PHYSICAL COMPUTING
FOR
WEB DEVELOPERS

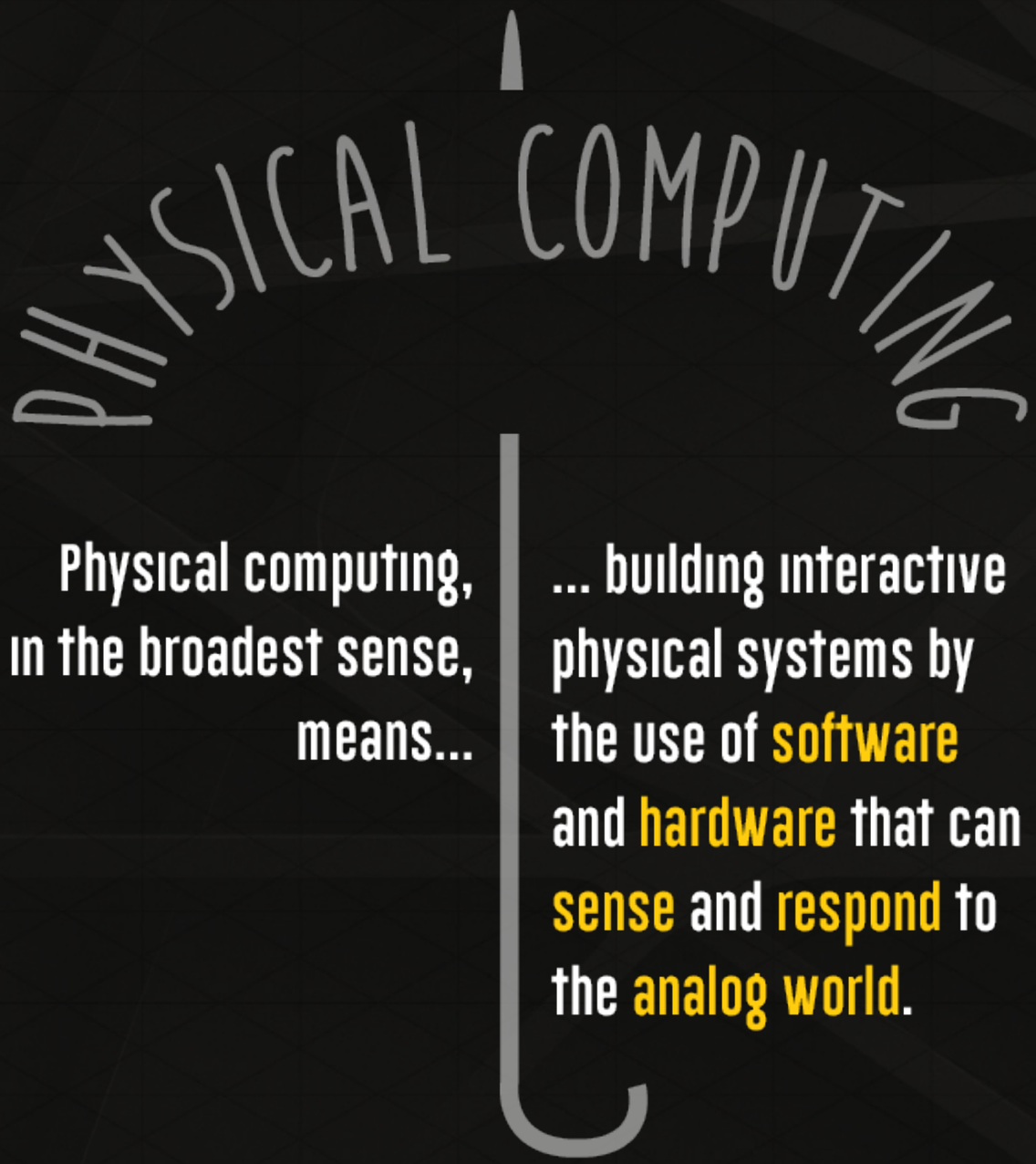
Workshop with **Jean-Philippe Côté**

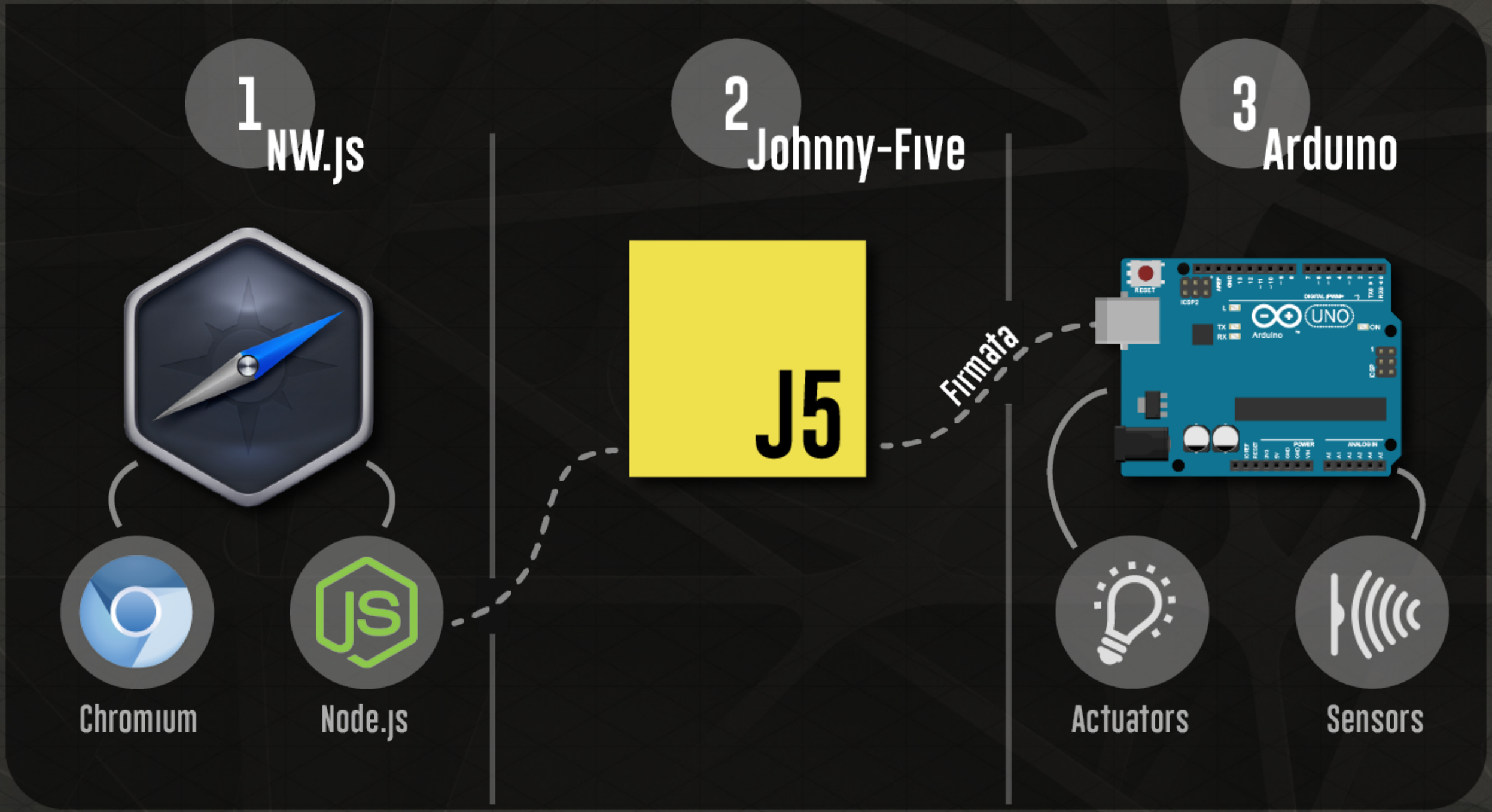
TangibleJS

Pre-Installed Software

- **Arduino** IDE — https://www.arduino.cc
- **CH34x** Driver — Mac http://bit.ly/2e3lydU; Windows http://www.wch.cn/download/CH341SER_ZIP.html
- **NW.js** (SDK Flavor) — http://nwjs.io
- **Node.js** — https://nodejs.org

* If you have not yet installed the software as per the pre-workshop instructions, please request one of the USB keys with all necessary installers.


PHYSICAL COMPUTING
Physical computing, in the broadest sense, means...
... building interactive physical systems by the use of software and hardware that can sense and respond to the analog world.


1
NW.js
2
Johnny-Five
3
Arduino
J5
Firmata
Chromium
Node.js
Actuators
Sensors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Libraries to download

1. Go to: http://tangiblejs.com/forward2017

2. Download: workshop-libs.zip

* The libraries are: jQuery, QuickSettings.js, Tone.js and a super simple particle library I put together for this workshop (particle.js).

01

Our 1st NW.js Desktop Application

Running the app

macOS

- Put nwjs.app inside the project folder and double-click it.

Windows

- Copy all the files from the decompressed NW.js zip archive into the project folder and double-click on nw.exe.

or

- Drag and drop the project folder onto nw.exe or onto a shortcut to nw.exe.

