CIRCUITS AND CODE: FUN WITH ARDUINO!

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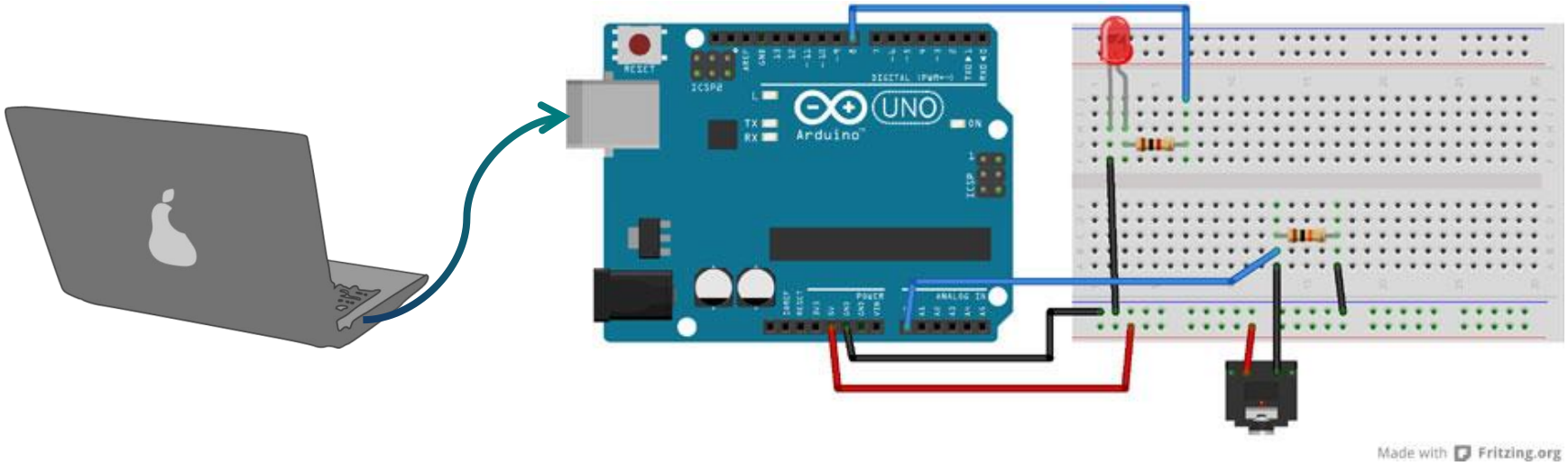
What is Arduino?

The heart (or the brain) of DIY projects

- Microcontroller
  - A board with a chip that can be programmed to do many different things
- Inputs (digital and analog)
  - Read input from sensors like ultrasonic sensor and thermistor
- Outputs
  - Drive Circuitry

