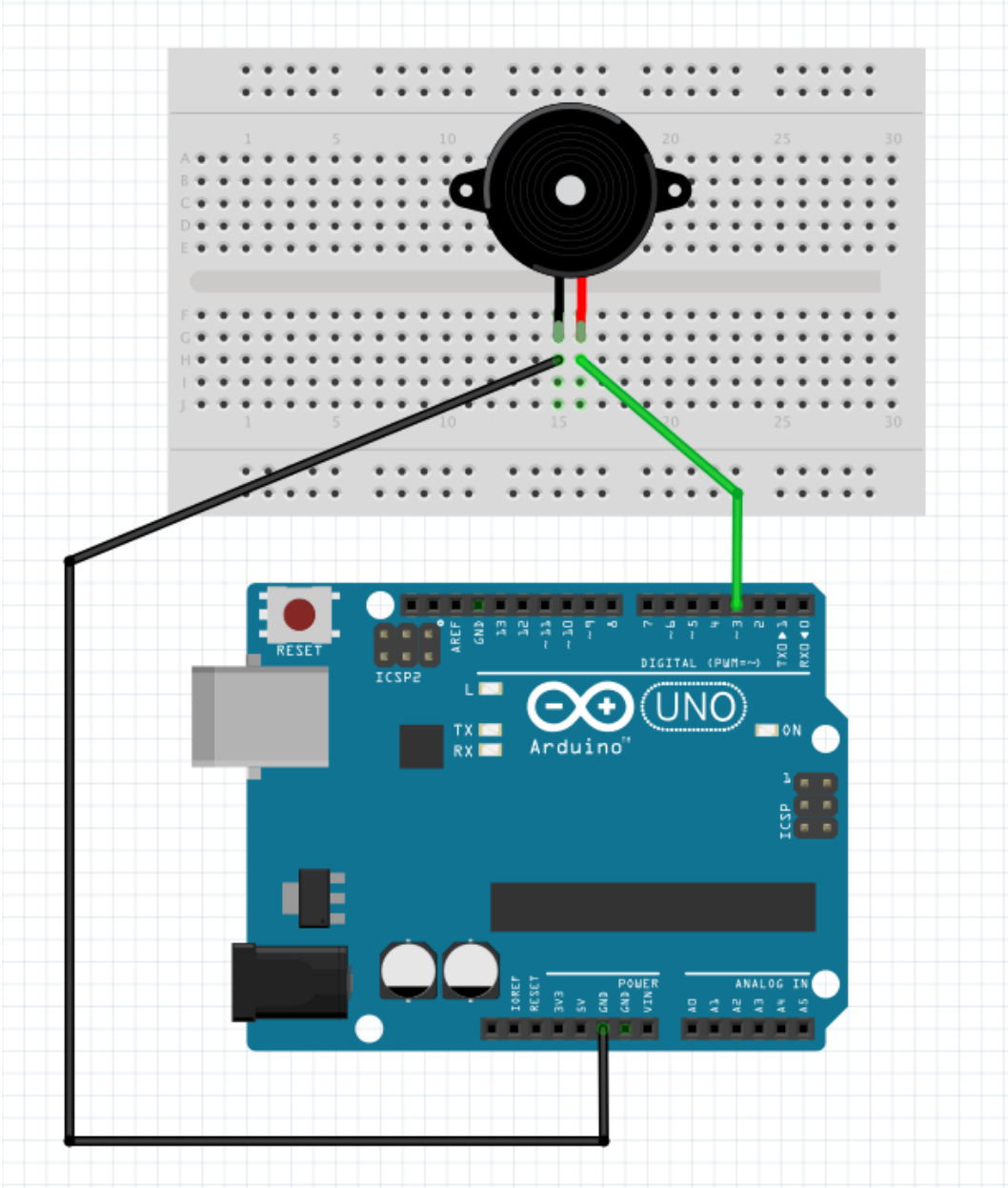
The isOn attribute

```
>> myLed2.value
1
>> myLed2.isOn
true
>>
```

The other Led attributes

Using PWM pins with the Piezo element

Setting up the hardware

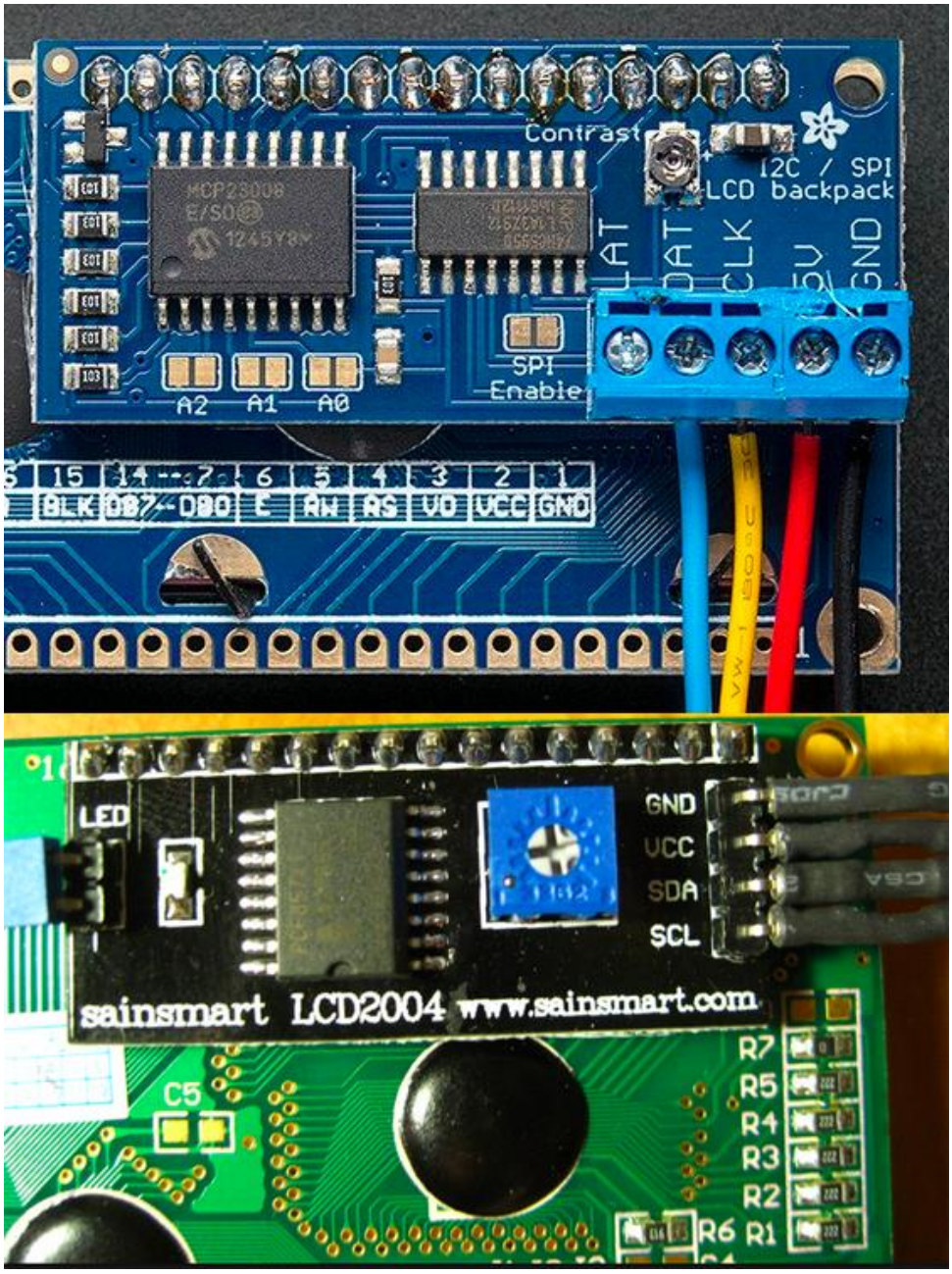


Piezo wiring diagram

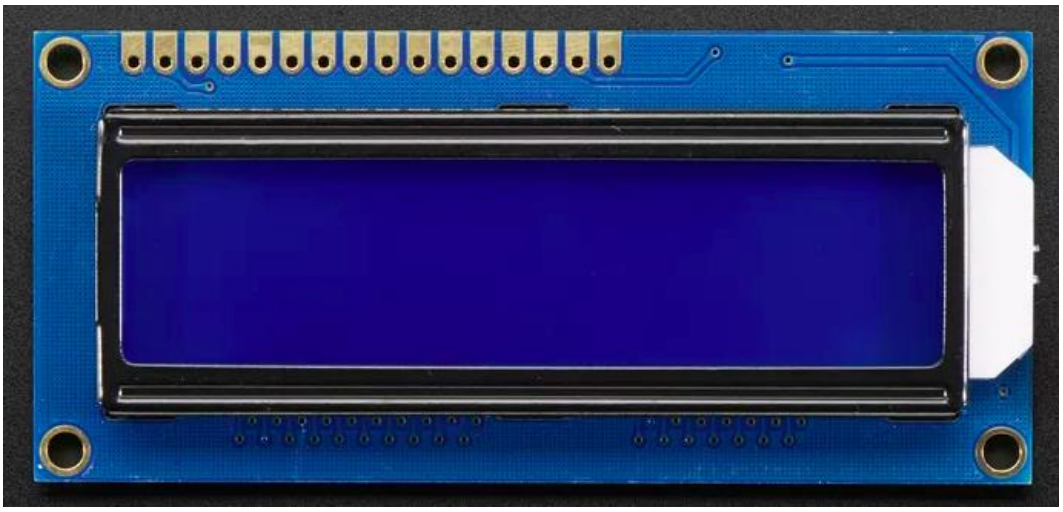
4

Using Specialized Output Devices

What you'll need for this chapter

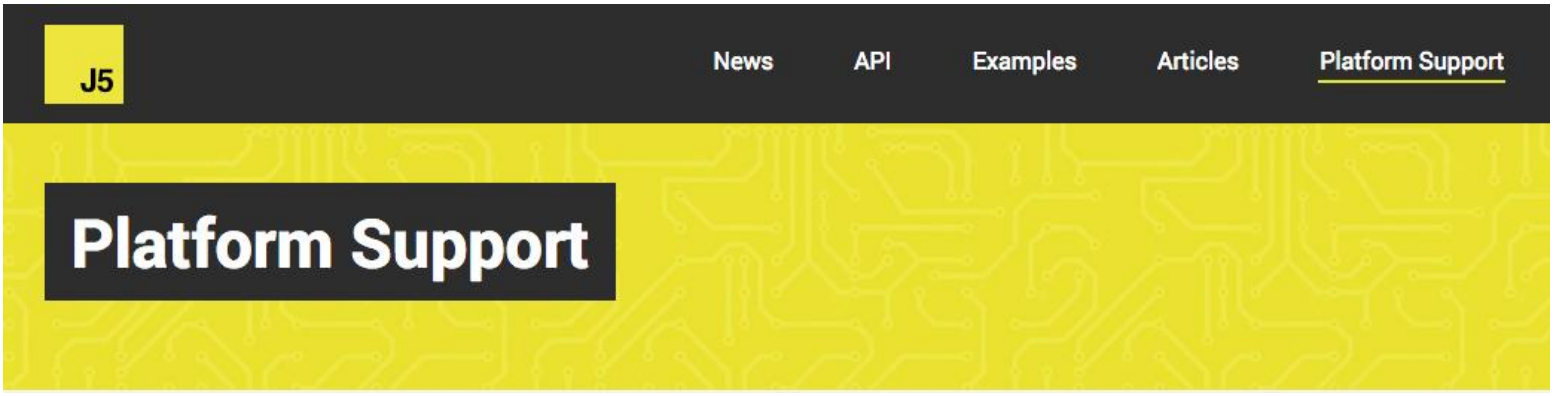


Examples of i2c backpacks on character LCDs



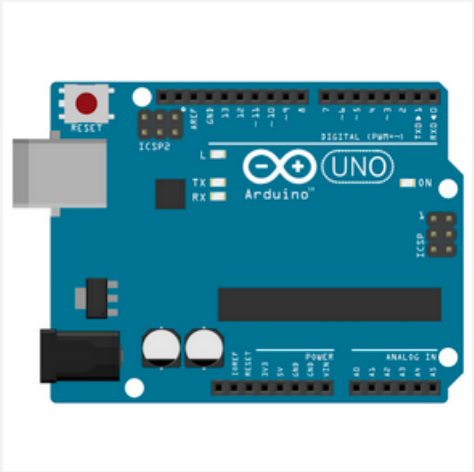
A non-i2c character LCD

Checking compatibility with Johnny-Five



The johnny-five.io header

Arduino Uno

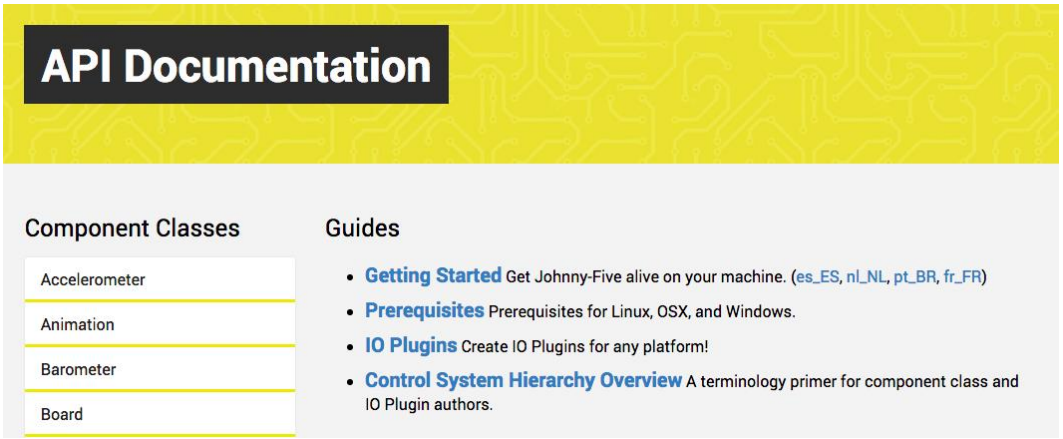


- Firmware/Runtime: StandardFirmata (additional instructions)
- The JavaScript program is executed on a **host** machine that runs node.js/io.js. The program transmits basic IO instructions to the board via **usb serial**, which acts as a **thin client**. Requires tethering.