Available APIs

- NW.js APIs
  - http://docs.nwjs.io/en/latest/
  - Available in nw.*
- Native Node.js APIs
  - https://nodejs.org/dist/latest-v6.x/docs/api/
  - Accessible by using nw.require("module")
- Node.js 3rd-Party Modules
  - https://www.npmjs.com/
  - Accessible by using nw.require("module")
- Front-End Libraries
  - Accessible by linking them with <script> tags in the usual fashion.
- Chrome Platform APIs
  - https://developer.chrome.com/apps/api_index
  - Available in chrome.*

Running the app from the command line

Step1.

macOS

- Add `export PATH=$PATH:/Applications/nwjs.app/Contents/MacOS/` to your `~/.bash_profile`

GNU/Linux (depends on distro)

- Add `export PATH=$PATH:/path/to/nw` to your `~/.profile`

Windows

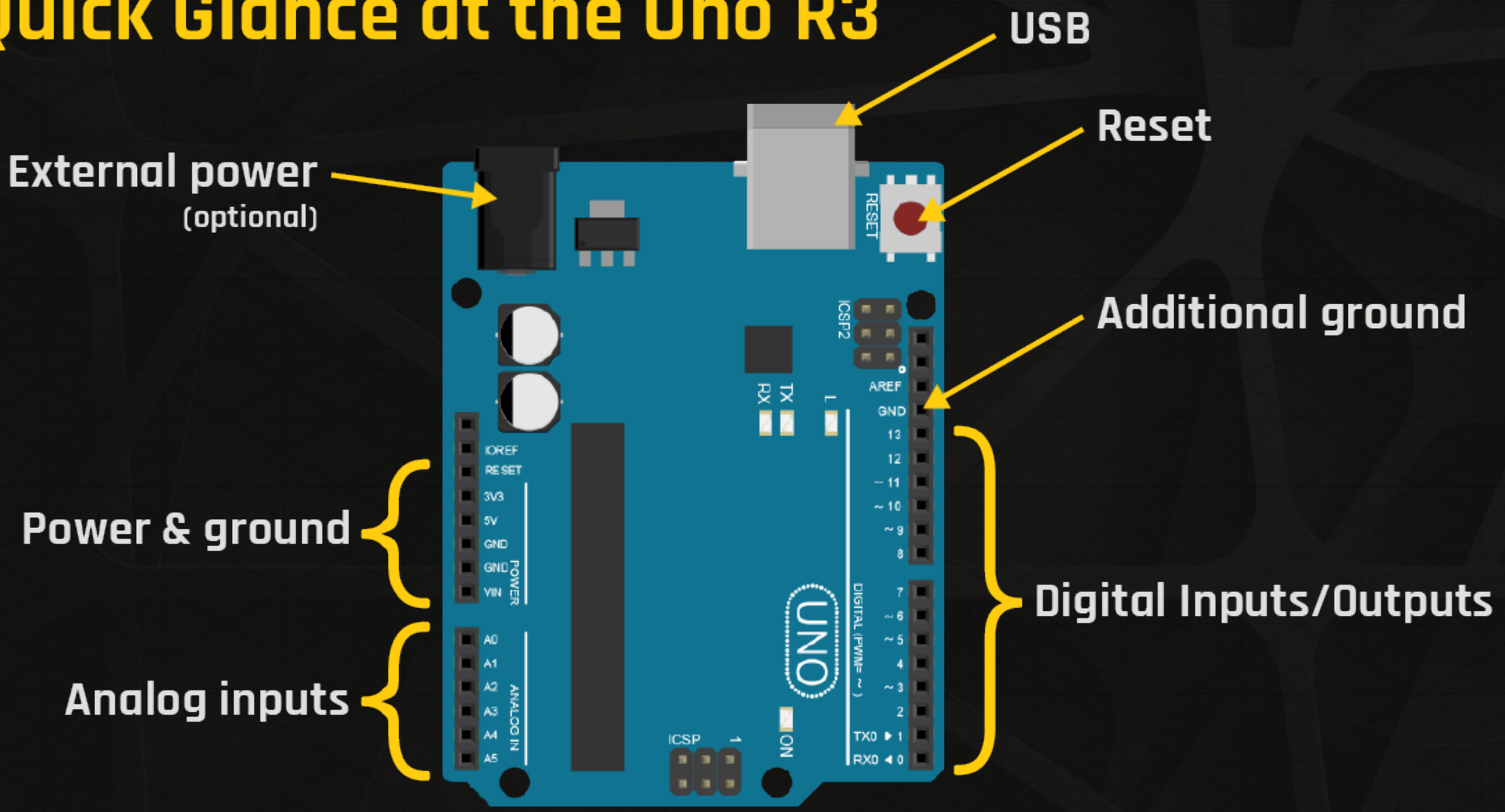
- Add the path to `nw.exe` to your `Path` system variable

Step 2.

From the project folder, simply issue:

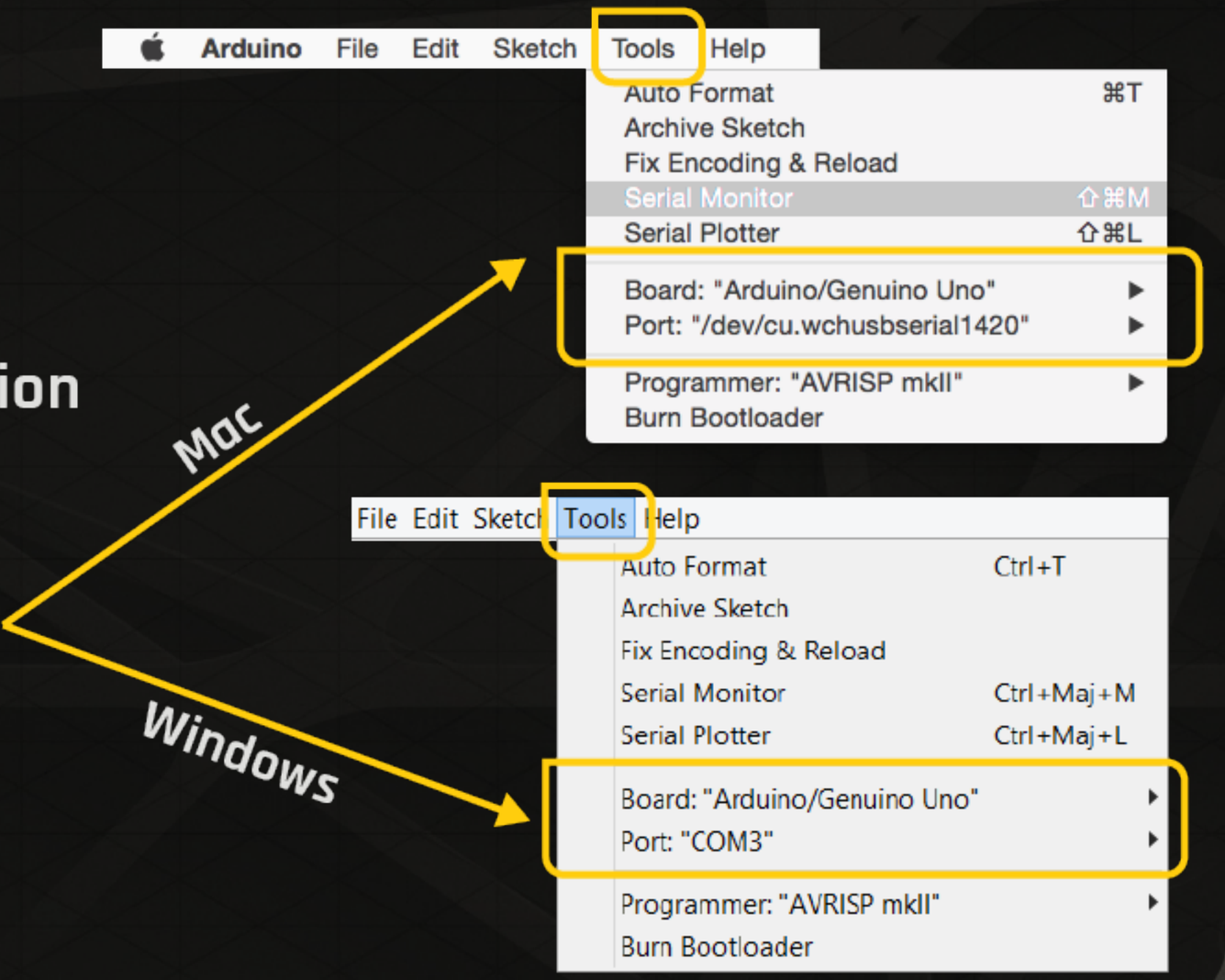
`nwjs .`	macOS
`nw .`	Linux
`nw.exe .`	Windows