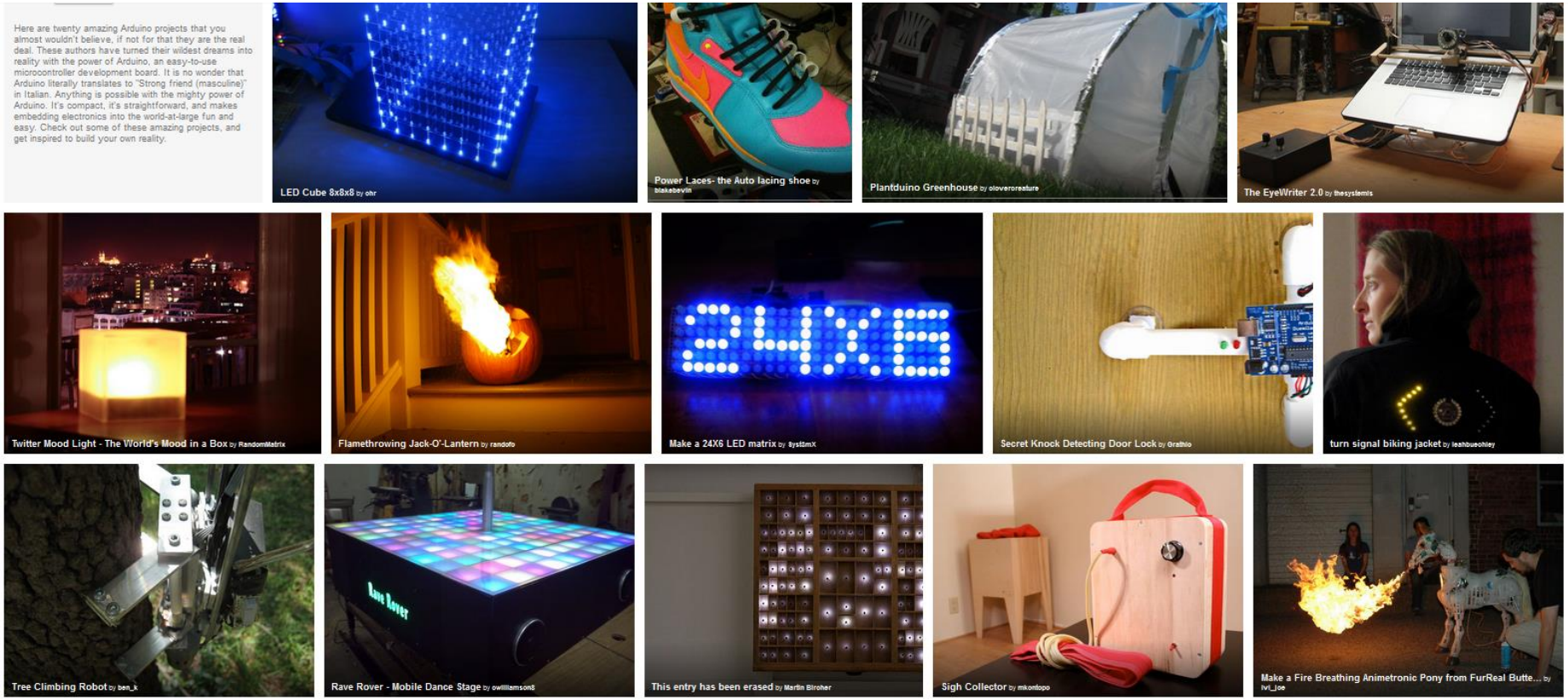


What is Arduino?

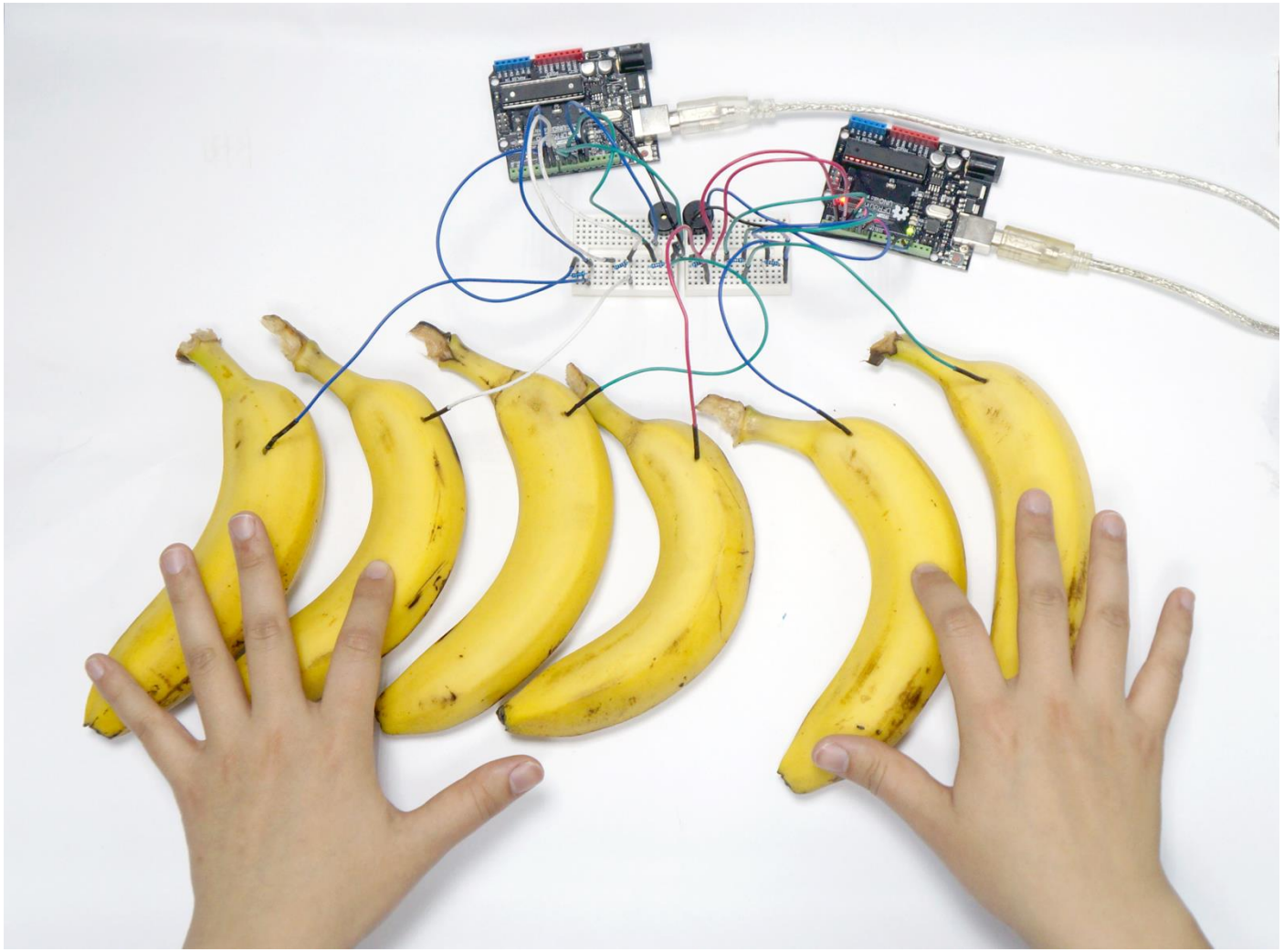
The heart (or the brain) of DIY projects