Analog Read	yes
Digital Read	yes
Digital Write	yes
PWM	yes
Servo	yes
I2C	yes
One Wire	yes
Stepper	yes

The Platform Support page entry for Arduino Uno

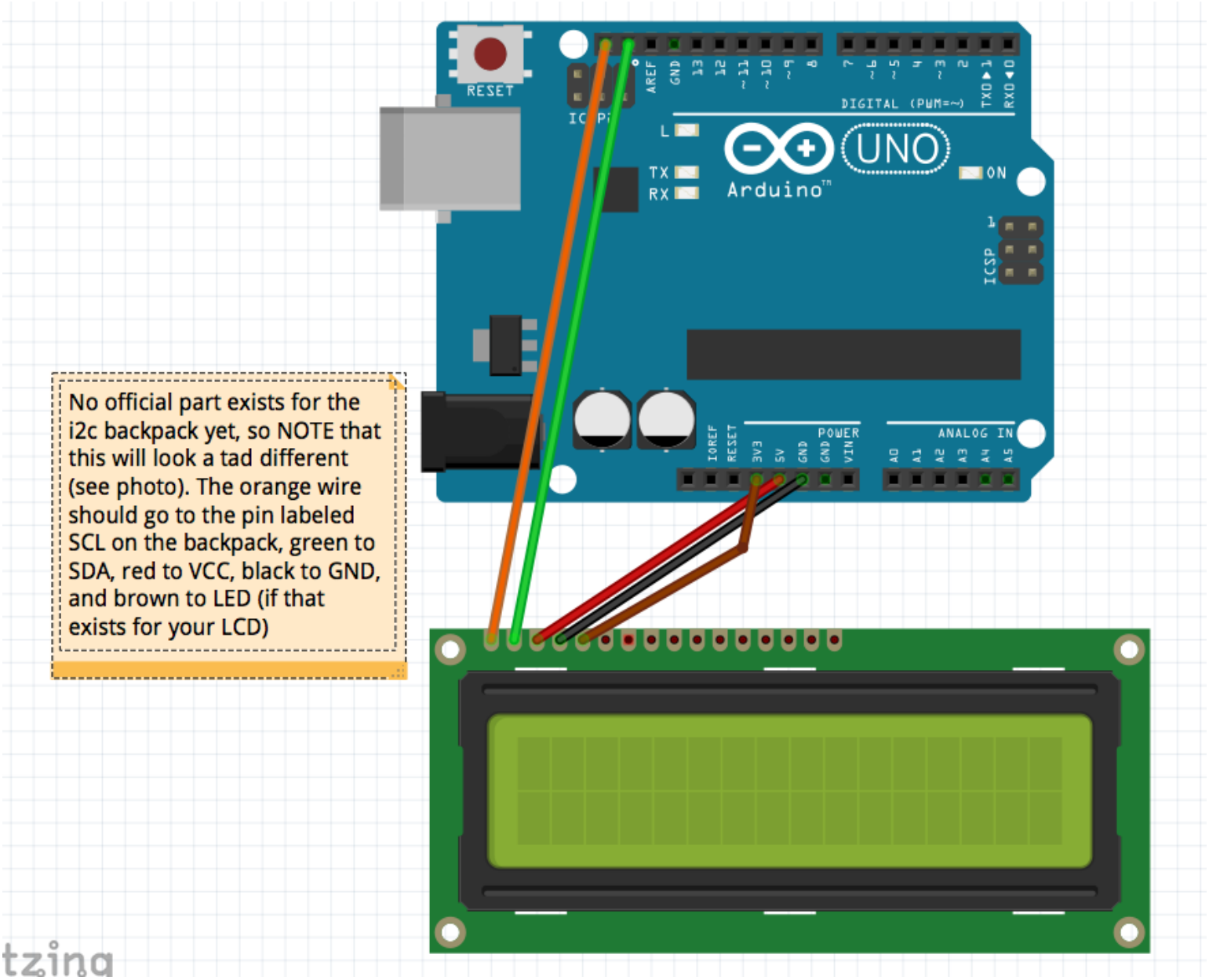
Obtaining documentation, wiring diagrams, and so on



The API documentation page

Project – Character LCD

Wiring up – i2c LCDs



A diagram of i2c LCD hookup

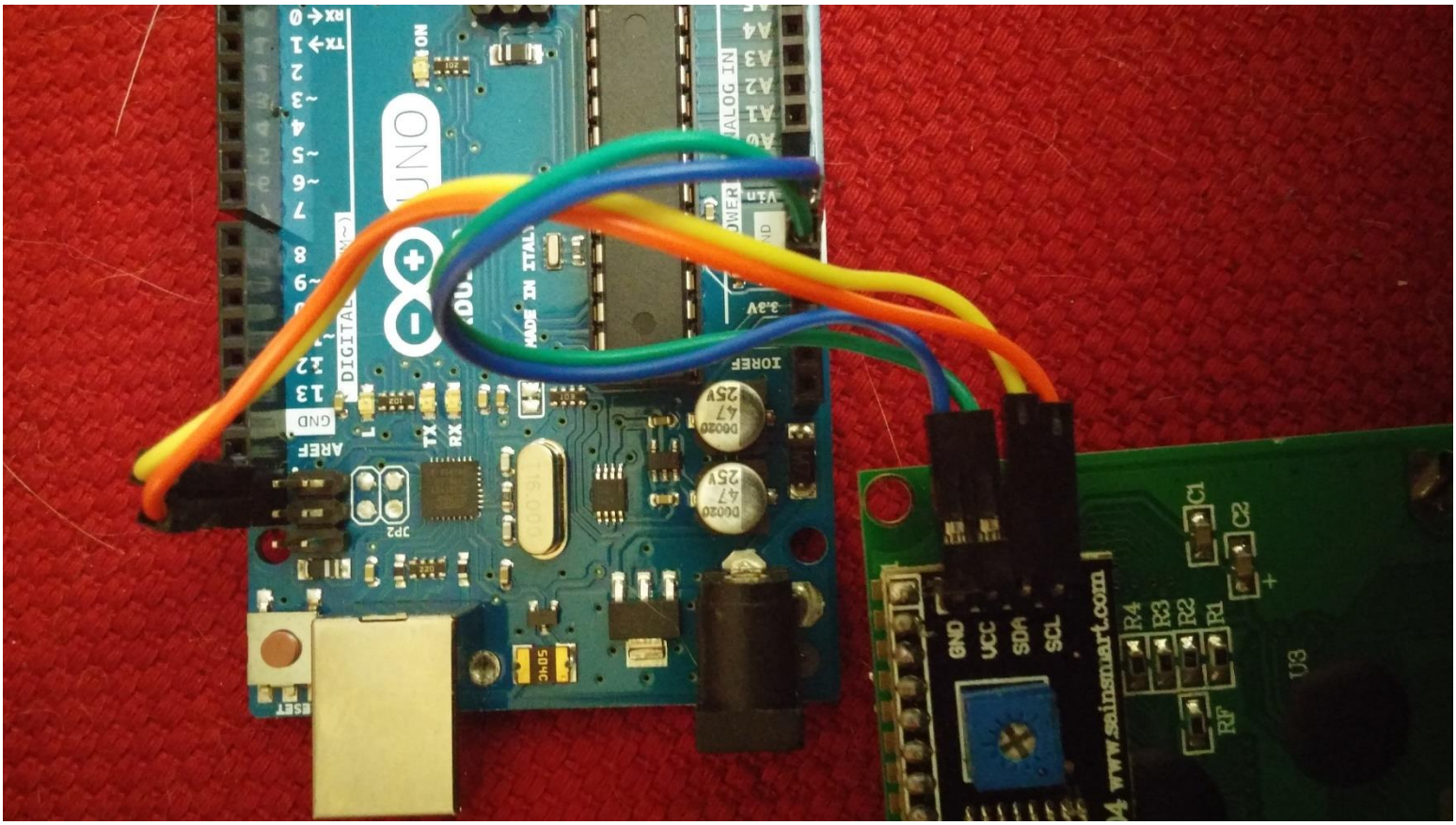
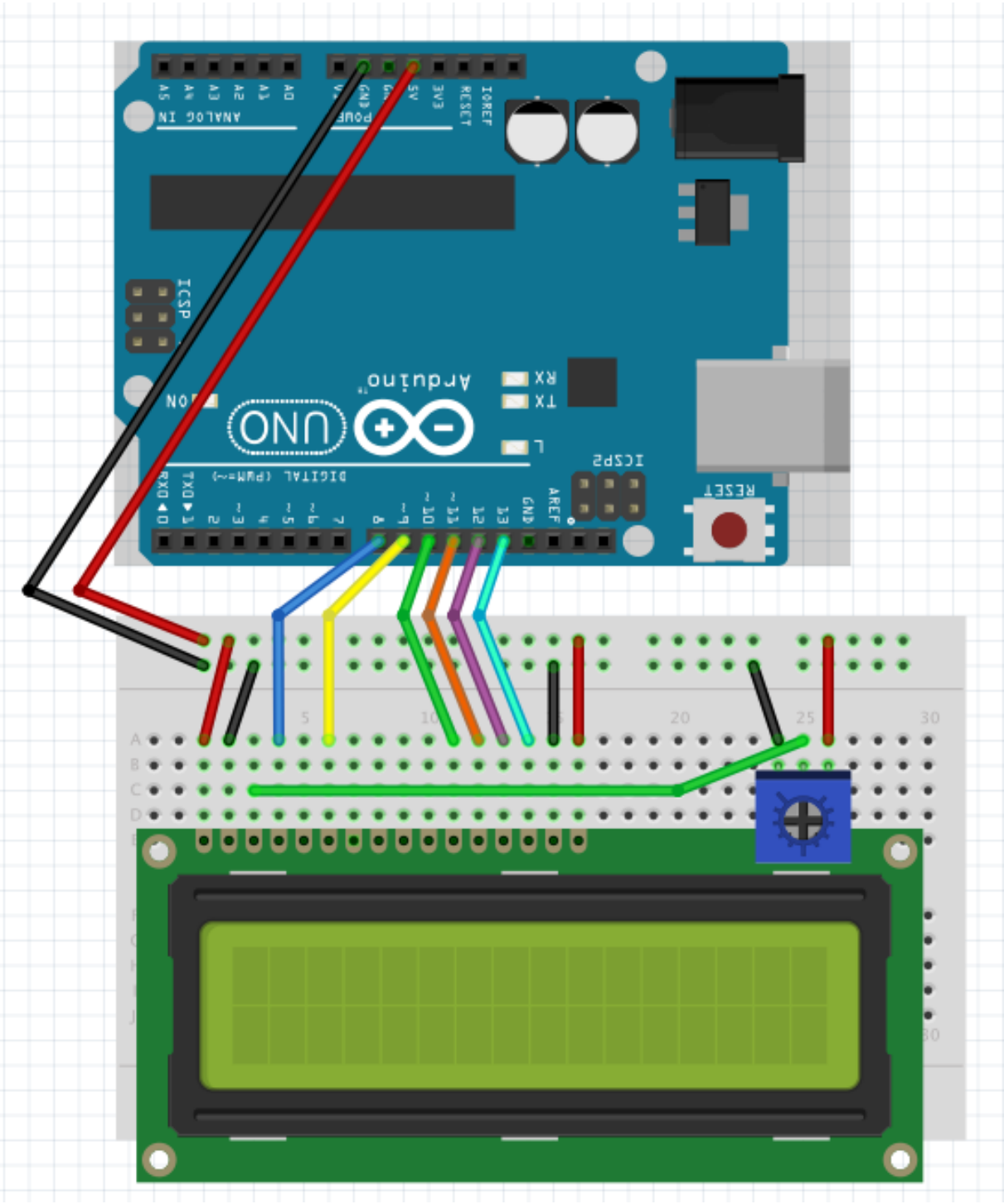