A Quick Glance at the Uno R3

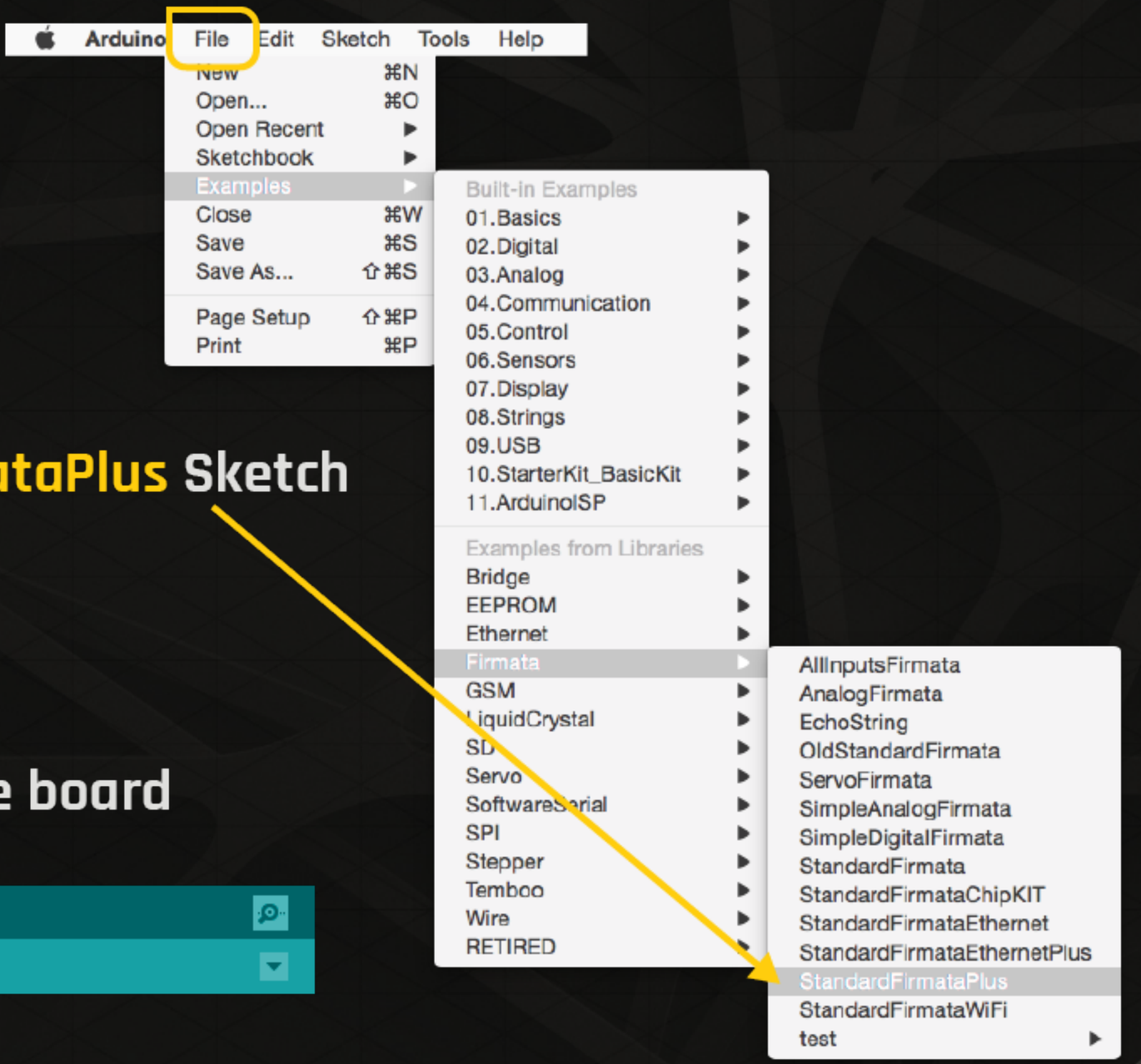


Firmata Setup

1. Plug in the board to your laptop's USB port
2. Start the Arduino application
3. Make sure the board type and port are selected



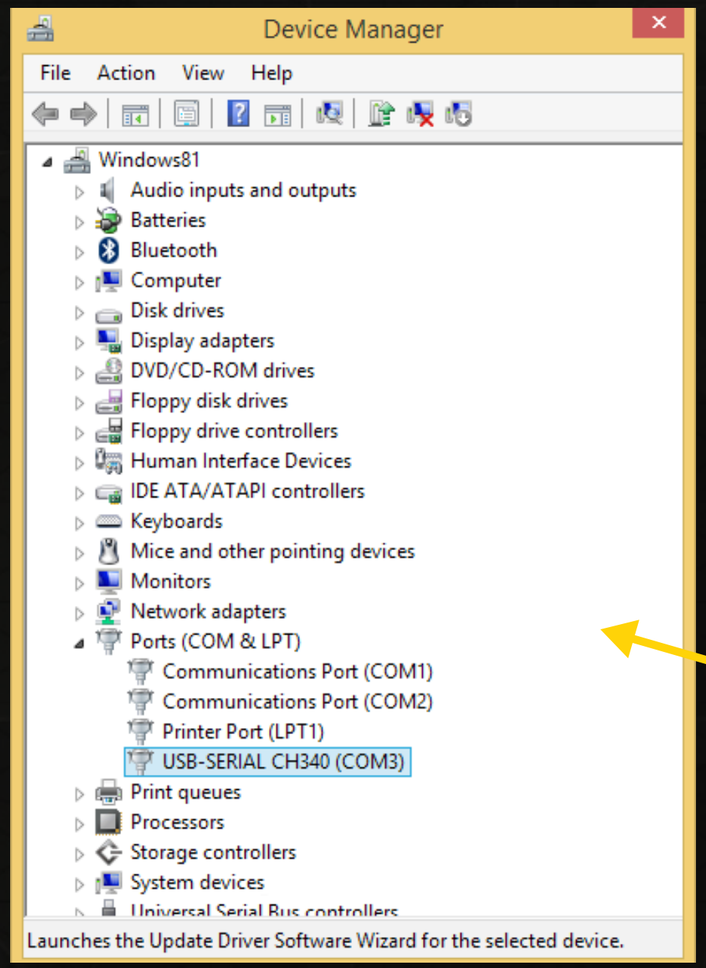
Firmata Setup



4 Load the **StandardFirmataPlus** Sketch

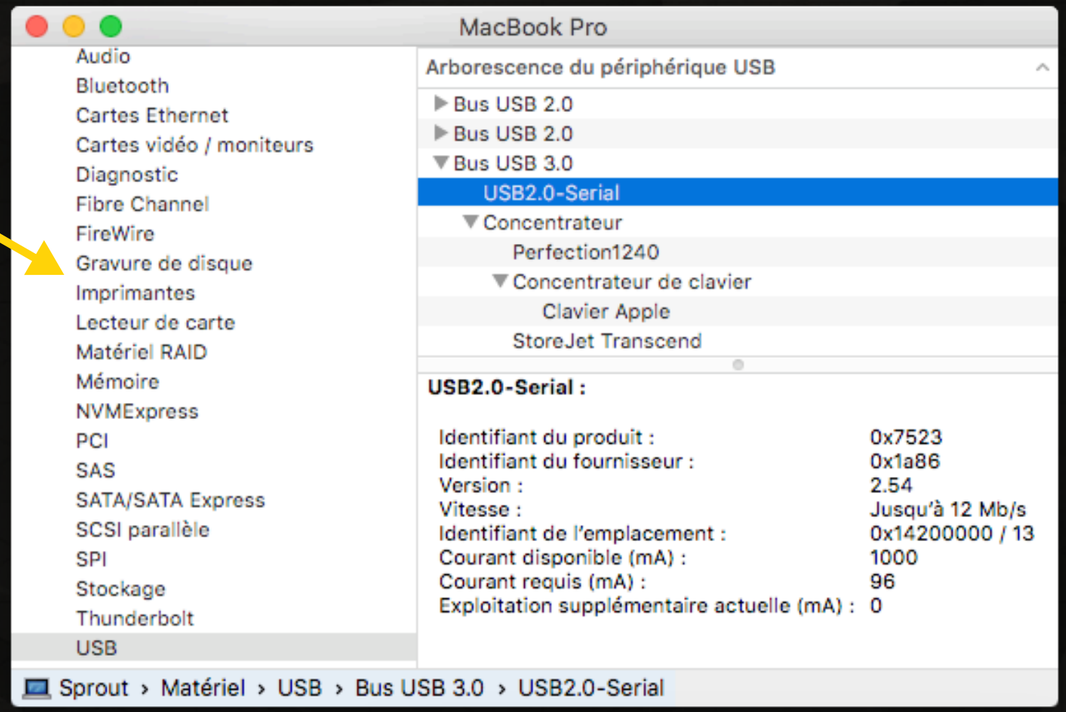
5 Upload the sketch to the board

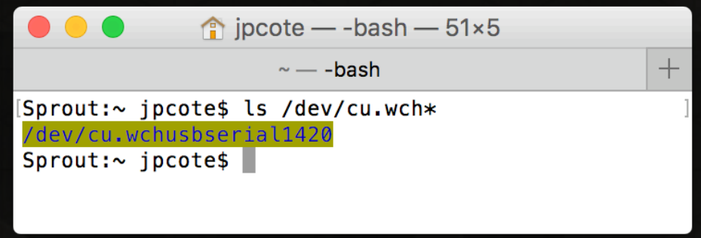
System-Level Device Detection



Windows Device Manager

macOS System Profiler





* For the device to show up, it must be plugged in!