What Can I Build With Arduino?

- http://www.instructables.com/id/20-Unbelievable-Arduino-Projects/



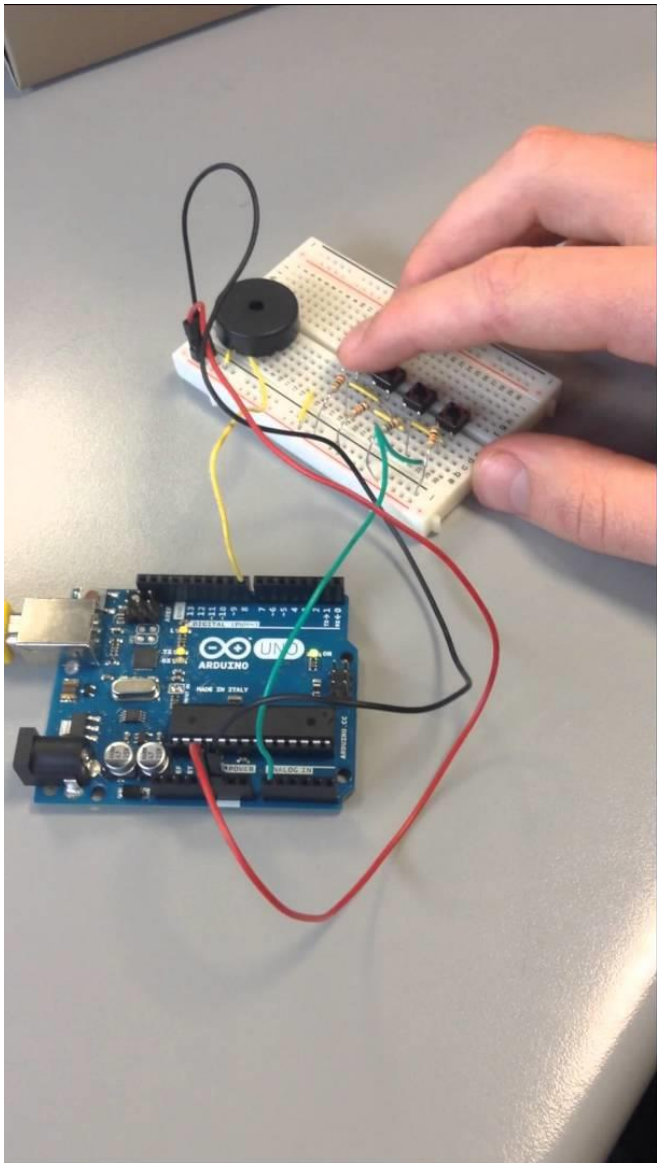
What Can I Build With Arduino?



What are you working with?

What Can I Build With Arduino?

