The Remote Control Cardboard Box

Gil, Kevin, and J.D.
December 2015

Arduino & Code

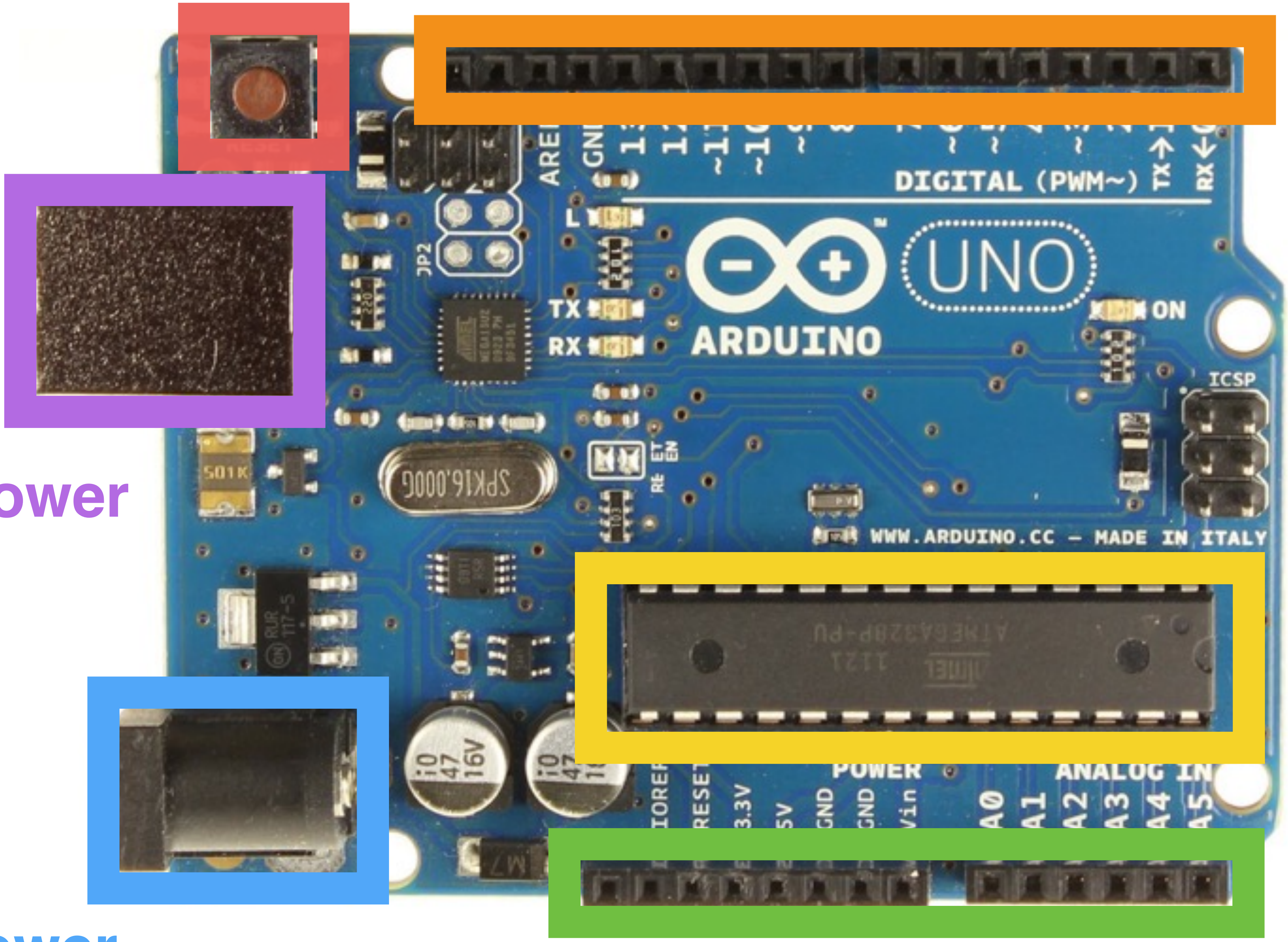
Motor Control