Photo of i2c backpack wiring. Wiring up regular LCDs



Wiring up a non-i2c LCD

5
Using Input Devices and Sensors

What you'll need for this chapter

A common push button for robotics projects

A basic rotating potentiometer

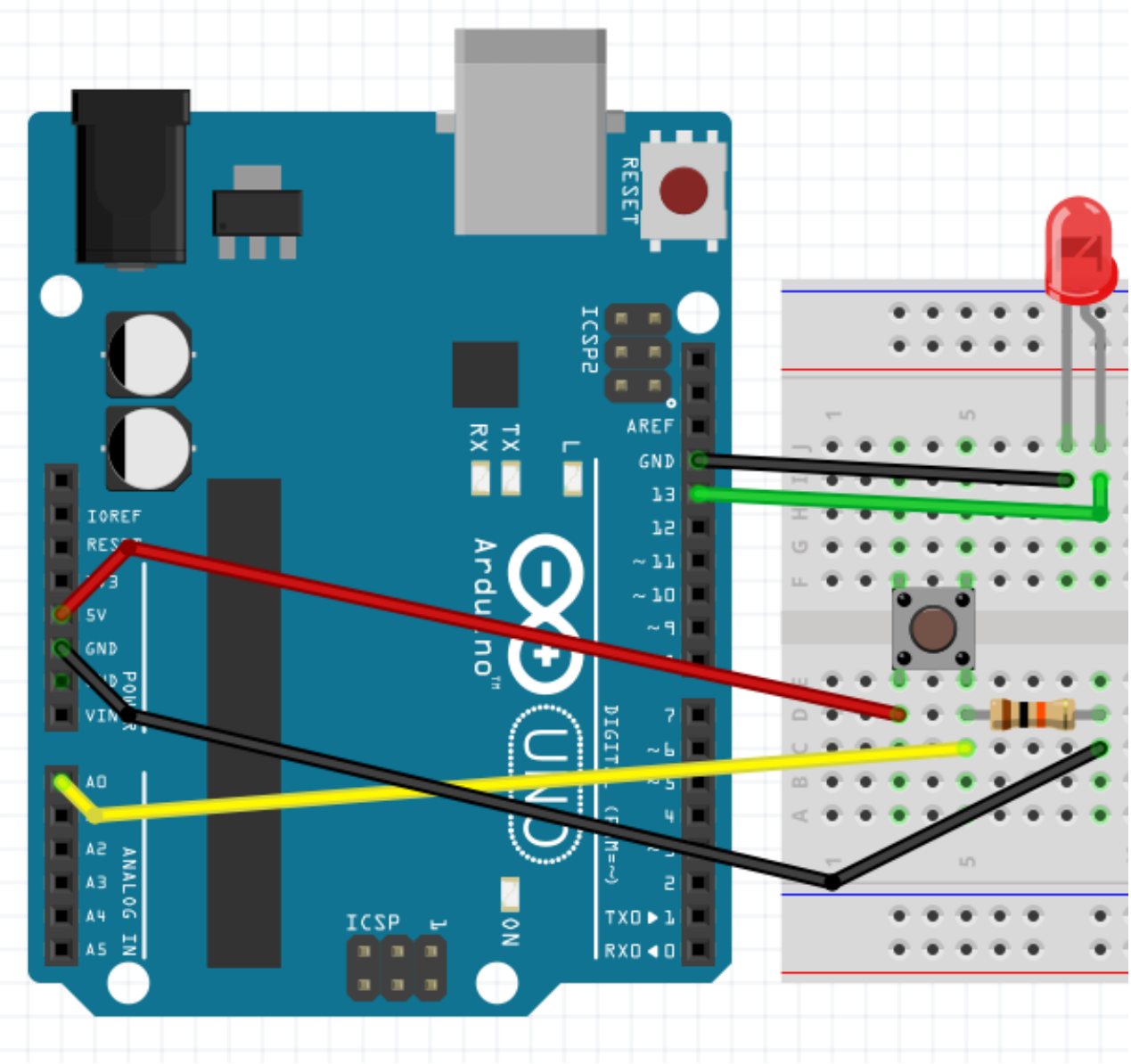
A light sensor diode

A temperature sensor

A 10k ohm resistor

Using basic inputs – buttons and potentiometers

Wiring up our button and LED



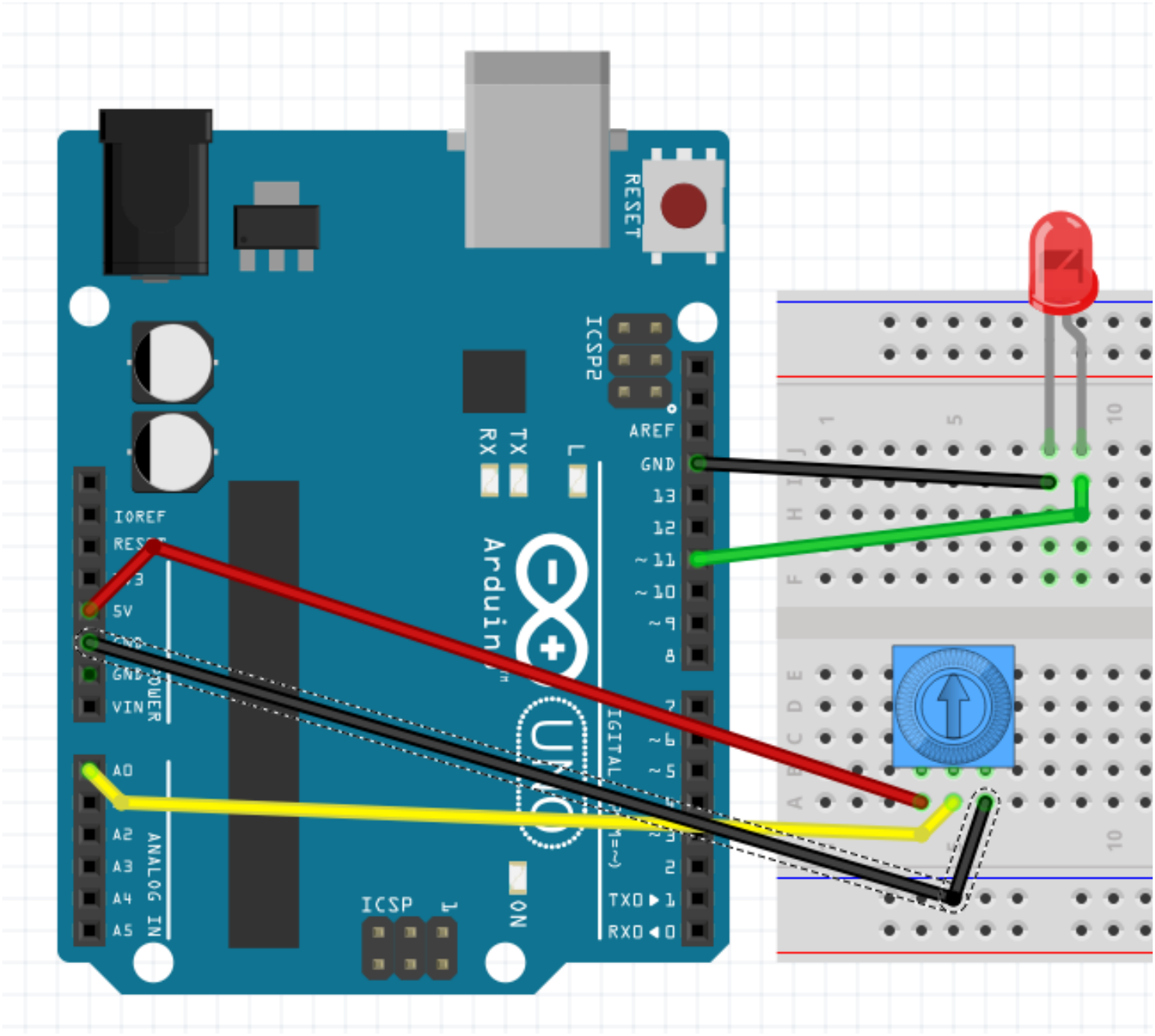
Wiring diagram for a button and an LED

Coding button-led.js

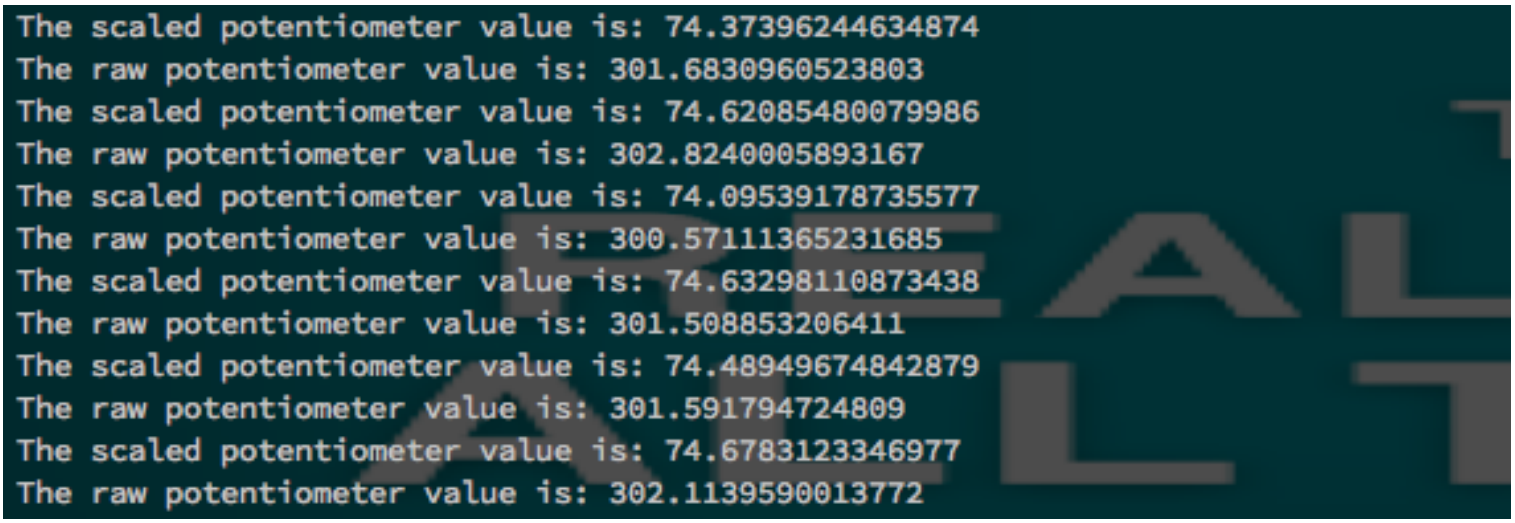
```
The button has been pressed!
The button has been released!
The button has been pressed!
The button has been released!
The button has been pressed!
The button has been released!
```

The output from led-button.js

Wiring the potentiometer and the LED



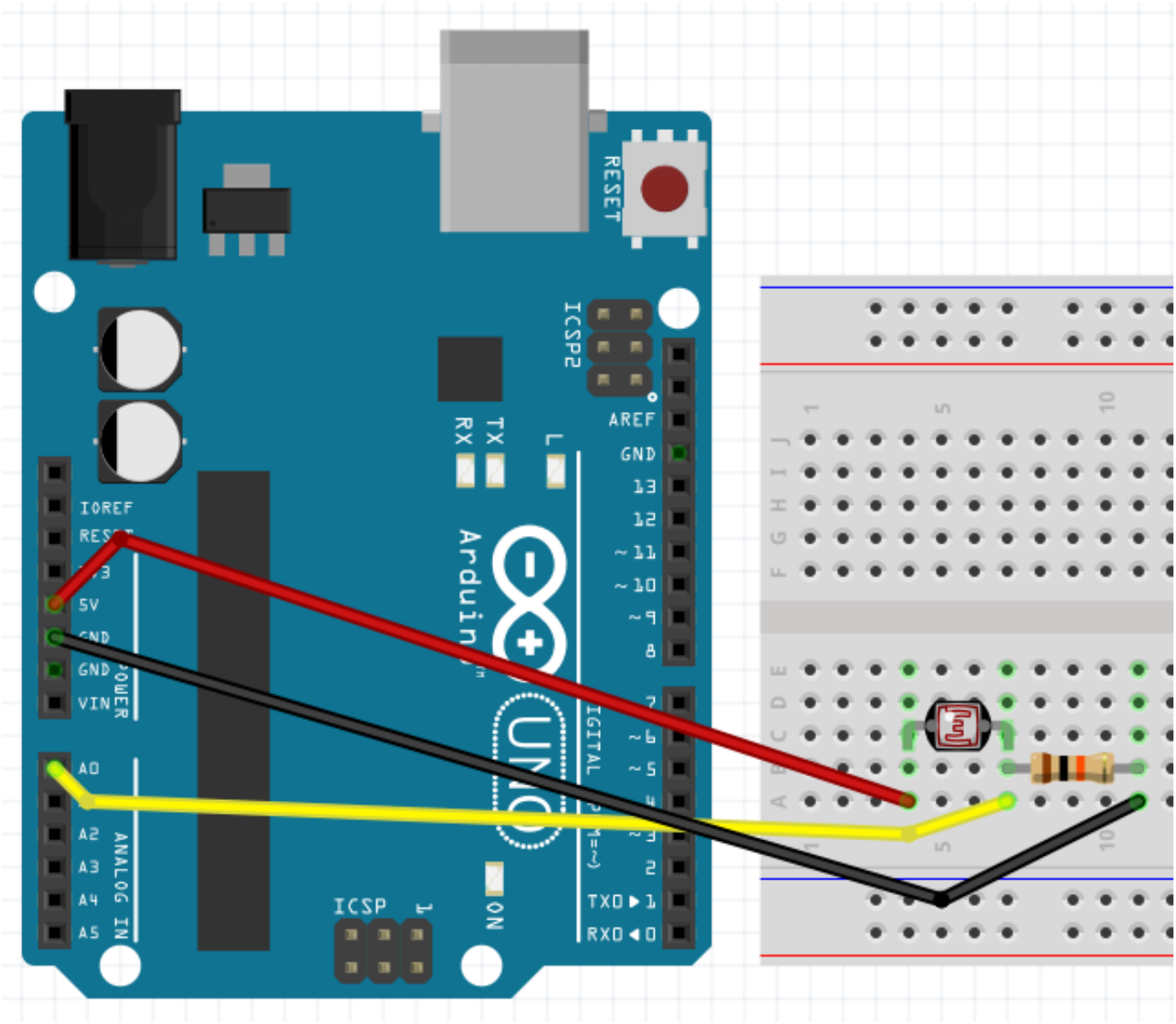
Wiring diagram for a dimmer switchCoding our dimmer switch



The output from dimmer-switch.js

Using sensors – Light and Temperature

Wiring up our photocell



The wiring diagram for the photocell

Coding our photocell example

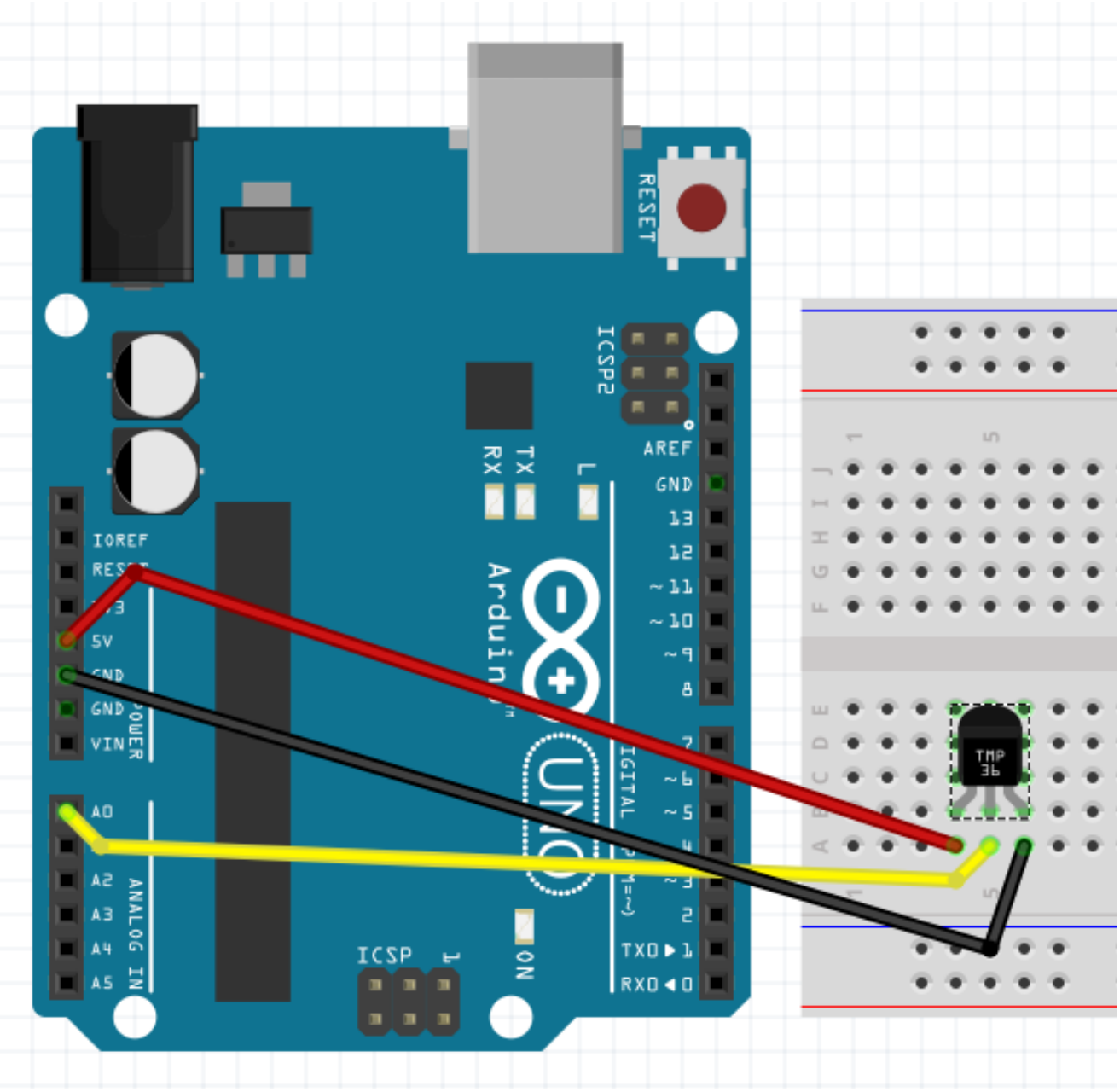
barcli

An output in the days before barcli

A barcli graph in the console

Coding everything together

Wiring up the temperature sensor



Wiring up the temperature sensor

Coding our temperature example

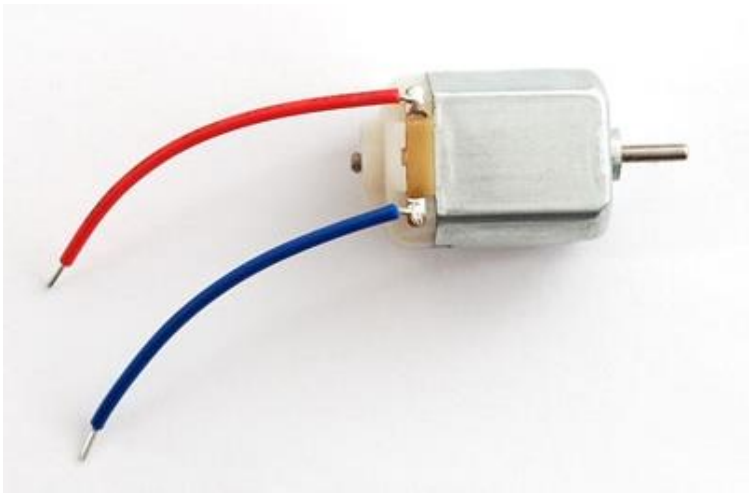
```
Farenheit: |                                                  | 72
  Celcius: |                                                  | 21
   Kelvin: |                                                  | 294
```