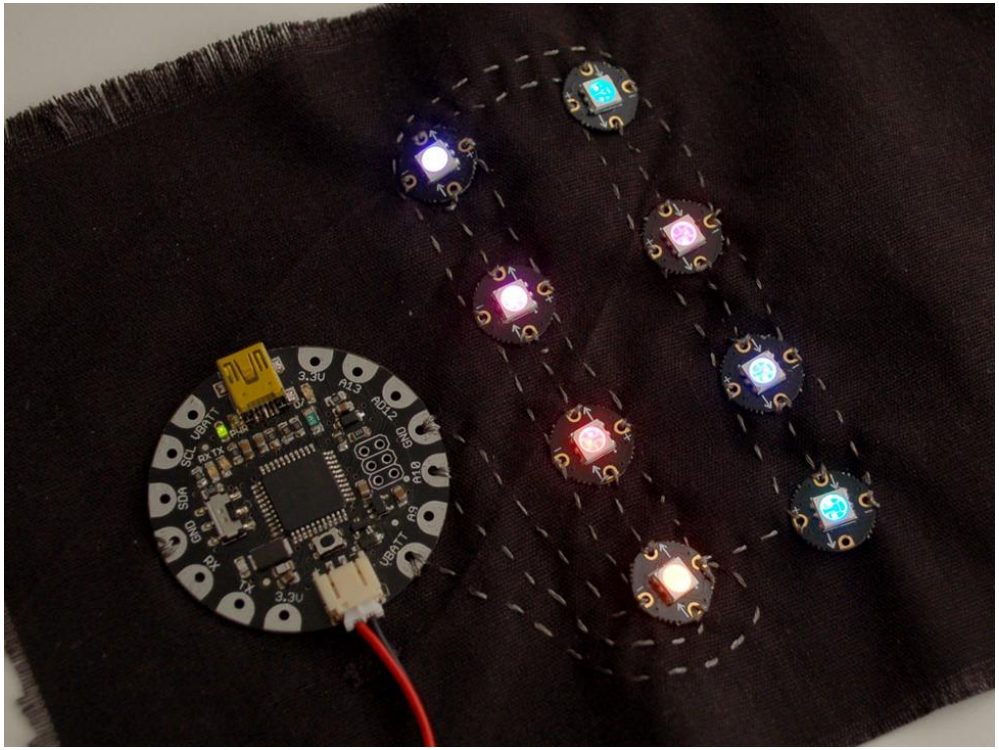
- **Spaceship Interface**
- **Love-O-Meter**
- Color Mixing Lamp
- Mood Cue
- Light Theremin
- Keyboard Instrument
- Digital Hourglass
- Motorized Pinwheel
- Zoetrope
- Crystal Ball
- Knock Lock
- Touchy-feely Lamp

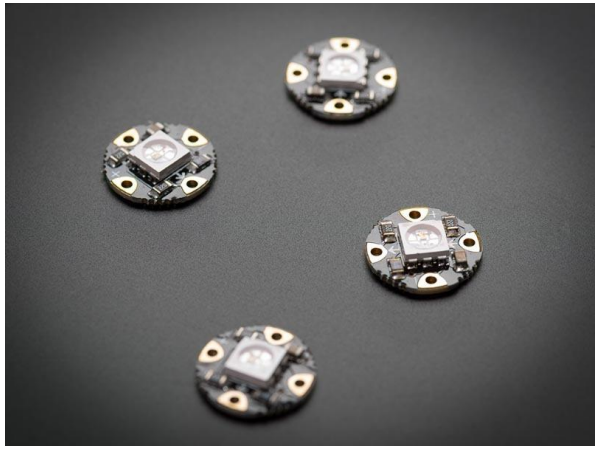


Who are you working with?