Installing Johnny-Five & nwjs-j5-fix

Johnny-Five

- Using the Terminal/PowerShell go to project directory and issue:

```
npm install johnny-five --save
```

- To confirm the installation, you can use:

```
npm -v johnny-five
```

nwjs-j5-fix

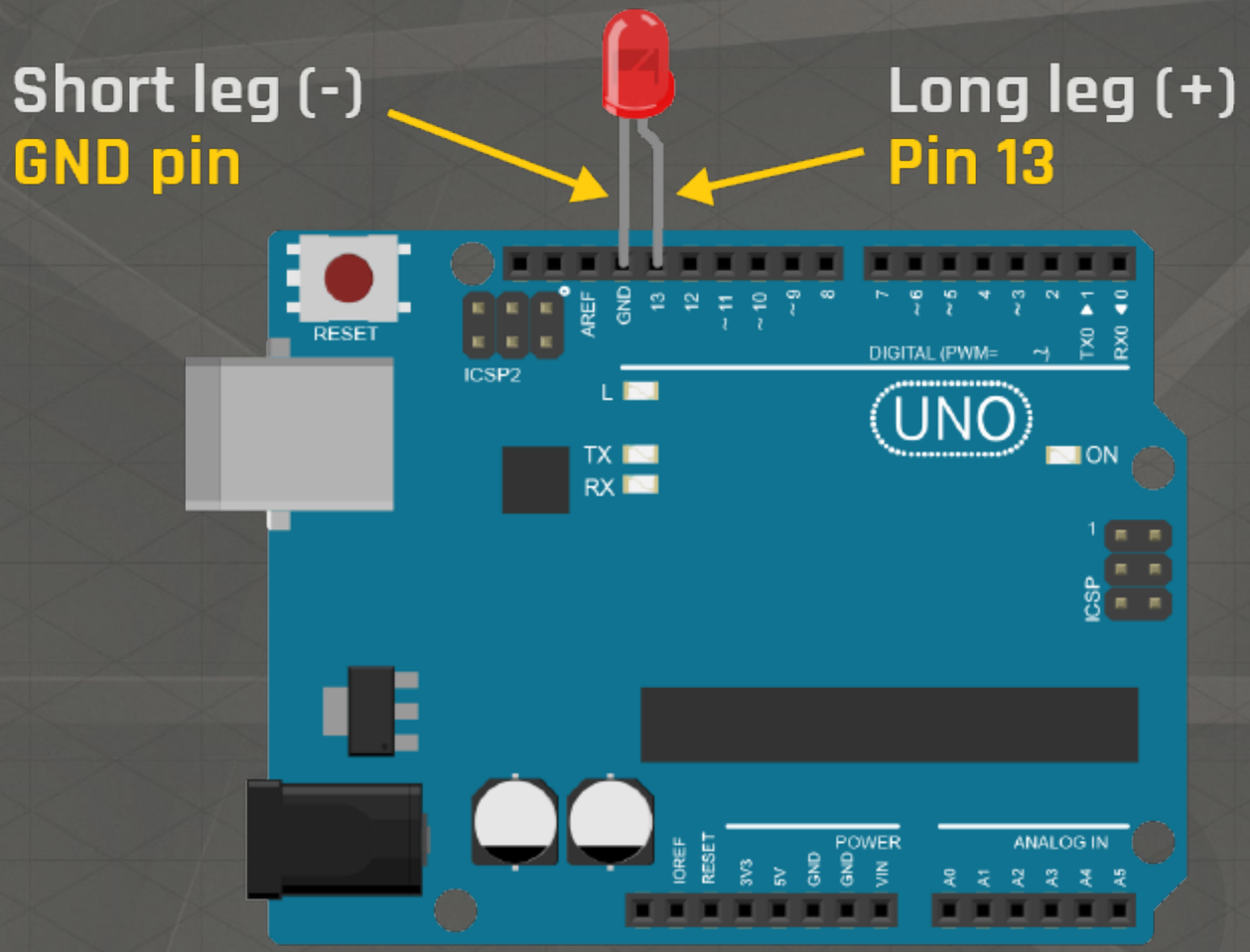
- Using the Terminal/PowerShell go to project directory and issue:

```
npm install nwjs-j5-fix --save
```

02

The Hello, world! of Physical Computing

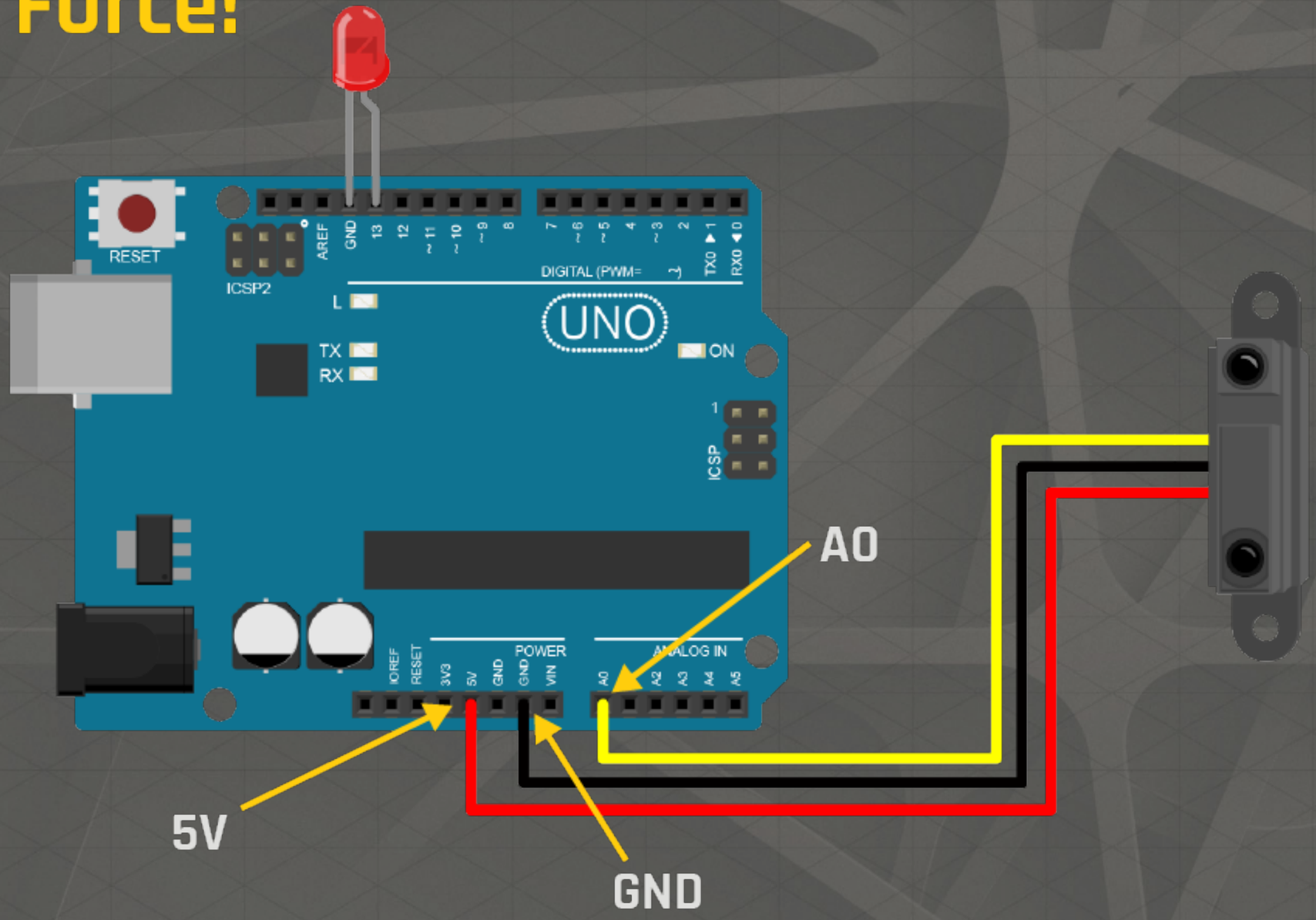
02. Blinking an LED



03

Using The Force to Control Light Particles

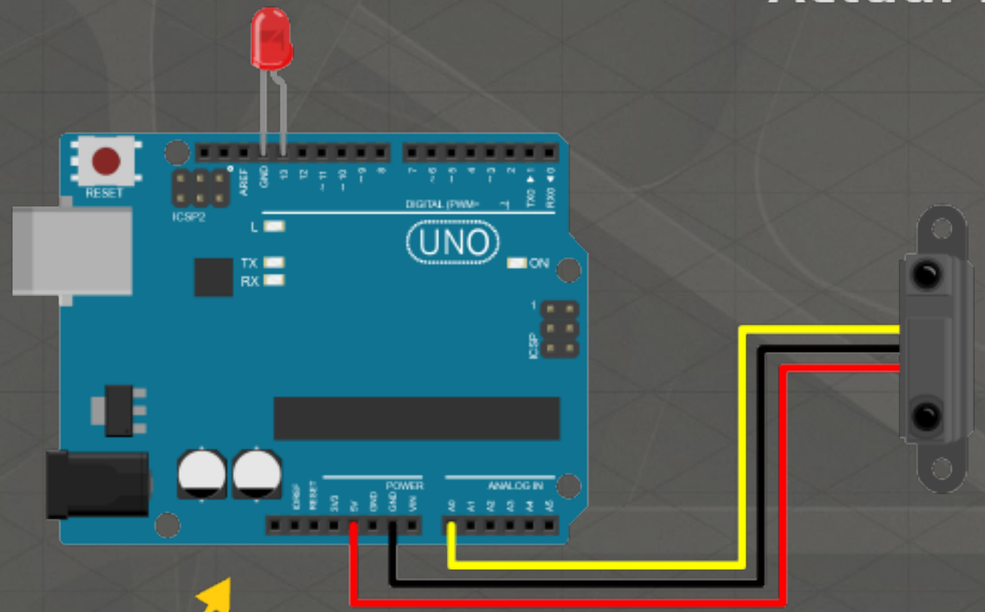
03. Use The Force!