The temperature.js console output

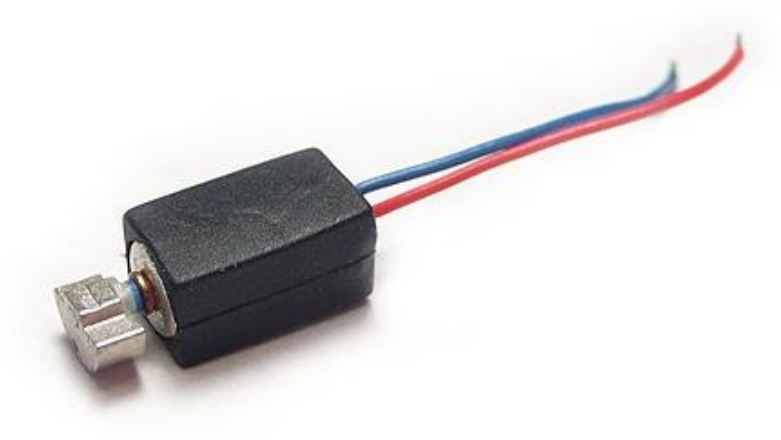
6
Moving Your Bot

The different kinds of servos and motors

Types of motors



A standard DC hobby motor



A vibration motor

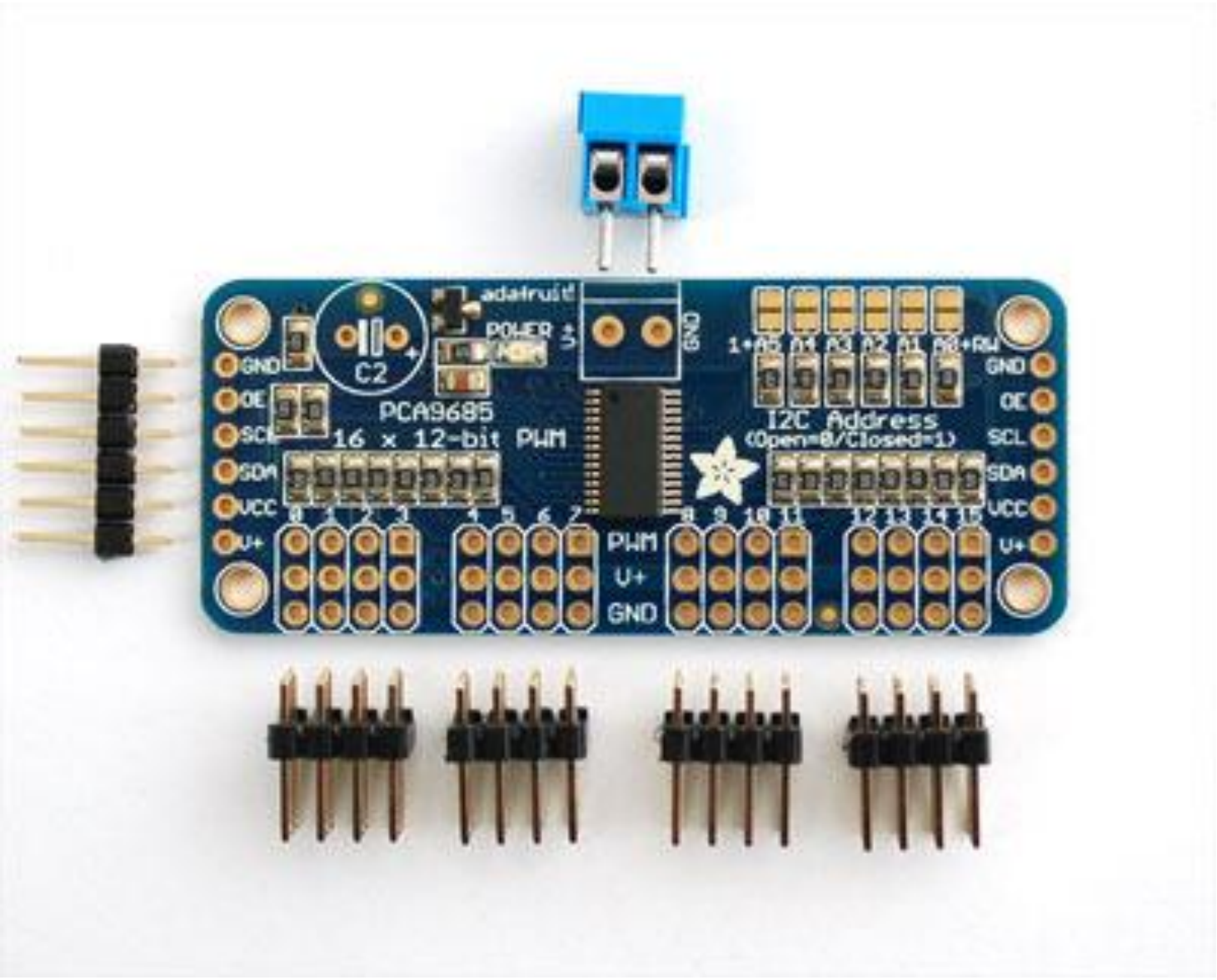
A stepper motor

Types of servos

A standard servo

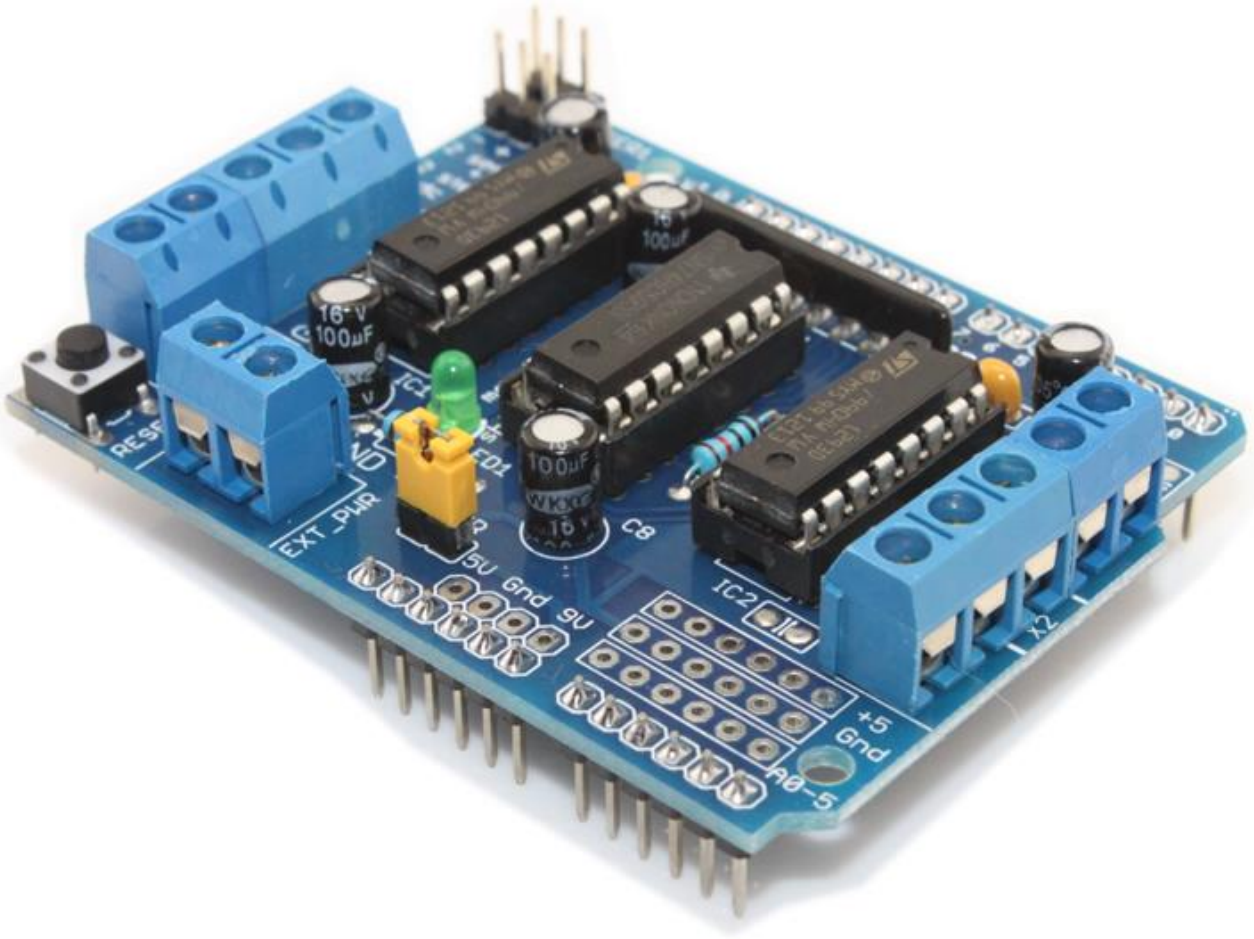
A continuous servo

Servo and motor controllers



An example of a servo controller with an I2C interface

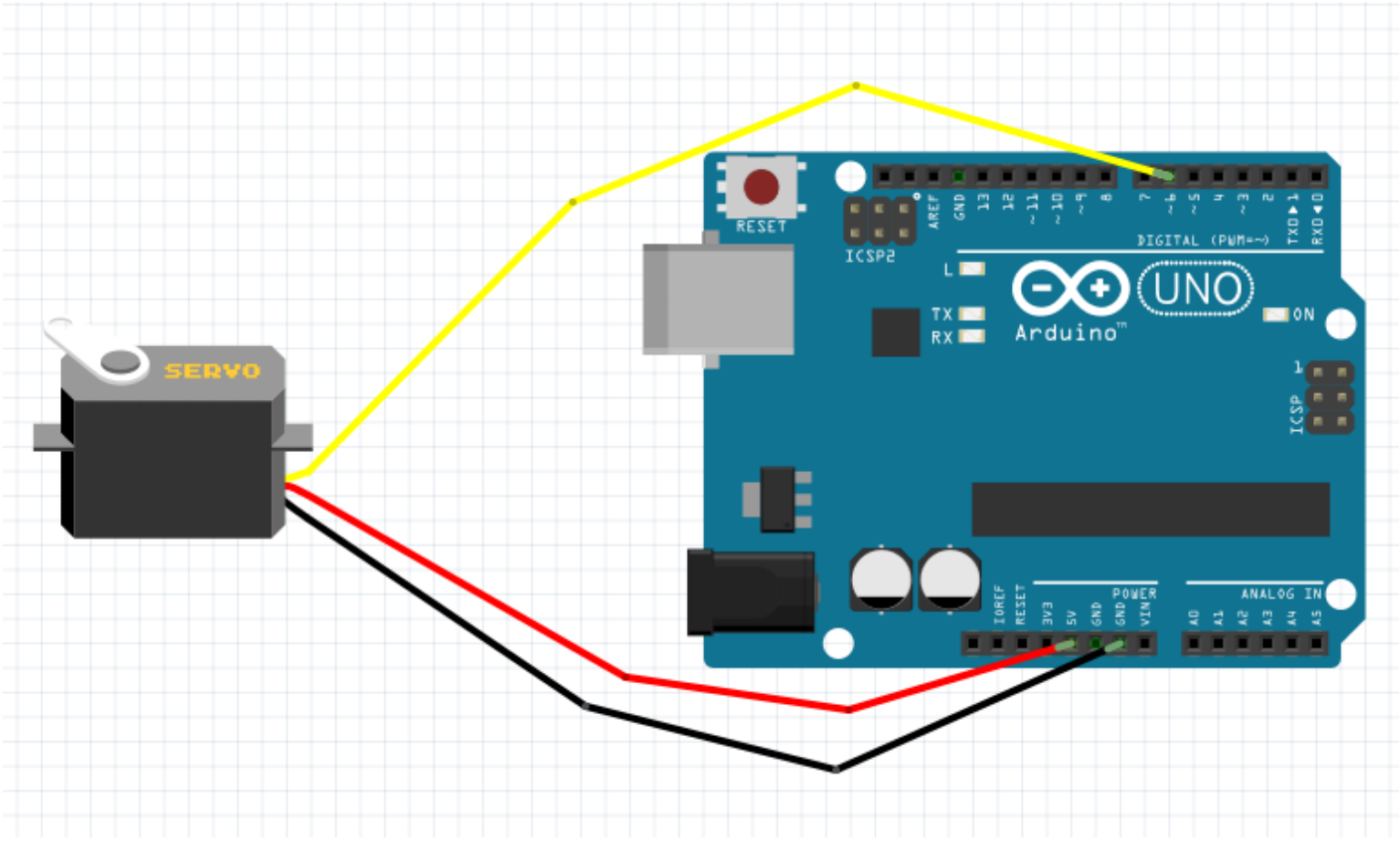
Motor and servo shields



An example of a motor shield

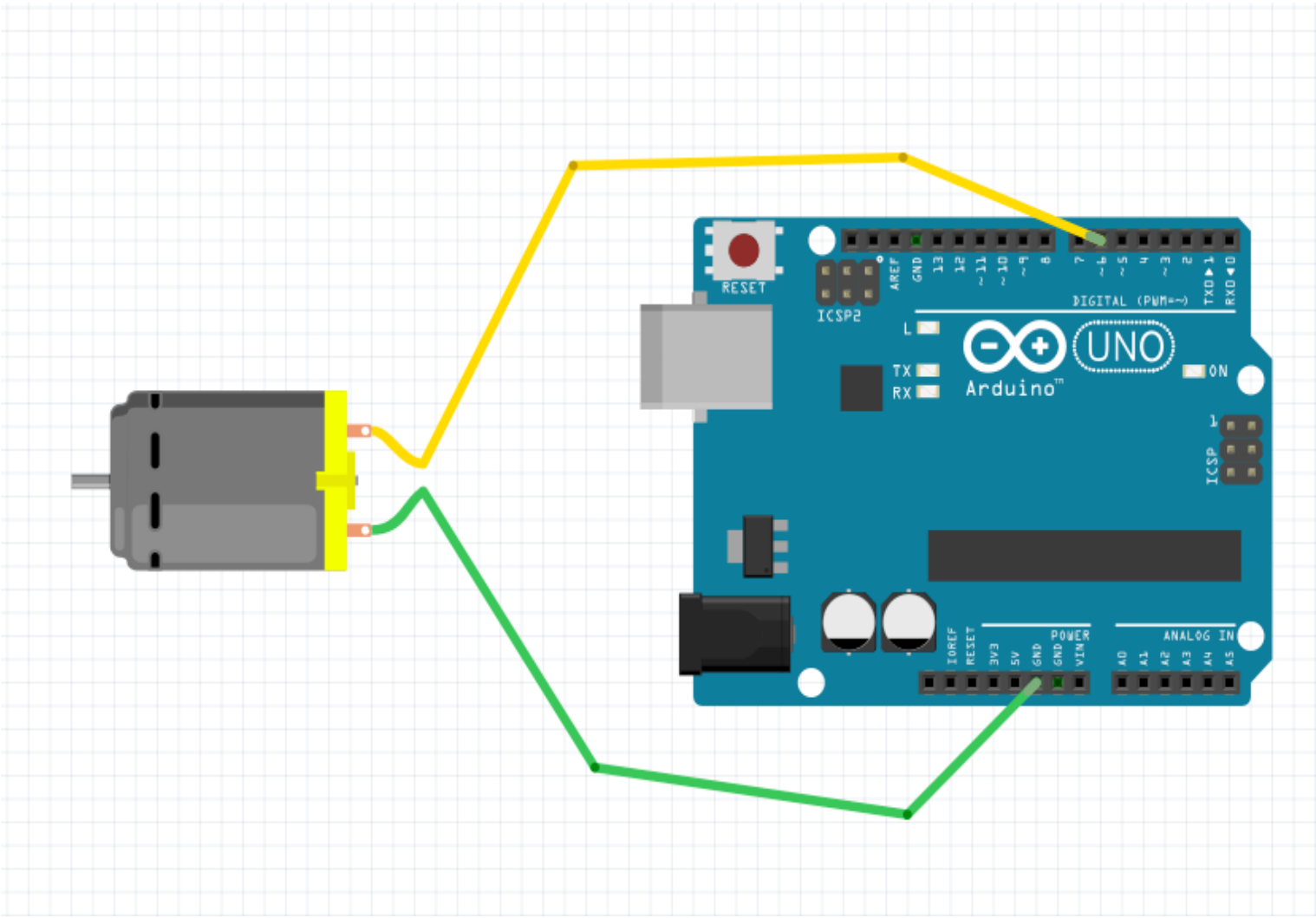