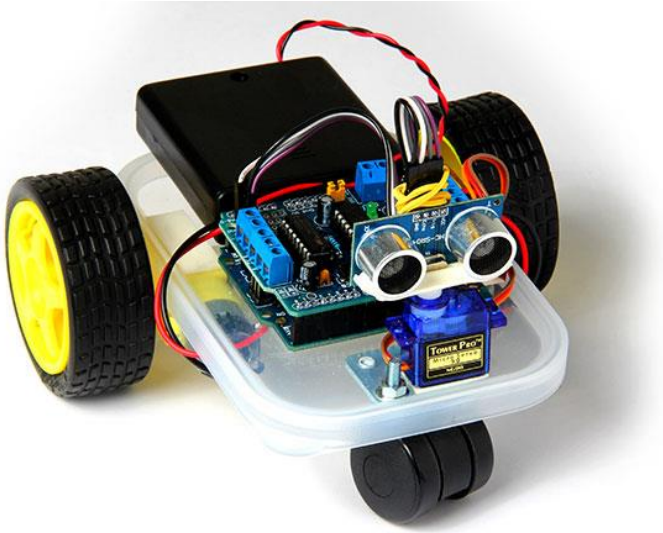
- Groups
- Teaching Assistants!

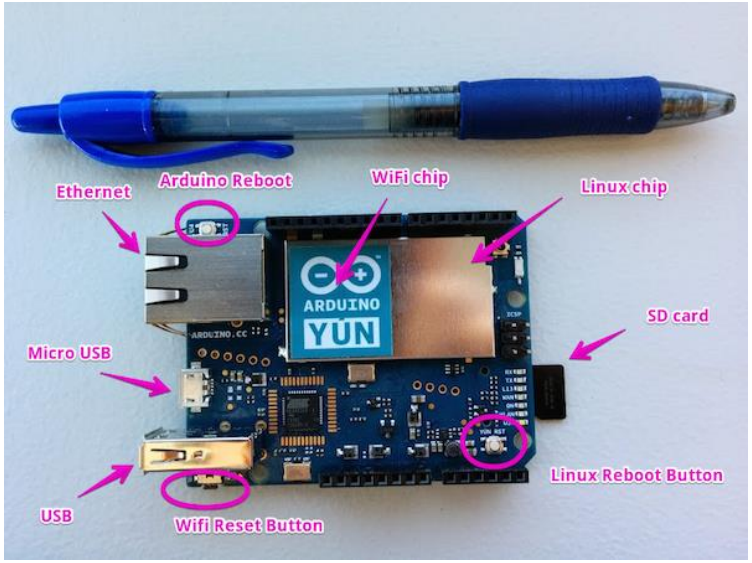
NeoPixels for Makers!





But what about Robots and IoT?

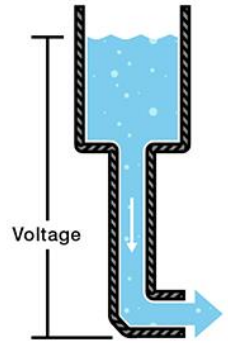


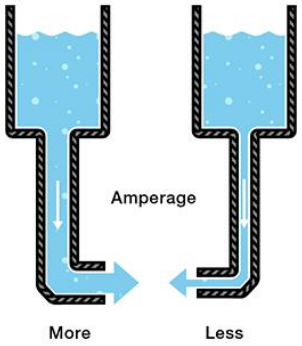


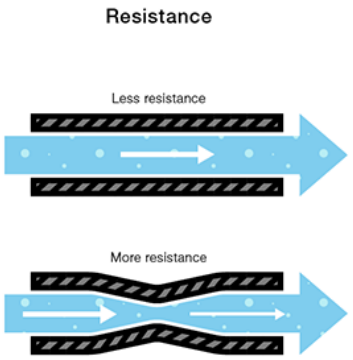
"..Once you've finished this tutorial, you may want to put your newly acquired skills to use by:
Building an Arduino Yun powered photo booth
Sending SMS and MMS from your Arduino Yun
Teaching your dog to send you selfies with the Arduino Yun "

Voltage, Current, Resistance

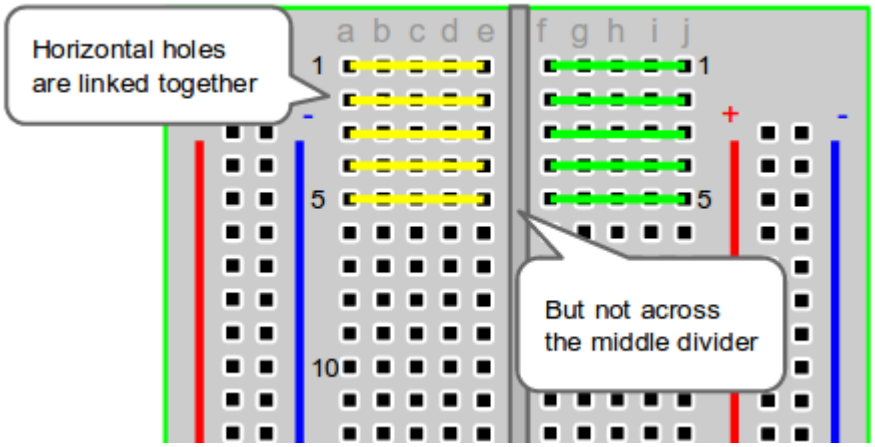
- **Voltage** is the difference in charge between two points.
- **Current** is the rate at which charge is flowing.
- **Resistance** is a material's tendency to resist the flow of charge (current).
- V = I * R