04

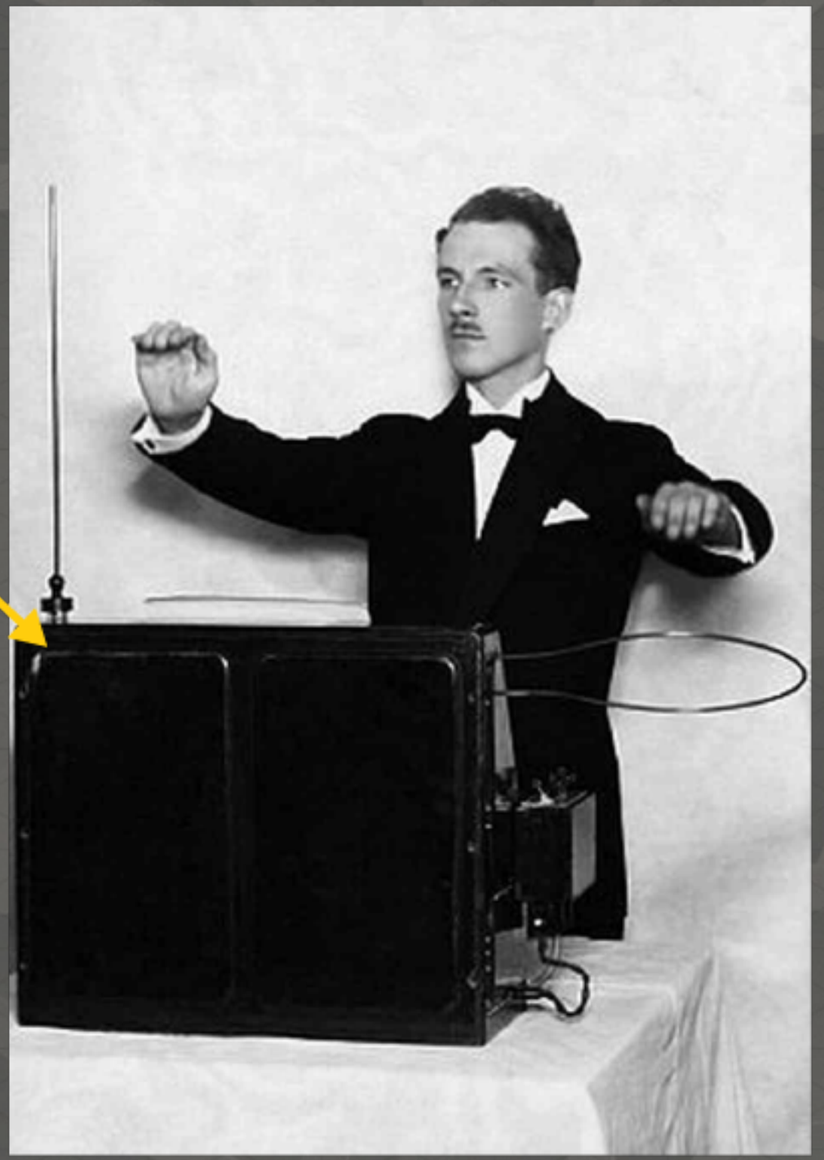
A Theremin'ish Instrument

04. Theremin



Same wiring as before

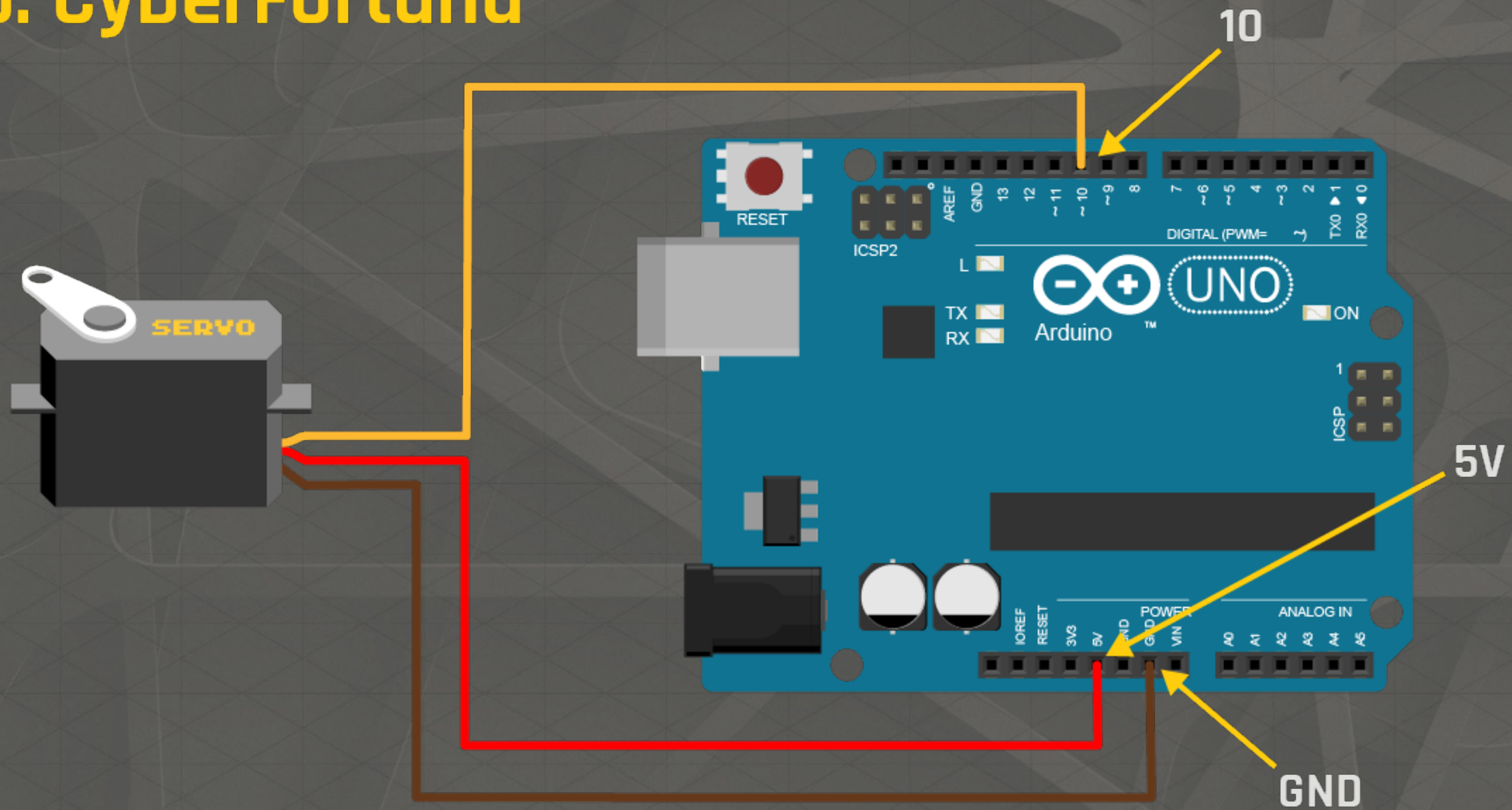
Actual Theremin



05

A 21st Century Fortune Teller

05. CyberFortuna

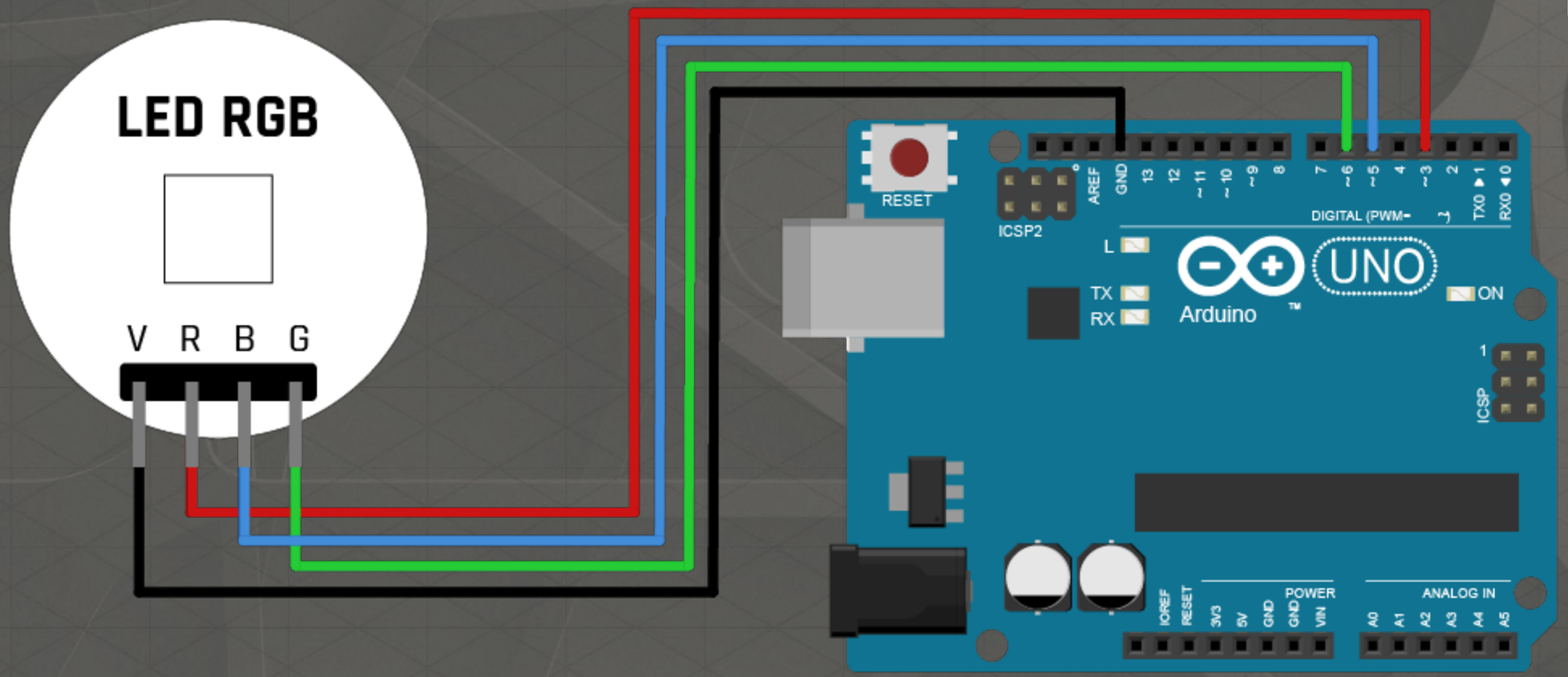


06

All the Colors in the World...