Wiring up servos and motors

Wiring up servos



A servo wiring diagram

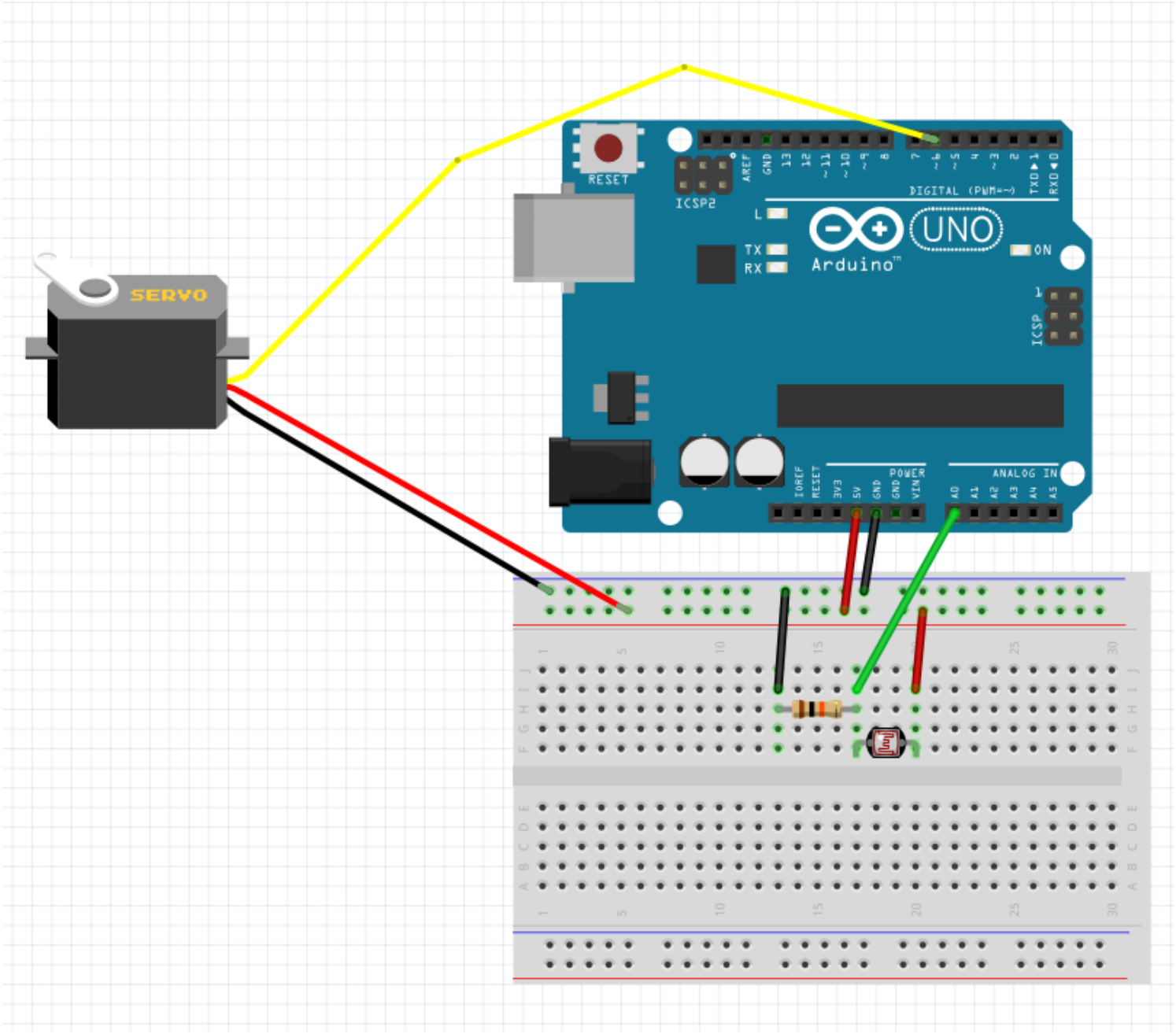
Wiring up motors



A motor wiring diagram

Creating a project with a servo and a sensor

Exploring the servo API with the REPL



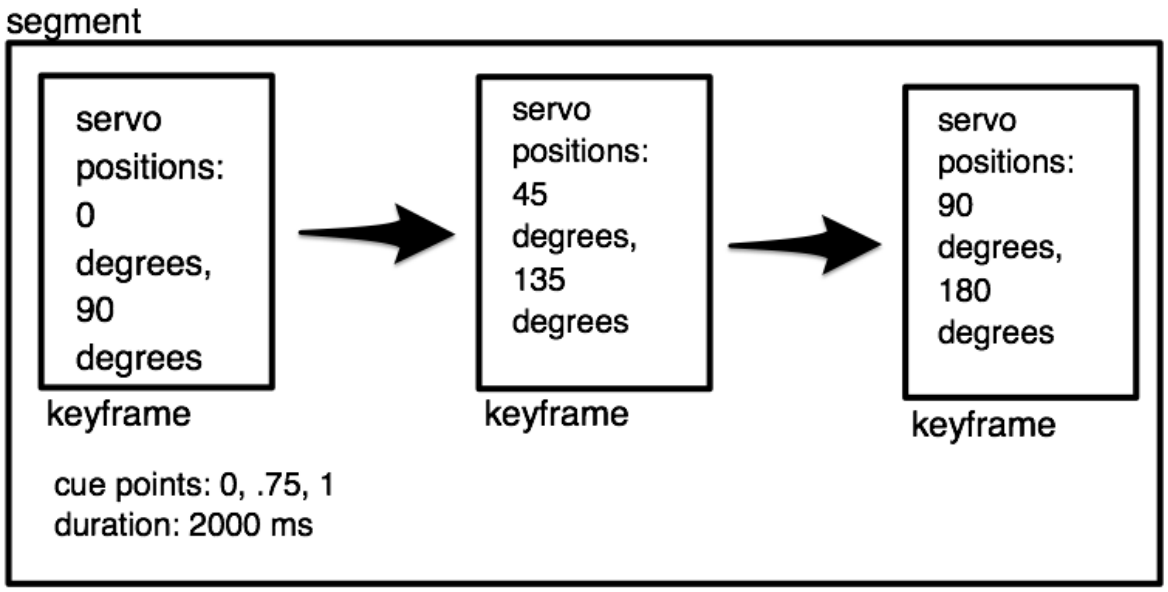
A servo and photoresistor wiring diagram

7

Advanced Movement with Animation Library

Looking at the Animation API

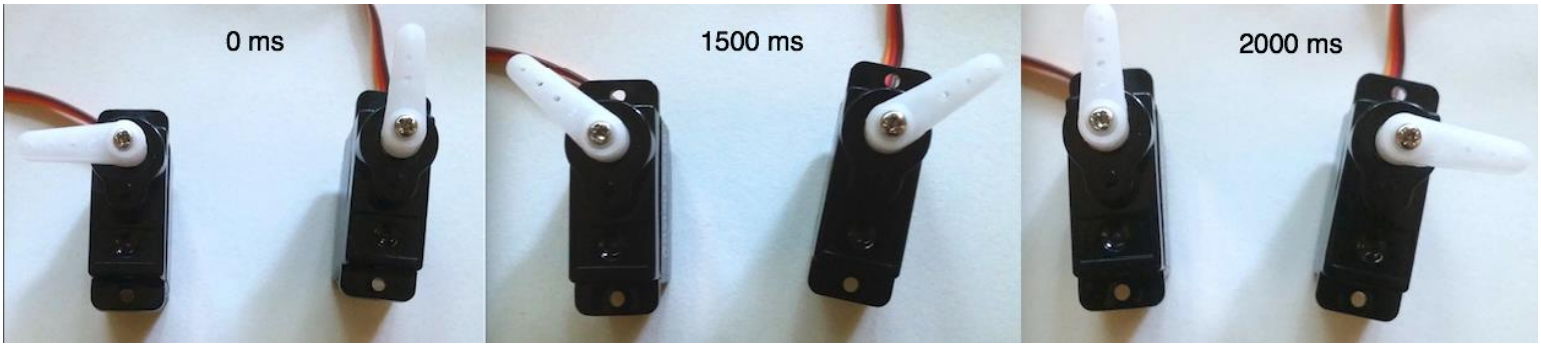
Learning the terminology



A graphical representation of an Animation segment

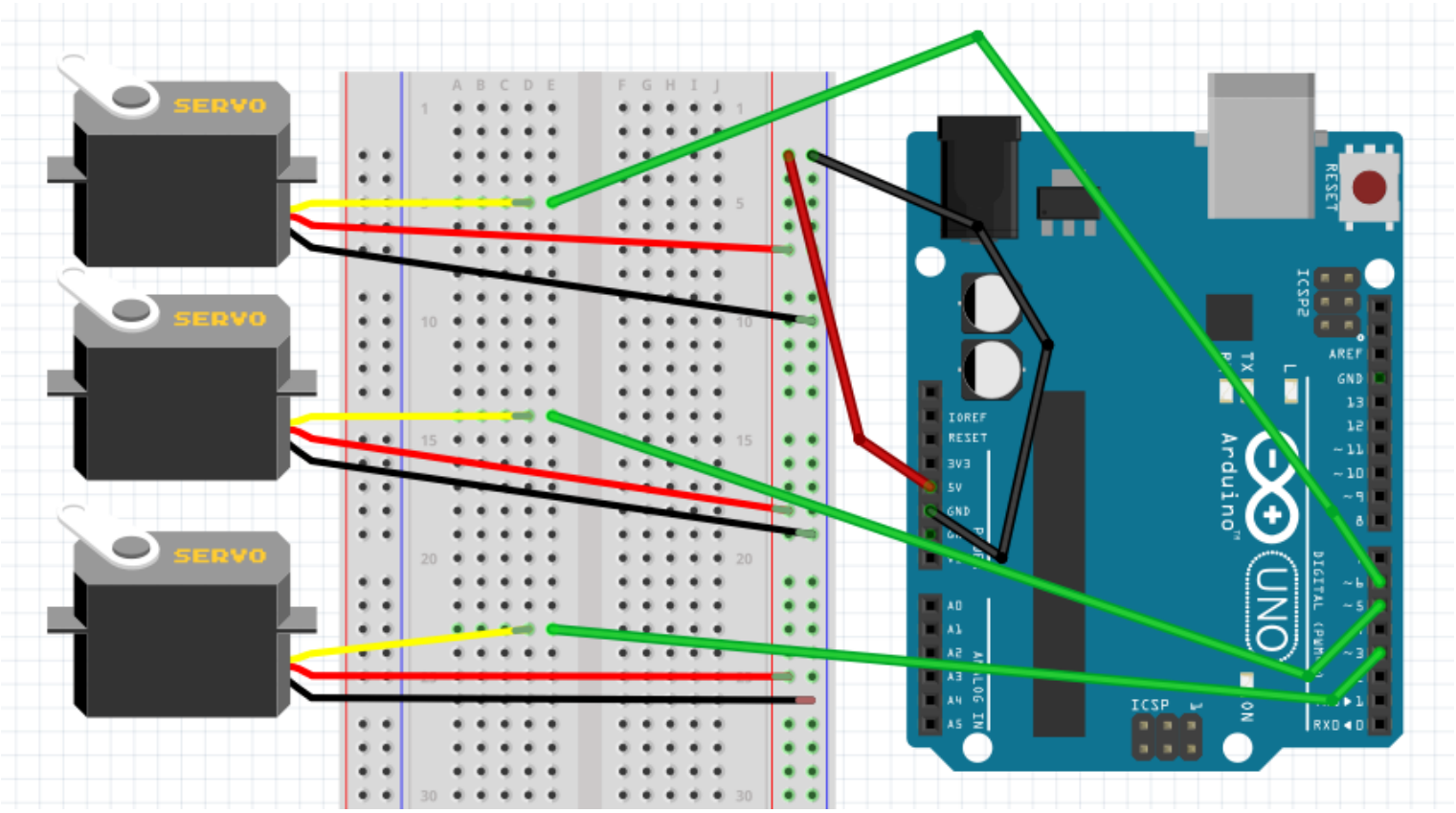
time of cue point = cue point value * duration