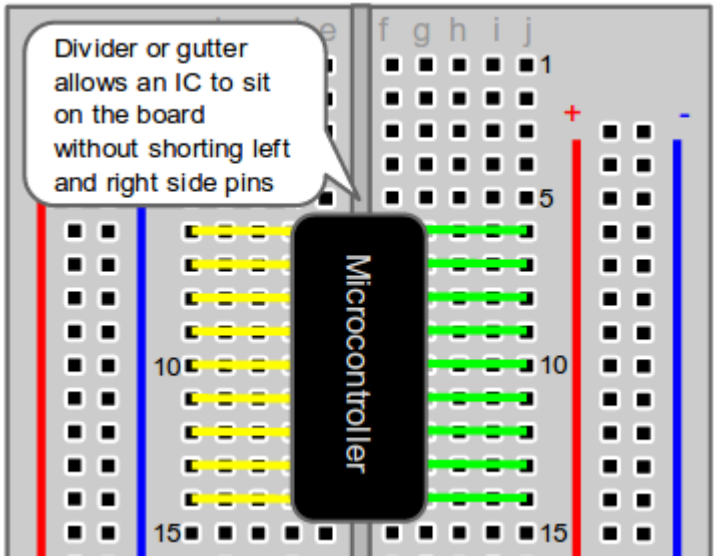


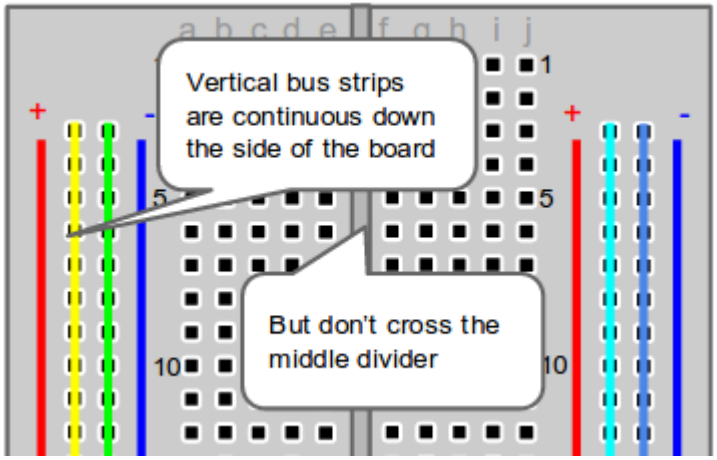


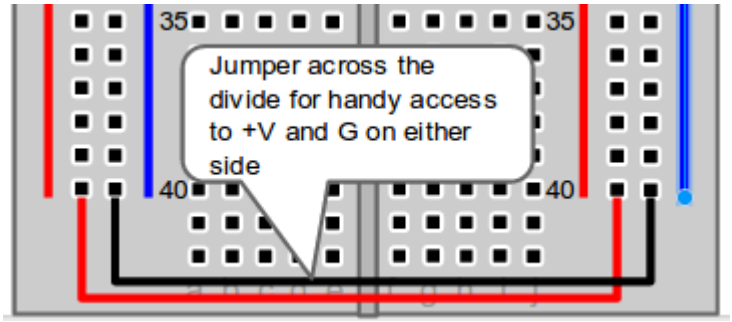


Breadboard Pins



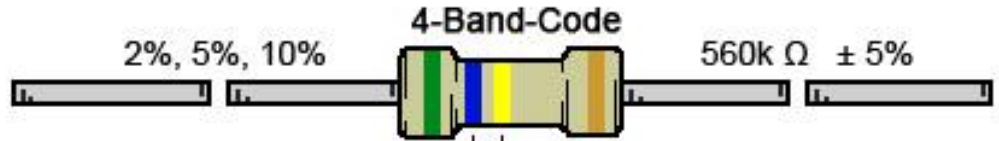




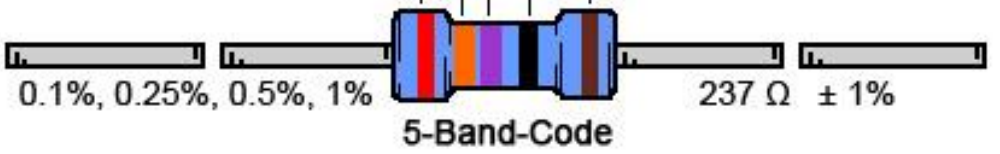


http://computers.tutsplus.com

Resistor Color Codes



COLOR	1ST BAND	2ND BAND	3RD BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	± 0.5% (D)
Blue	6	6	6	1MΩ	± 0.25% (C)
Violet	7	7	7	10MΩ	± 0.10% (B)
Grey	8	8	8		± 0.05%
White	9	9	9		
Gold				0.1Ω	± 5% (J)
Silver				0.01Ω	± 10% (K)