06. RGB LED

3 → R
5 → B
6 → G
GND → V



The Road Ahead...

Software

johnny-five.io/api

docs.nwjs.io

tangiblejs.com/code

Hardware

Boards

A wide range of microcontrollers and single board computers are supported by the Johnny-Five library.

Sensors

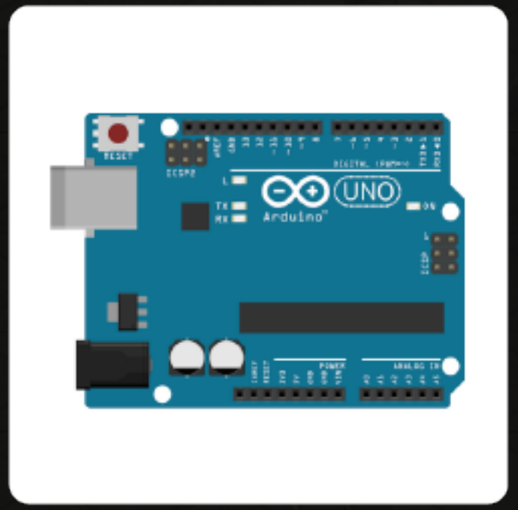
A sensor is an object whose purpose is to detect events or changes in its environment.

Actuators

An actuator is the mechanism by which a control system acts upon an environment.

Boards

Arduino

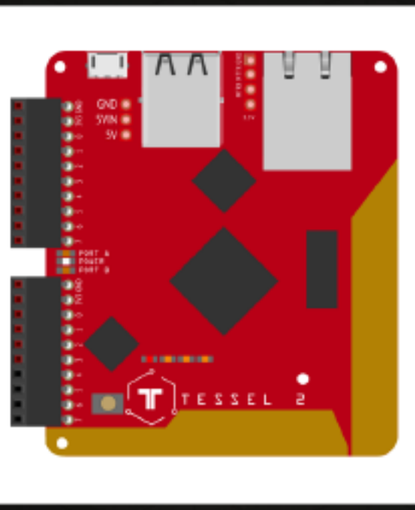


Most popular

Raspberry Pi

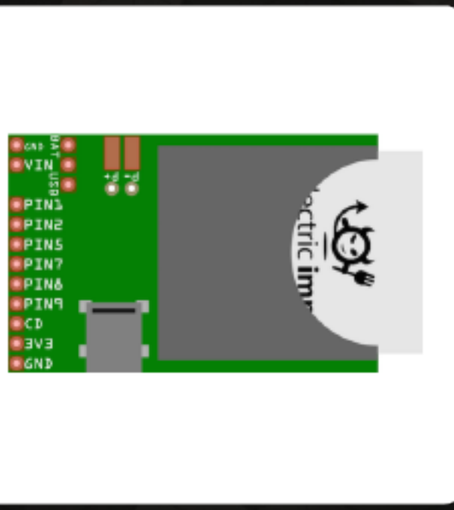
More powerful

Tessel



Native JavaScript

Electric Imp

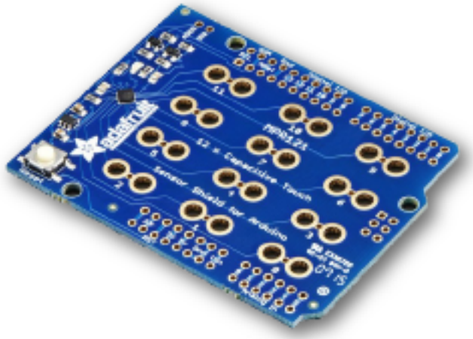


Tiny (24mm x 32mm)