The formula for a cue point time



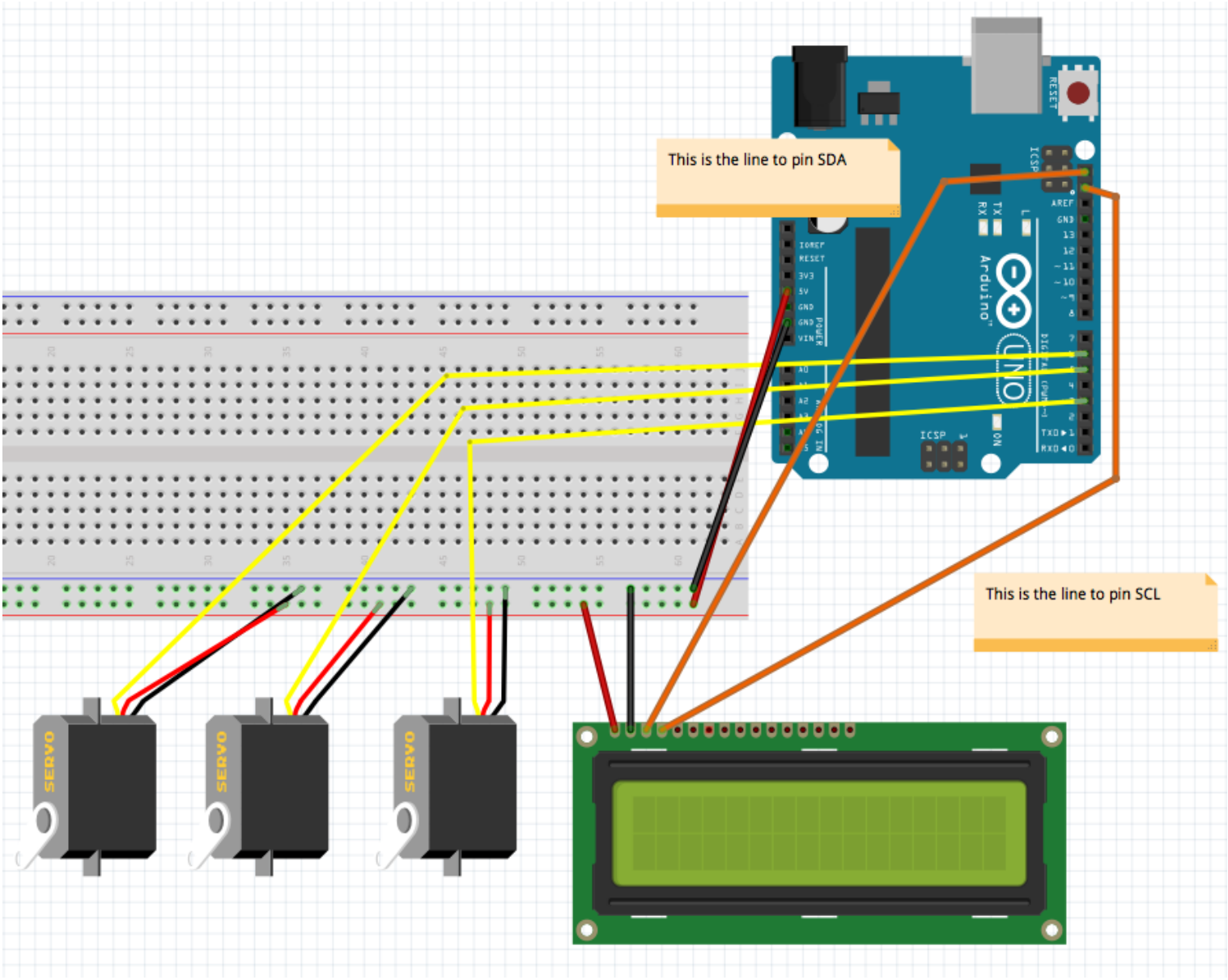
The pictures of the servo movement from the segment

Project – wiring up three servos and creating an array

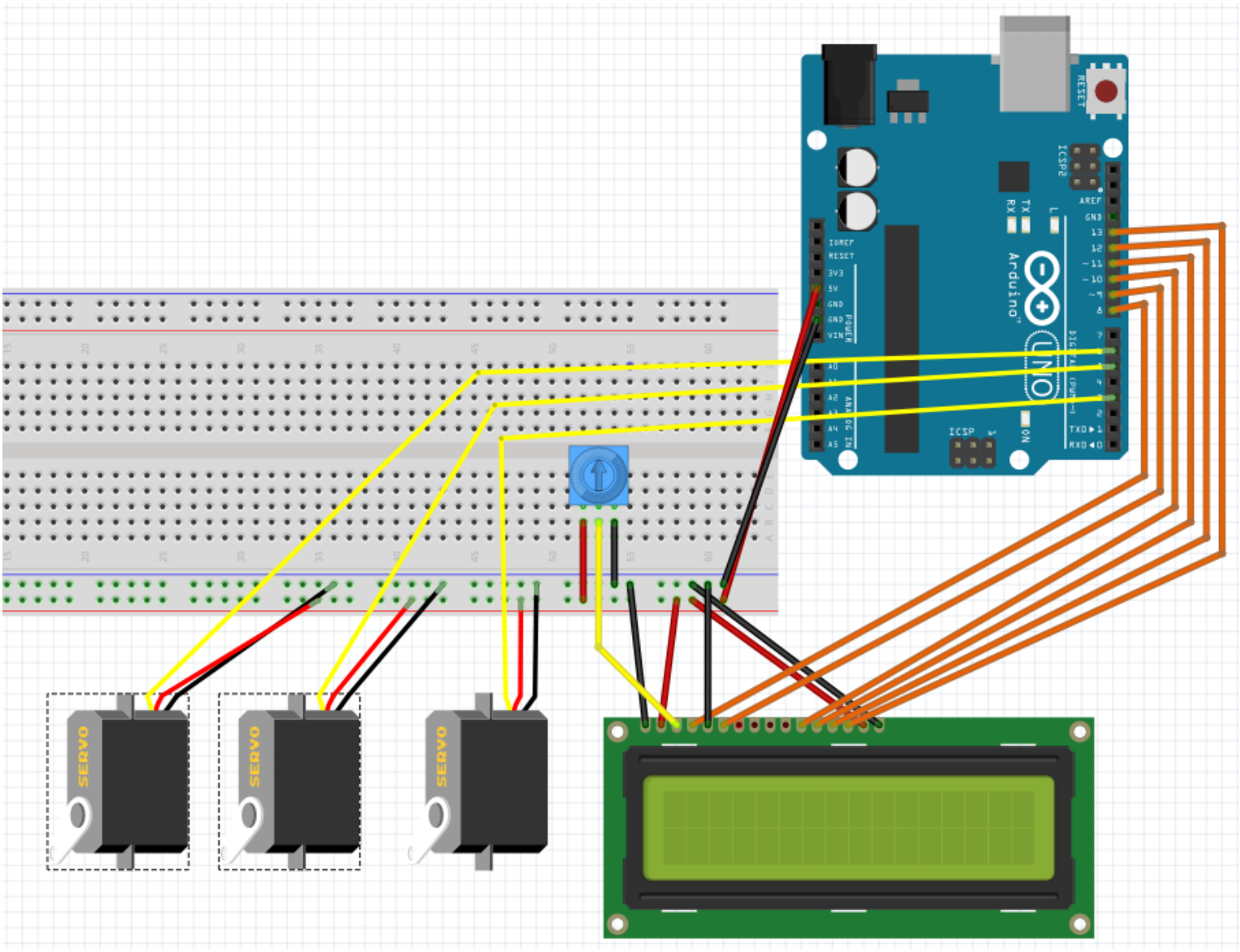


Animation events

Building a servo array with informative LCD readout



Events project wiring diagram—i2c LCD



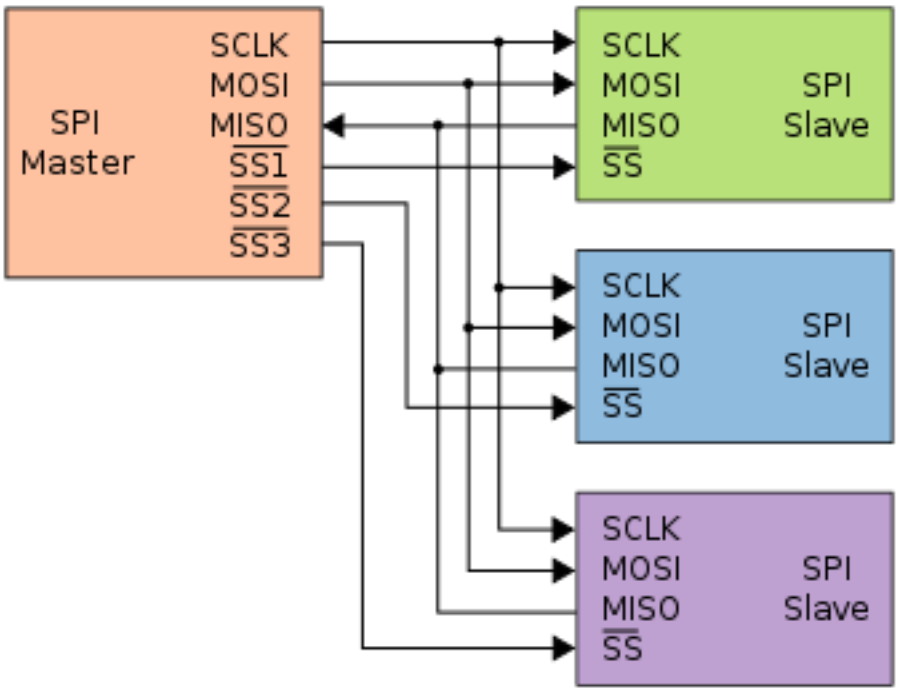
Events project wiring diagram—Standard LCD

8

Advanced Components –SPI, I2C, and Other Devices

Exploring SPI (Serial Peripheral Interface) devices

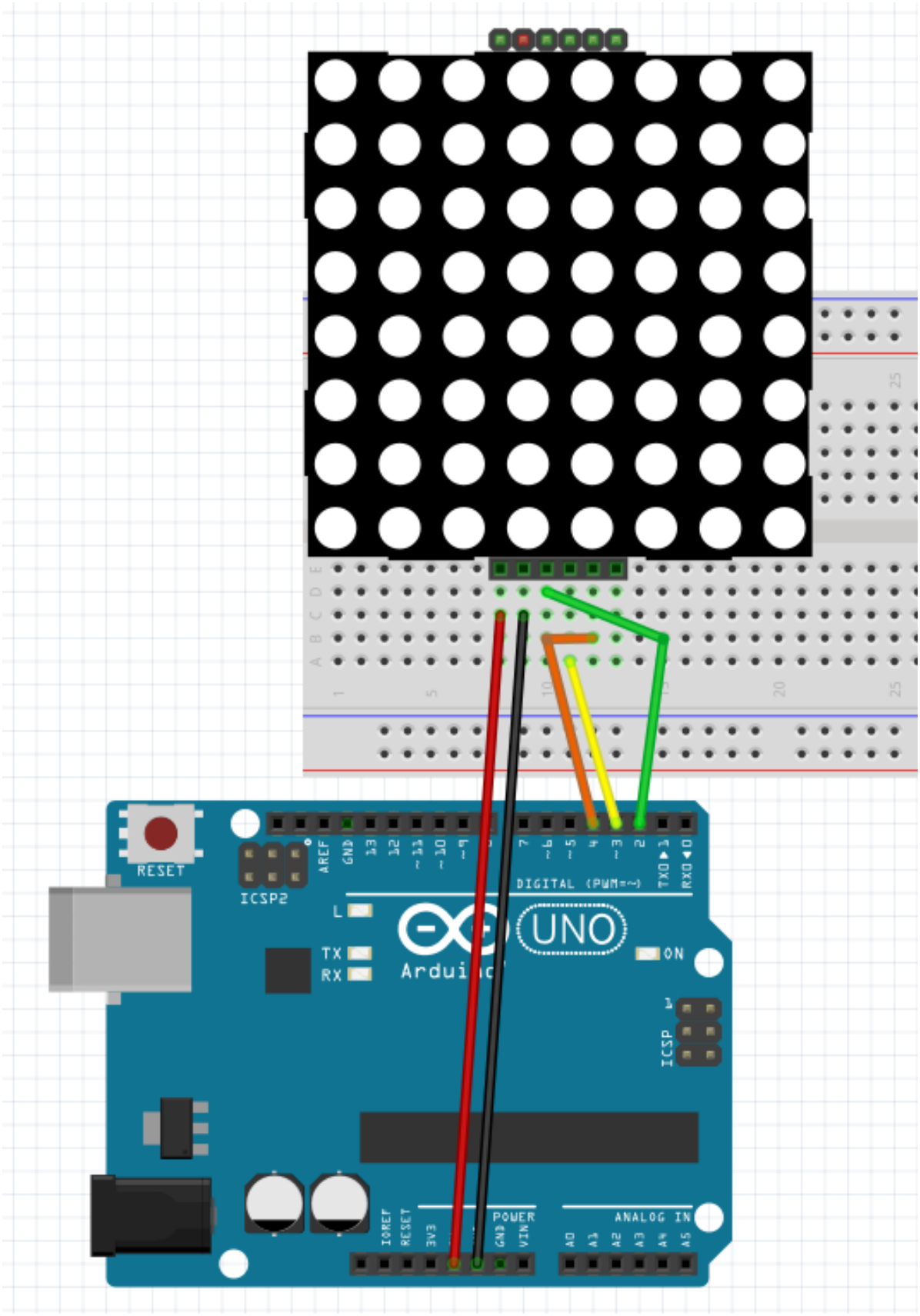
How SPI works



The SPI explained—Image credit https://en.wikipedia.org/wiki/Serial_Peripheral_Interface_Bus