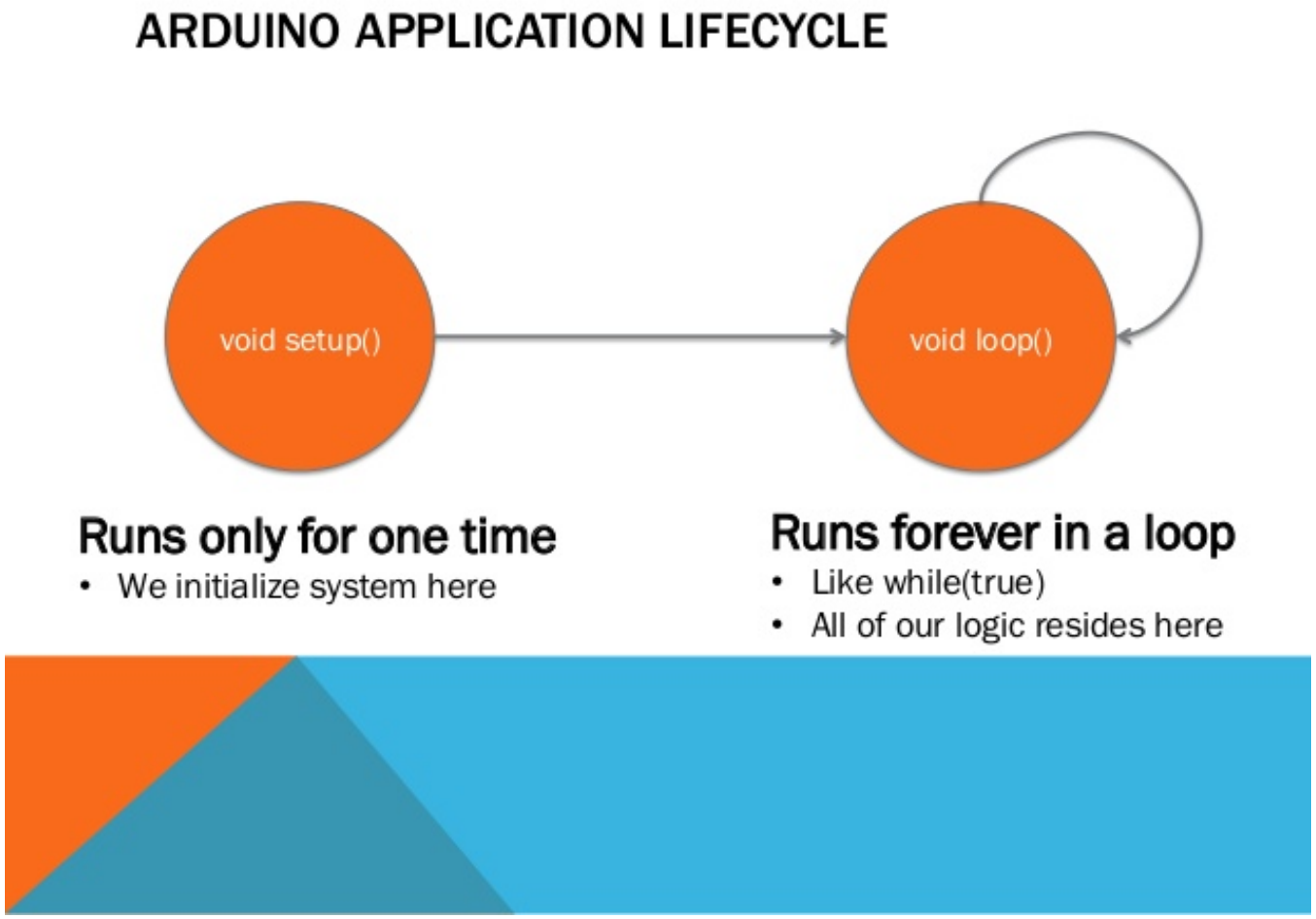


Digital Logic Levels + Analog Pins

- OFF = 0 = 0 Volts
- ON = 1 = 5 Volts

- Analog pins have 1024 levels between 0 Volts and 5 Volts

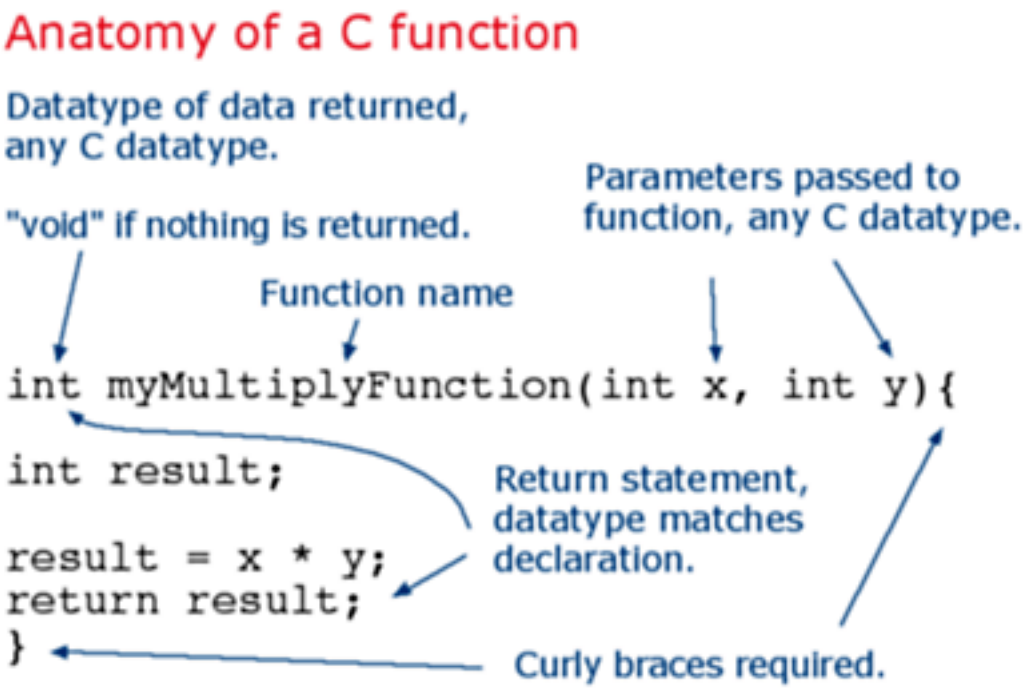
Arduino Code: setup() and loop() Functions



Functions

Segmenting code into functions allows a programmer to create modular pieces of code that **perform a defined task** and then **return to the area of code from which the function was "called"**.

The typical case for creating a function is when one needs to perform the same action multiple times in a program.



- https://www.arduino.cc/en/Reference/FunctionDeclaration

Functions

Standardizing code fragments into functions has several advantages:

- Functions help the programmer stay organized. Often this helps to conceptualize the program.
- Functions codify one action in one place so that the function only has to be thought out and debugged once.
- This also reduces chances for errors in modification, if the code needs to be changed.
- Functions make the whole sketch smaller and more compact because sections of code are reused many times.
- They make it easier to reuse code in other programs by making it more modular, and as a nice side effect, using functions also often makes the code more readable.
- There are two required functions in an Arduino sketch, setup() and loop(). Other functions must be created outside the brackets of those two functions. As an example, we will create a simple function to multiply two numbers.

Try this example located in a folder on your Desktop: **p02_SpaceshipInterfaceFunctions**

- https://www.arduino.cc/en/Reference/FunctionDeclaration