http://johnny-five.io/platform-support/

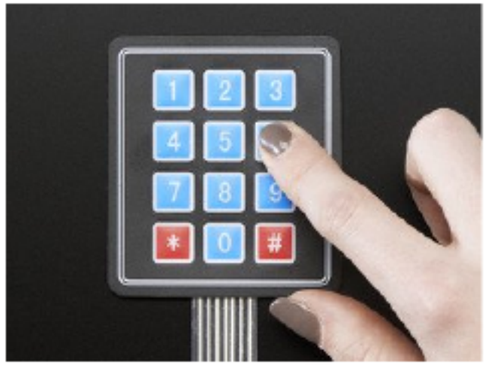
Sensors

Touch Sensors



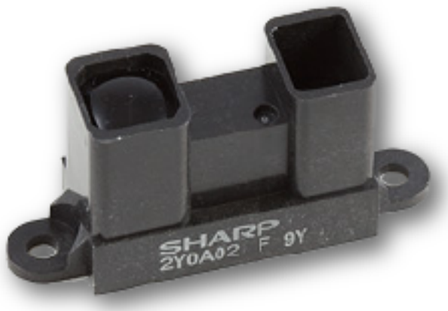
Touch Breakout

Ribbon Switch



Keypads

Distance Sensors



Infrared

2-10cm

20-150cm

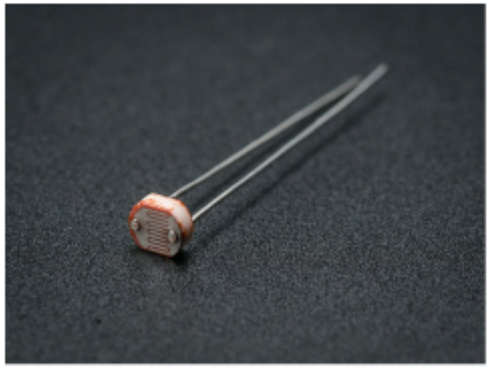
100-500cm

10-80cm

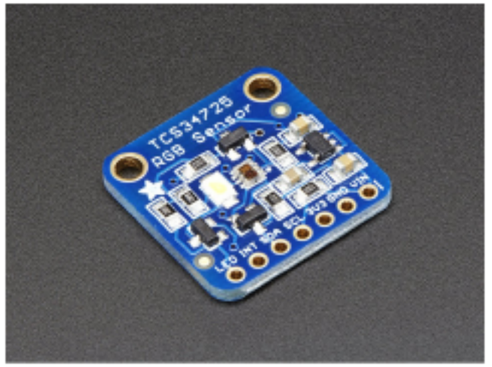
0-645cm

Ultrasonic

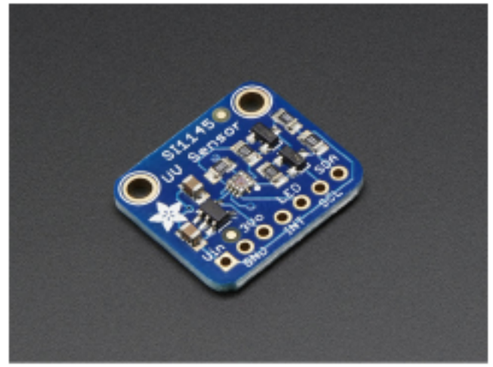
Light & Color Sensors



Photoresistor

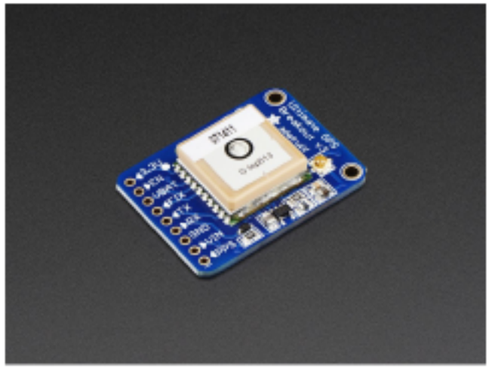


RGB Color

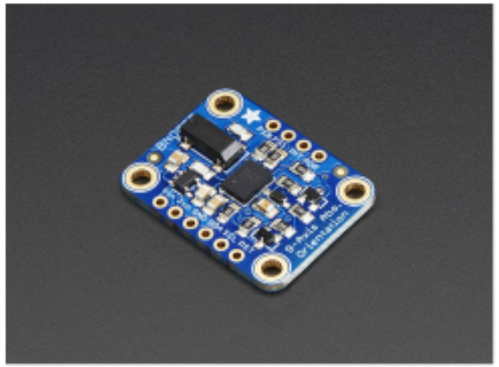


UR/IR/Visible

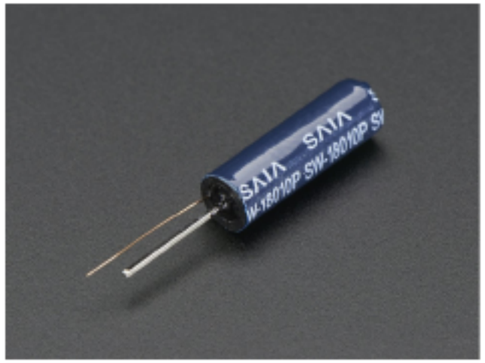
Position & Movement Sensors



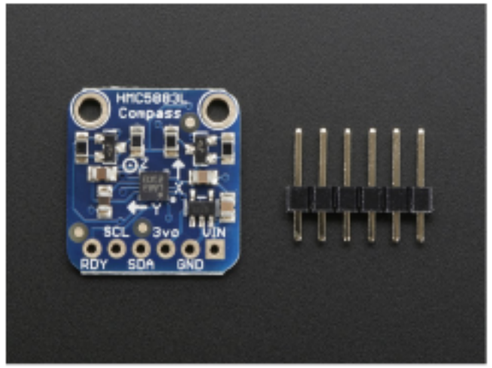
GPS



Gyro & Accelerometer

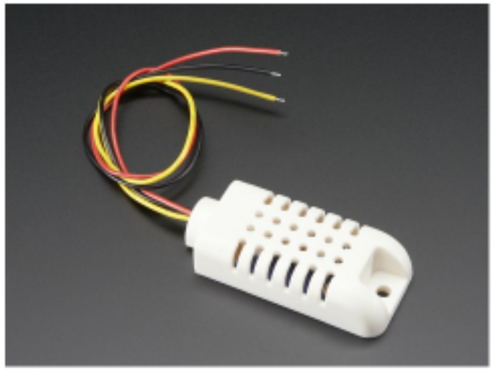


Vibration



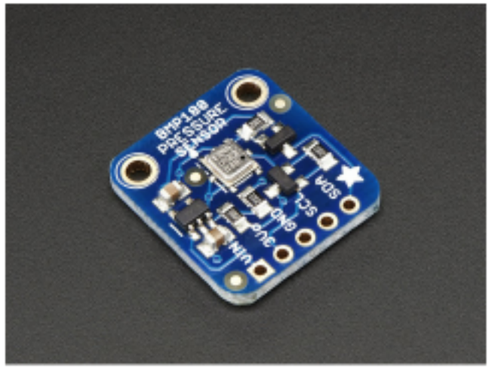
Compass

Environmental Sensors



Temperature/Humidity

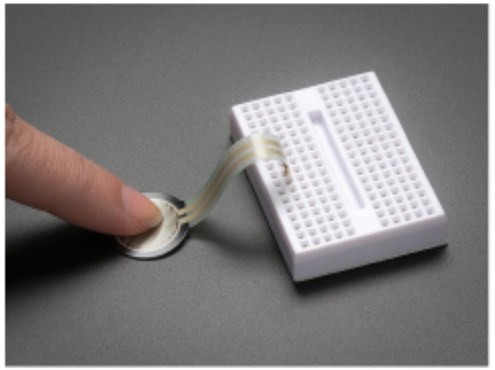
Wind Speed



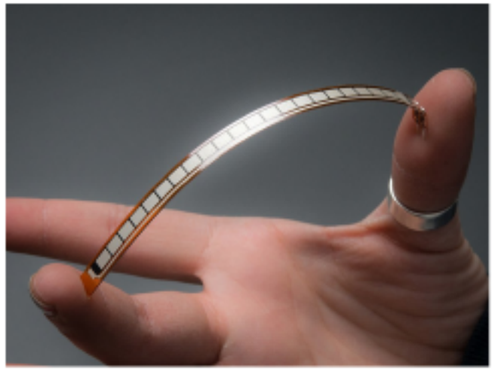
Barometric Pressure

Radioactivity

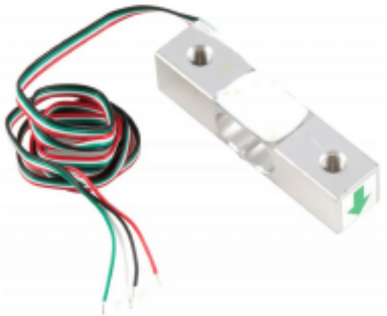
Force & Load Sensors



Force Sensor



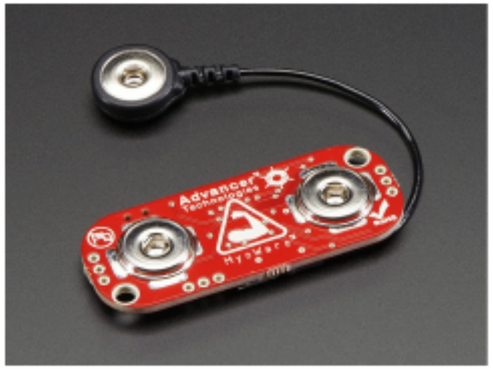
Flex Sensor



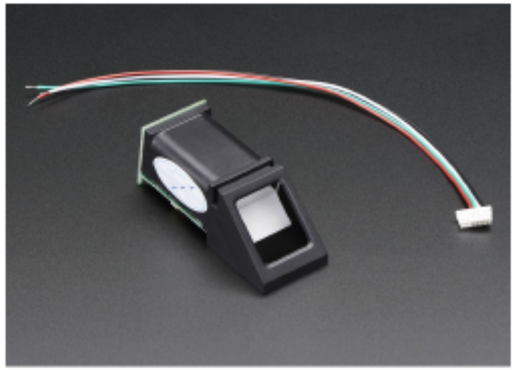
Load Cell

Push/Pull Force

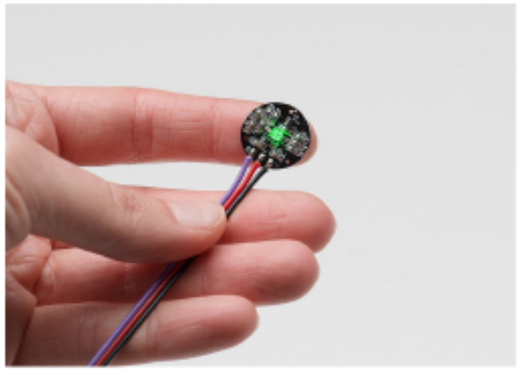
Biometric Sensors



Muscle Sensor



Fingerprint Scanner



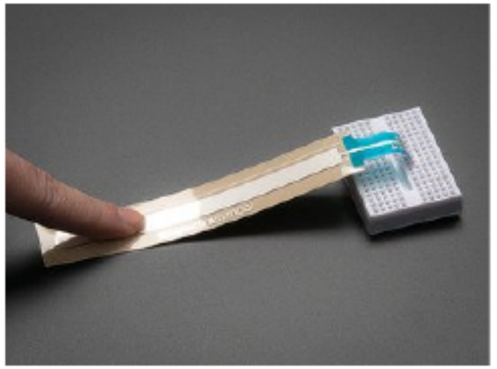
Pulse Sensor

Heart Rate Monitor

Encoders