Building with an SPI device – an LED matrix

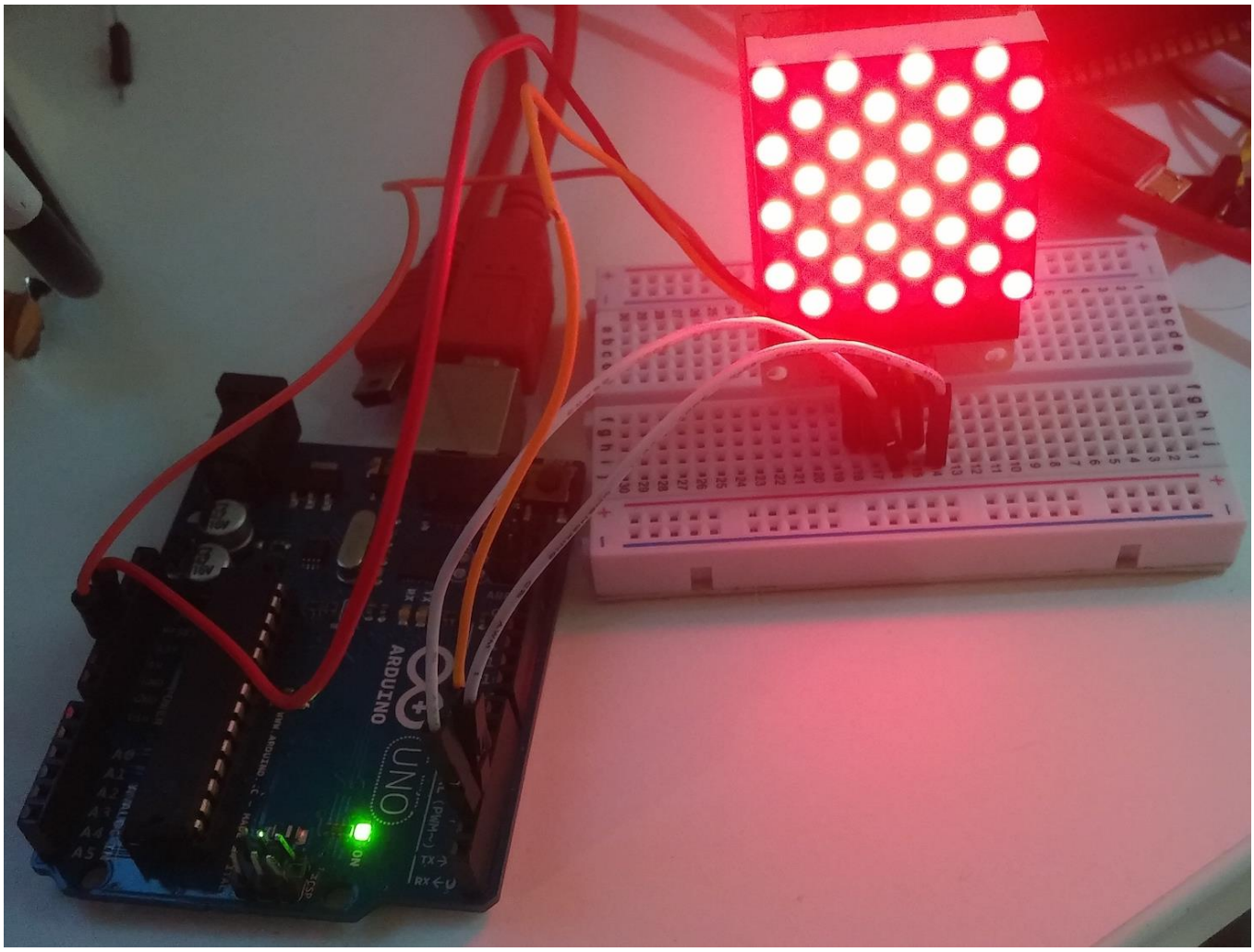
The build



Wiring diagram for the LED matrix

The API

The Code

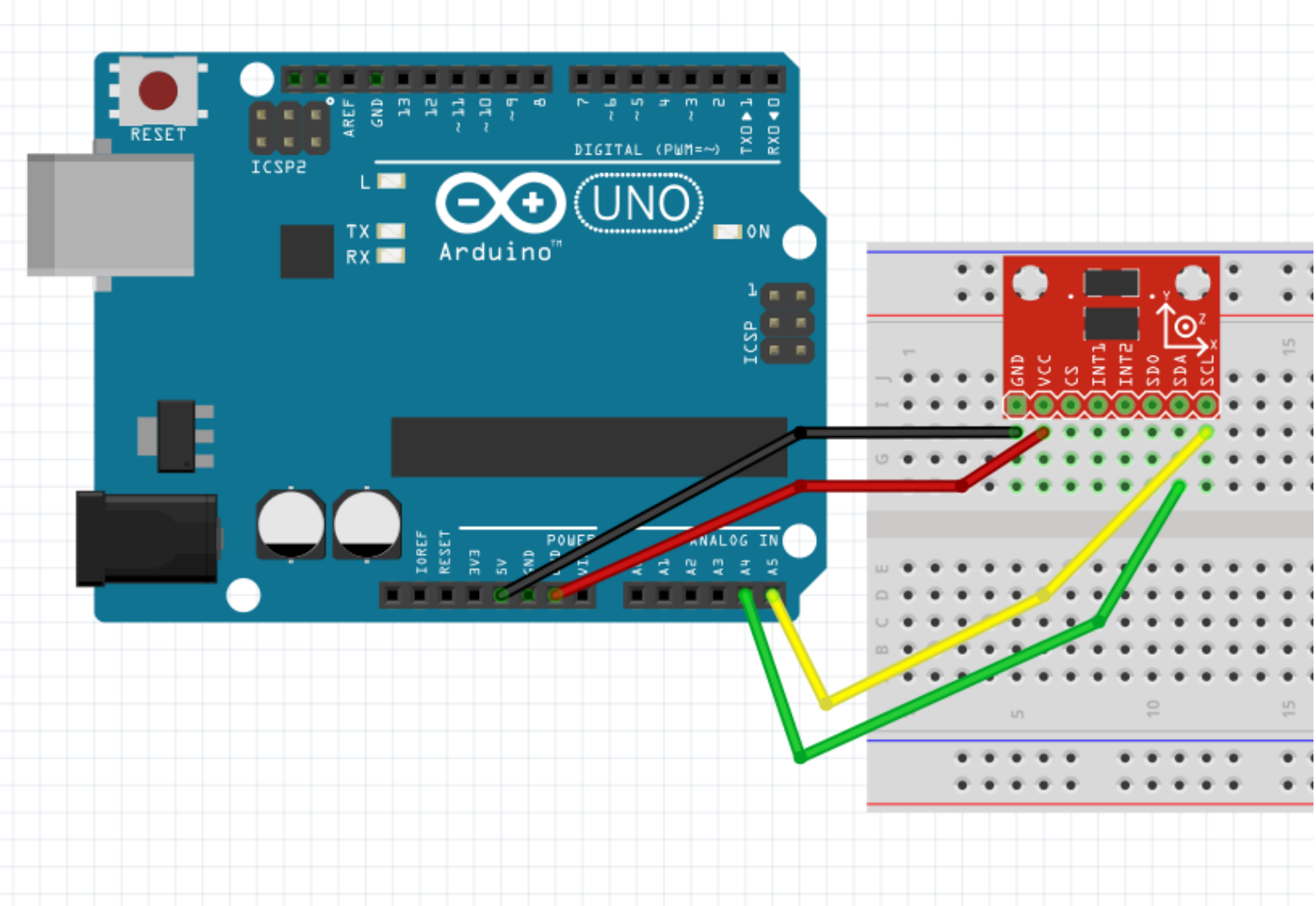


A matrix example with checkbox character

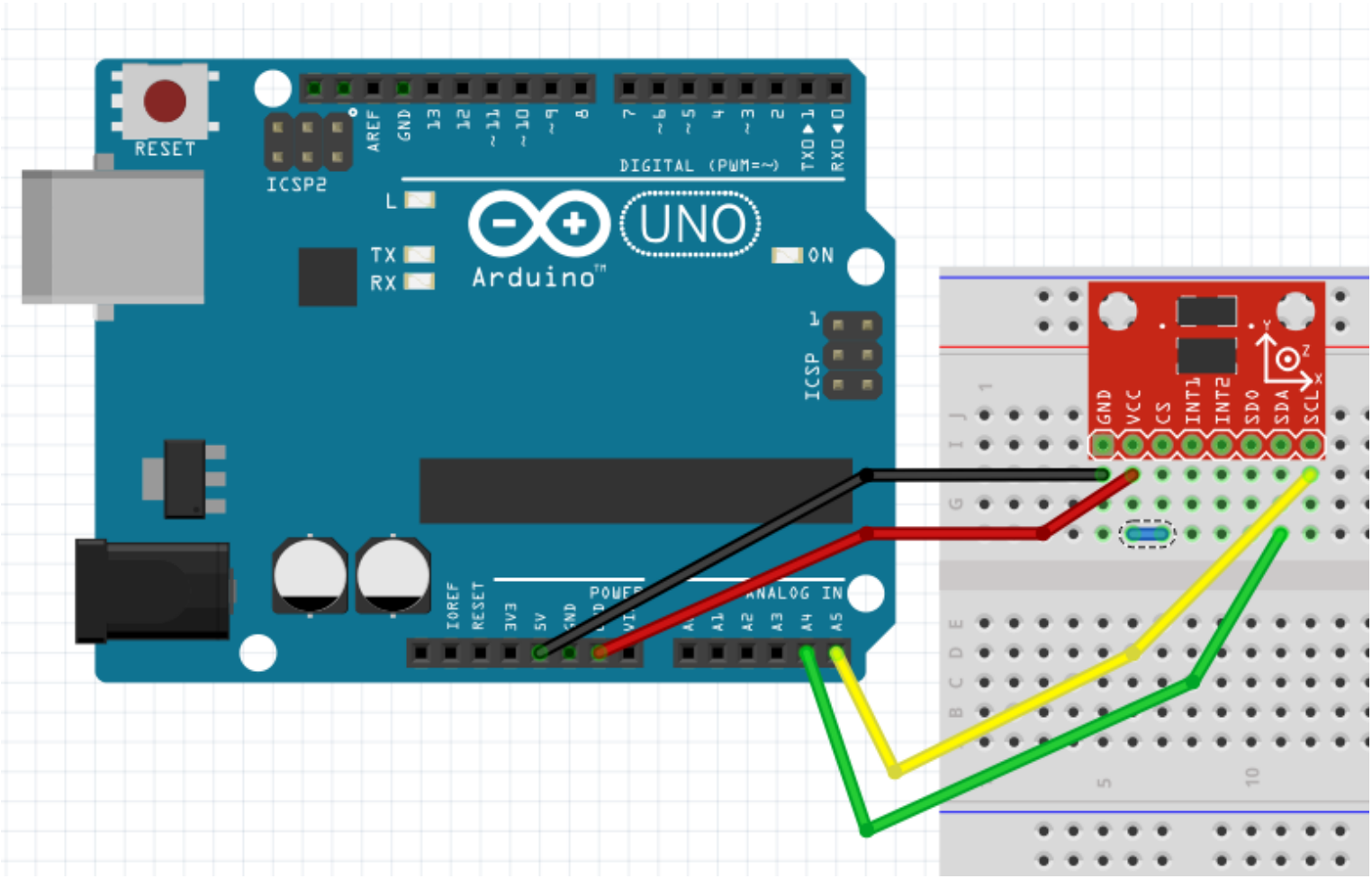
Exploring I2C devices

Building with an I2C device – Accelerometer

Wiring up our accelerometer

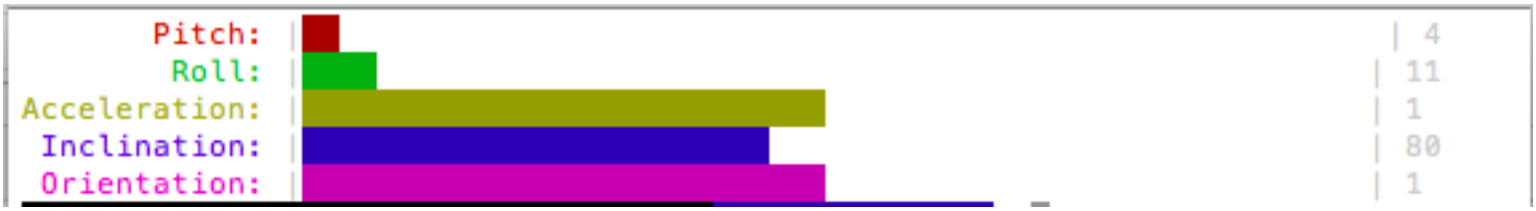


Accelerometer wiring for NON-R3 Arduino Uno



Wiring for the SparkFun breakout board

Coding up our example

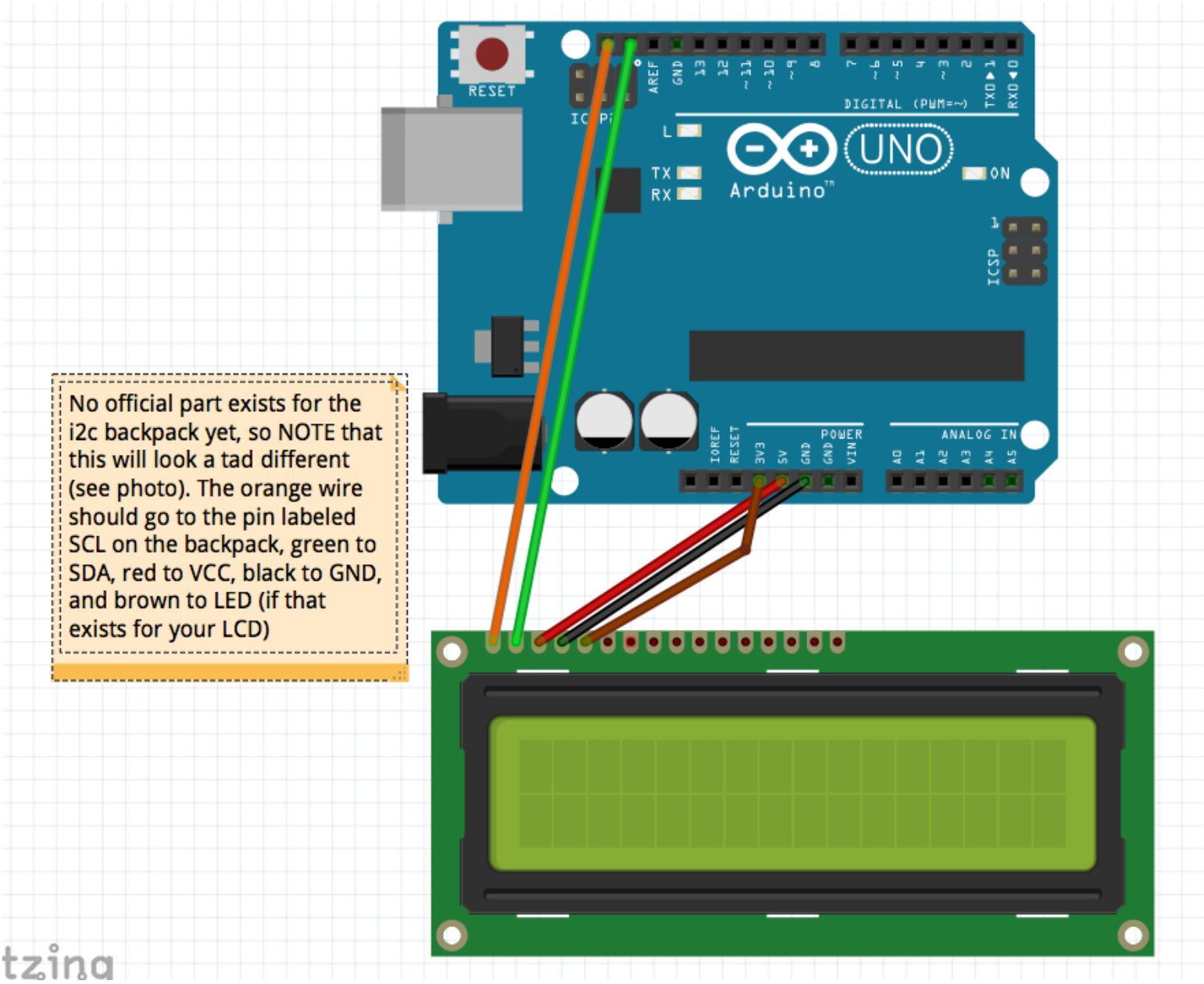


Barcli bar graphs in the terminal