Rotary Encoder

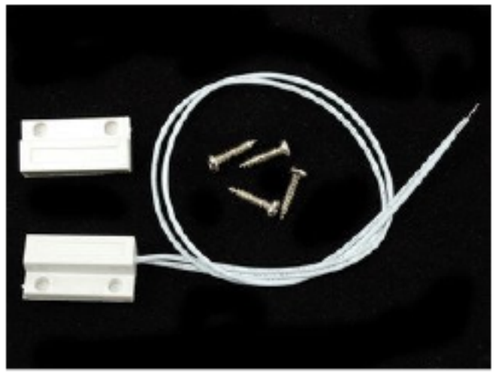
Analog Joystick



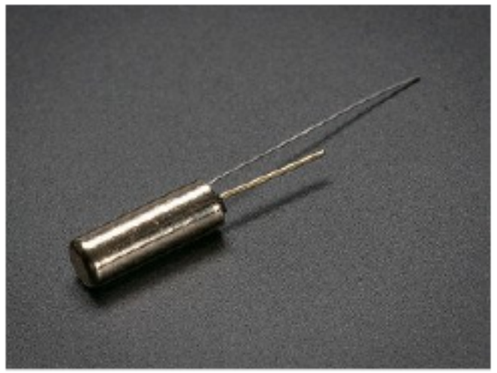
Ribbon Sensor

Linear Encoder

Switches



Magnetic Switch

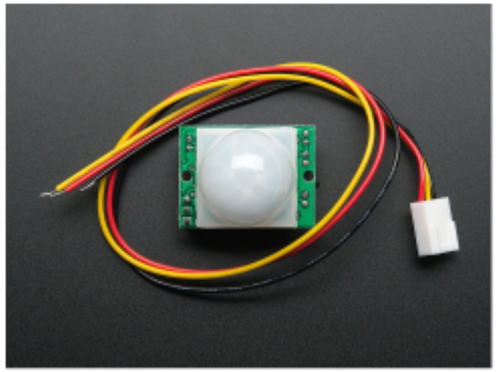


Tilt Switch

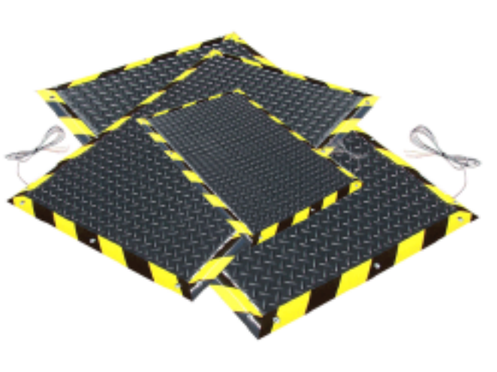
Foot Switch

Button

Break Beam Switch



PIR Motion Switch



Mat Switch

Mechanical Joystick

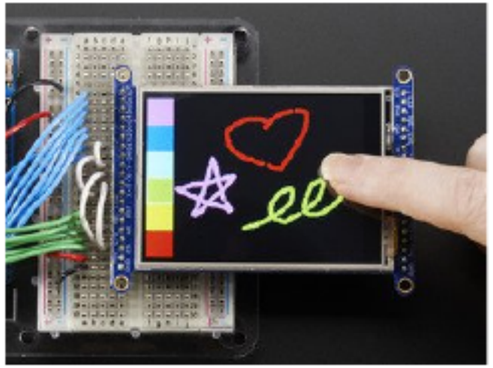
Actuators

Led Lighting & EL Wire

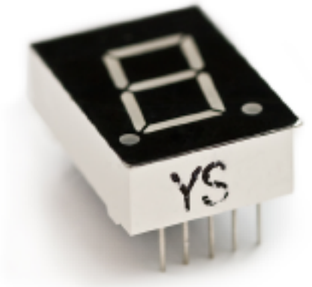
LED Lighting

EL Wire

LCD & LED Displays



LCD Displays

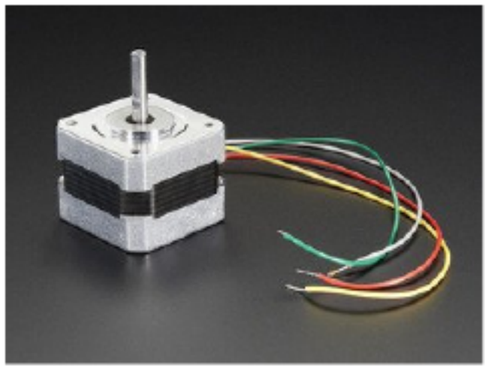


LED Display

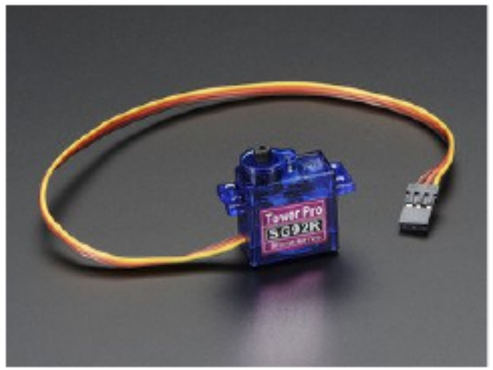
Motors

Continuous Motor

Vibration Motor

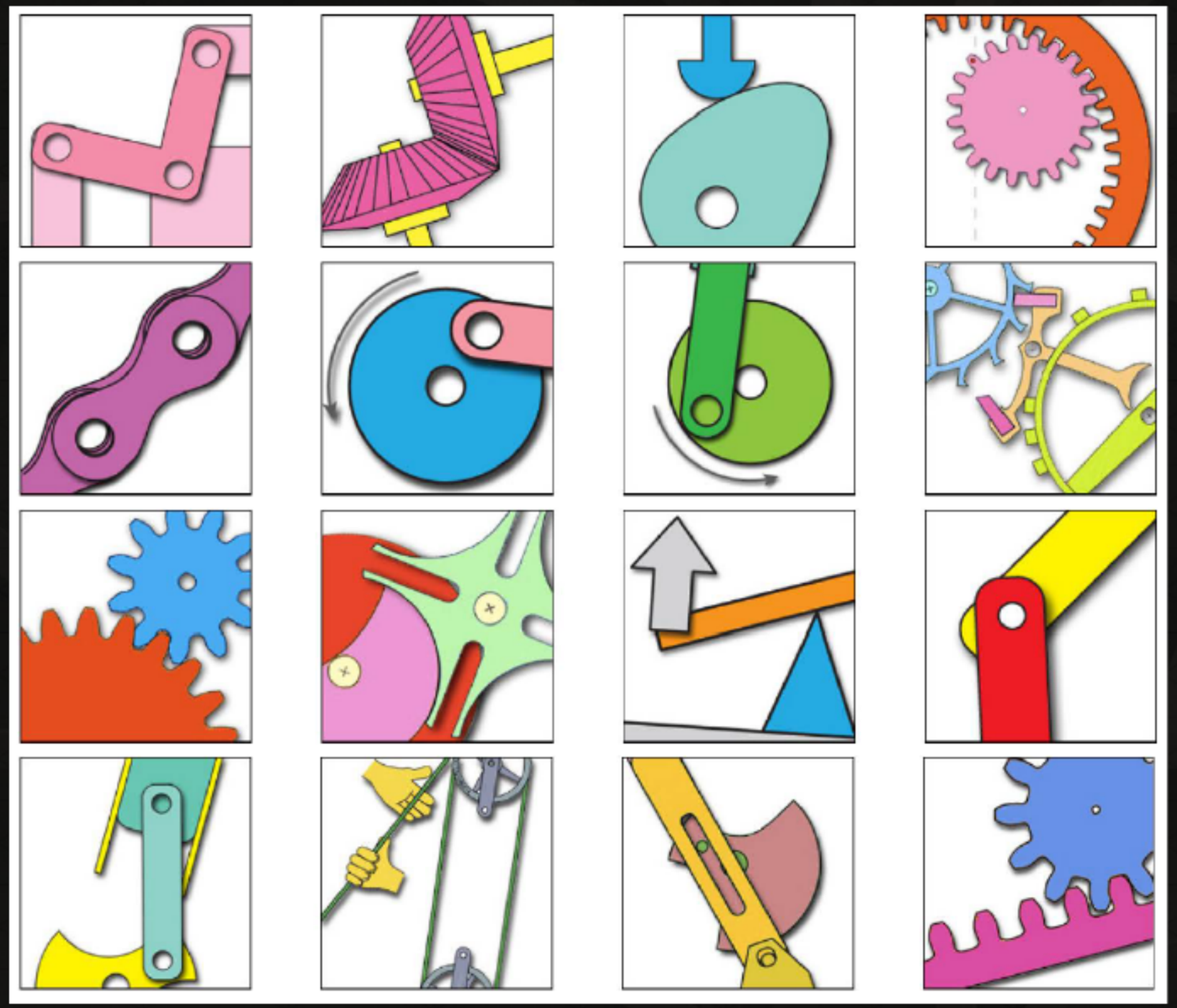


Stepper Motor



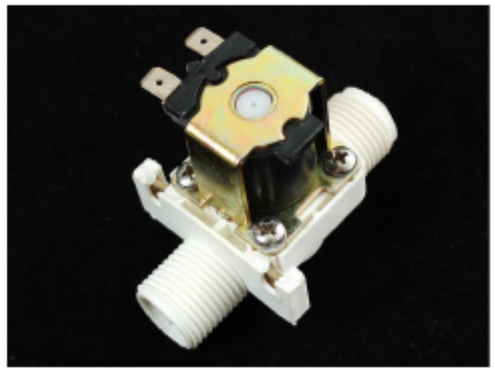
Servo Motor

Motors



http://www.robives.com/mechs

Pumps & Valves

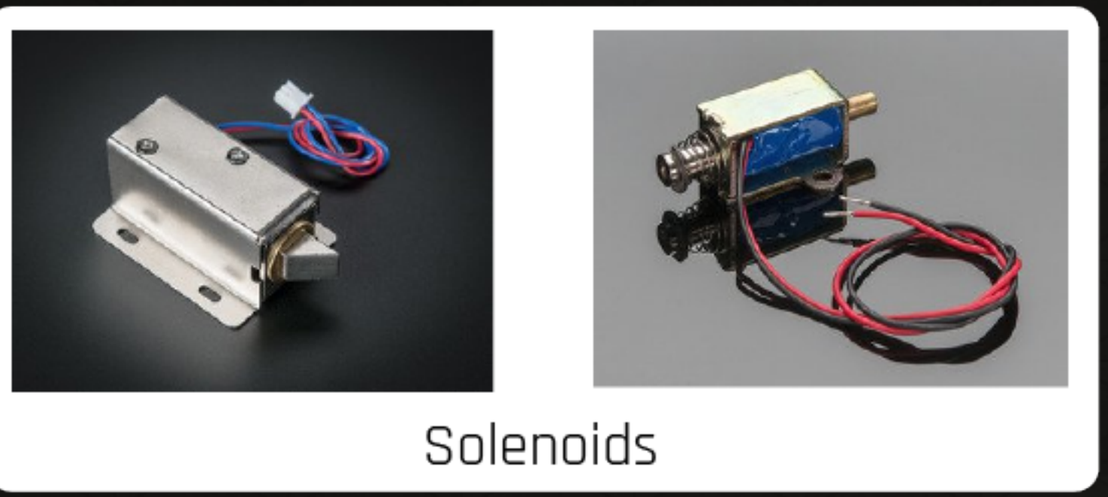


Valve

Liquid Pump

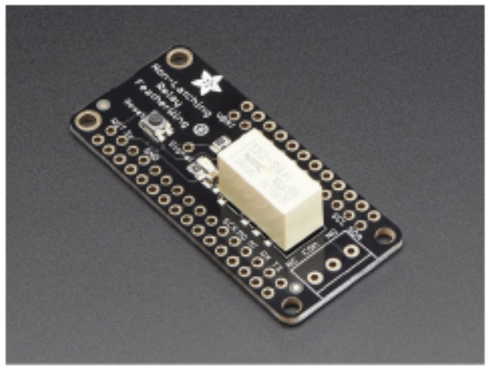
Vacuum Pump

Solenoids

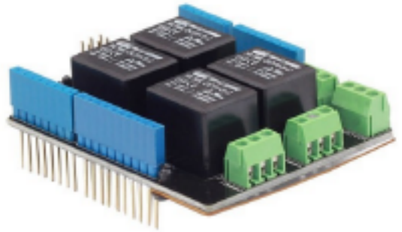


Solenoids

Relays



Relay Breakout



Relay Shield

Suppliers

Source Code

https://github.com/cotejp/forward2017-workshop

To install all necessary Node modules for a project, issue the following command in the project's folder:

```
npm install
```

http://tangiblejs.com/forward2017

http://tangiblejs.com

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