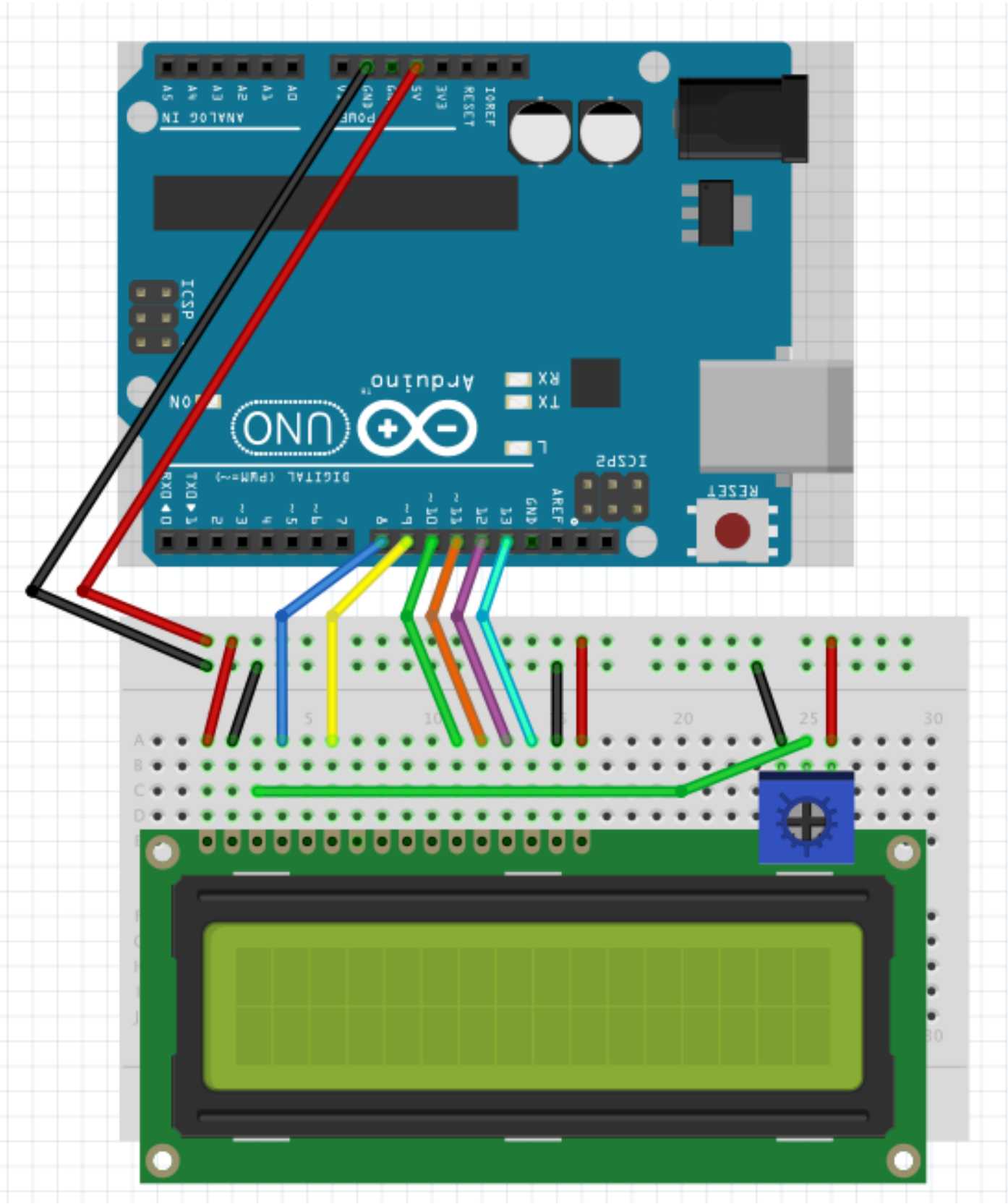
External Devices

Build – a USB gamepad

The hardware



Wiring diagram—I2C LCD



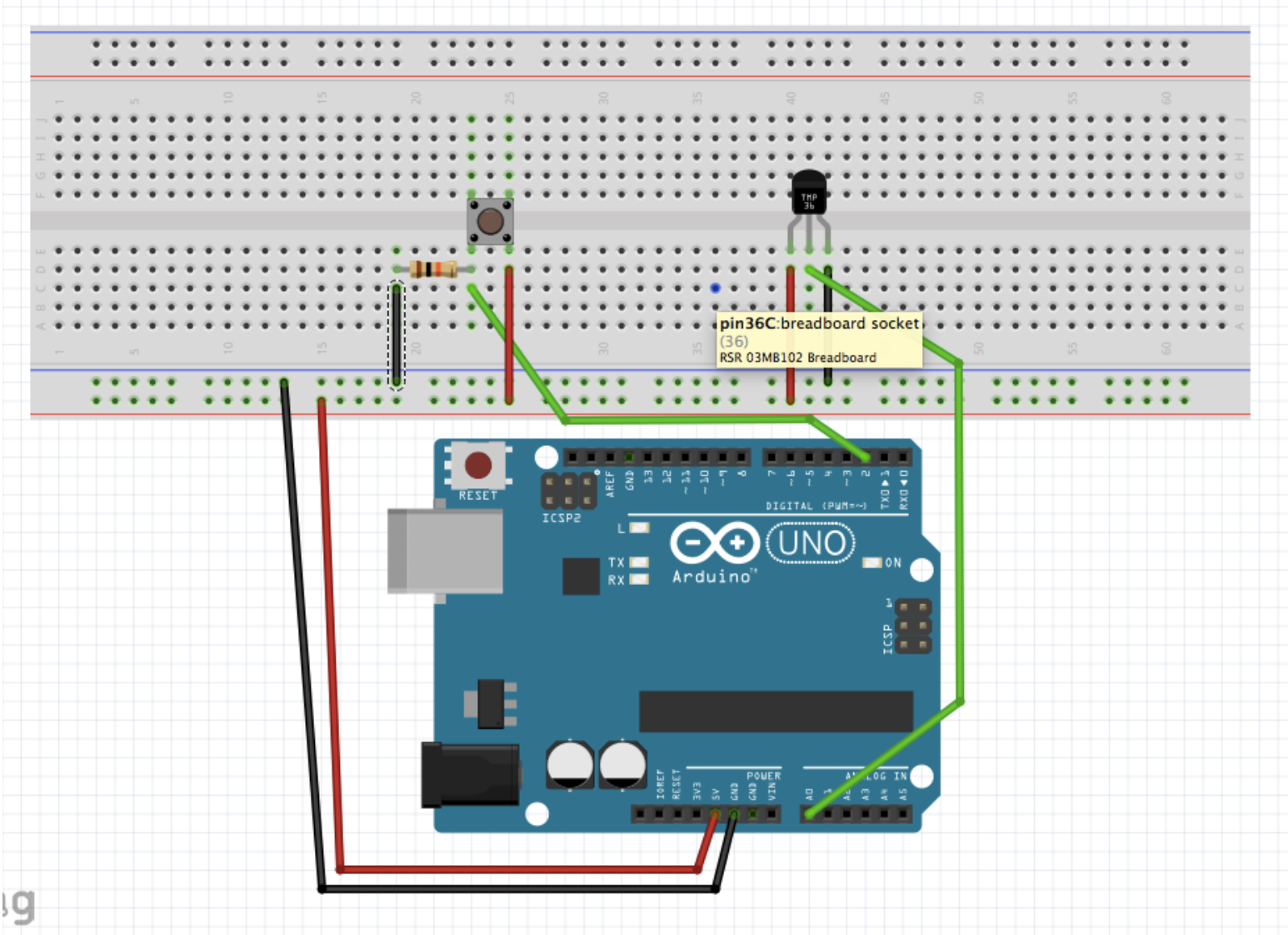
Wiring diagram—regular LCD

9

Connecting NodeBots to the World, and Where to Go Next

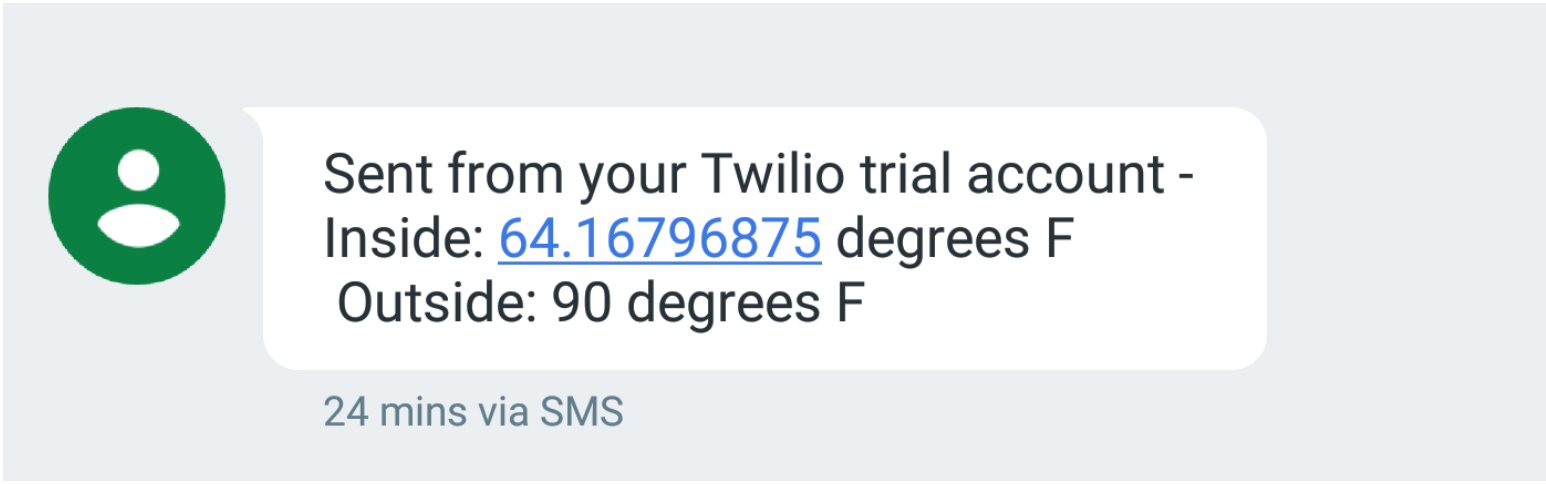
Connecting NodeBots to the Web

Building the WeatherBot



The Arduino WeatherBot schematic

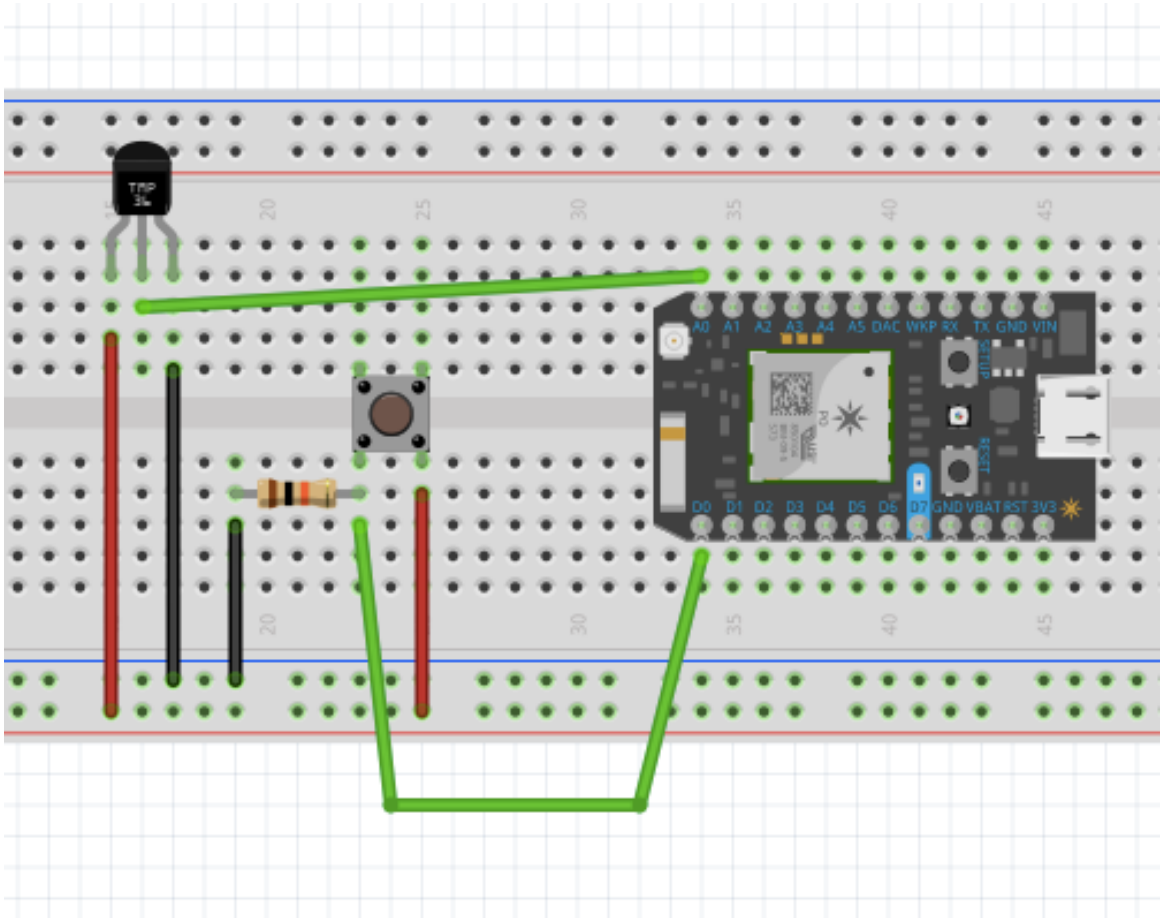
Using the TextBot



The text message from my WeatherBot!

Johnny-Five and the wide world of microcontrollers

Moving our WeatherBot to the Particle Photon



A WeatherBot Photon Schematic