Remote Control

Merging & Integration

Reset Button

Digital Inputs & Outputs



USB / Power

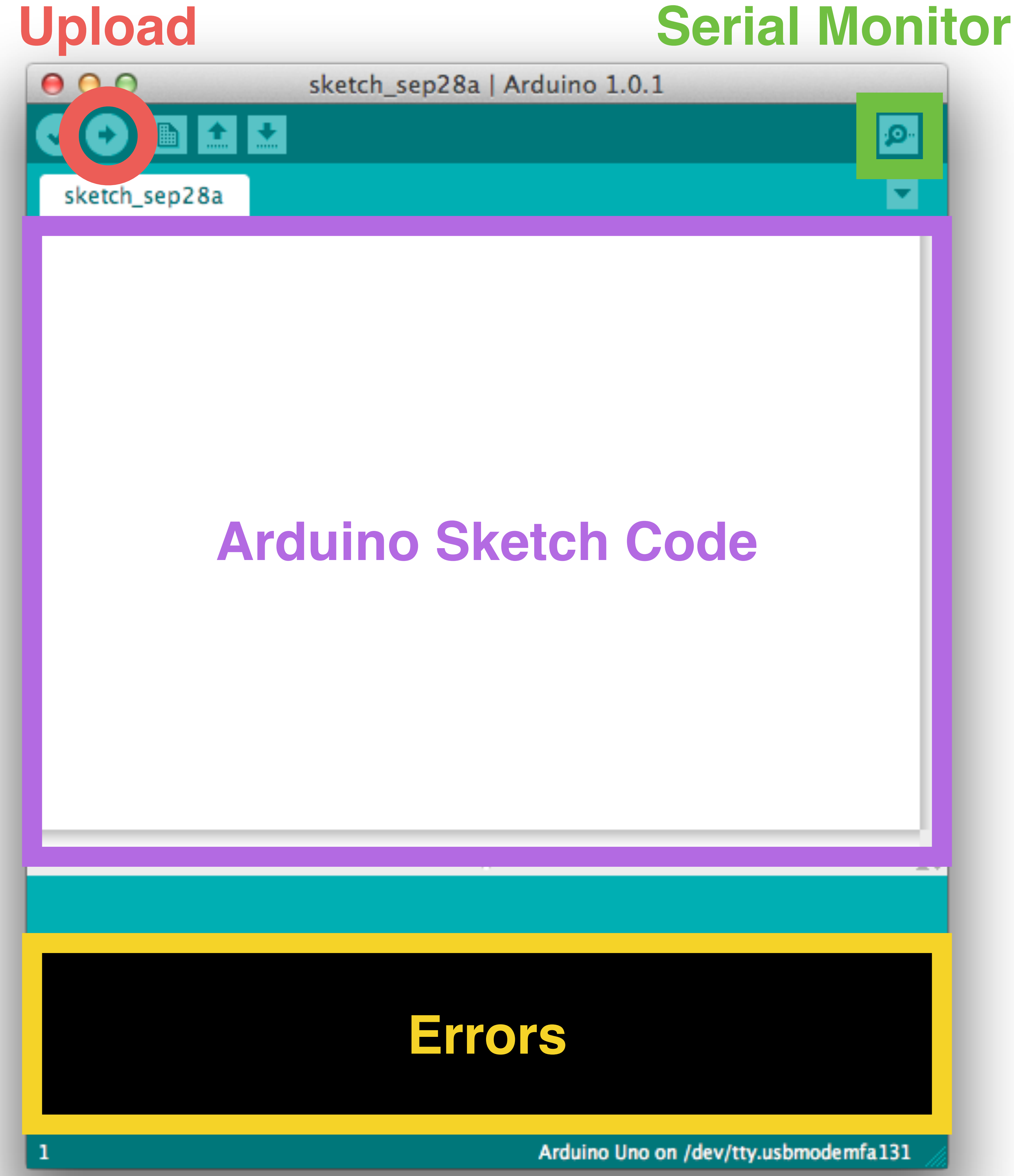
ATmega 328

DC Power

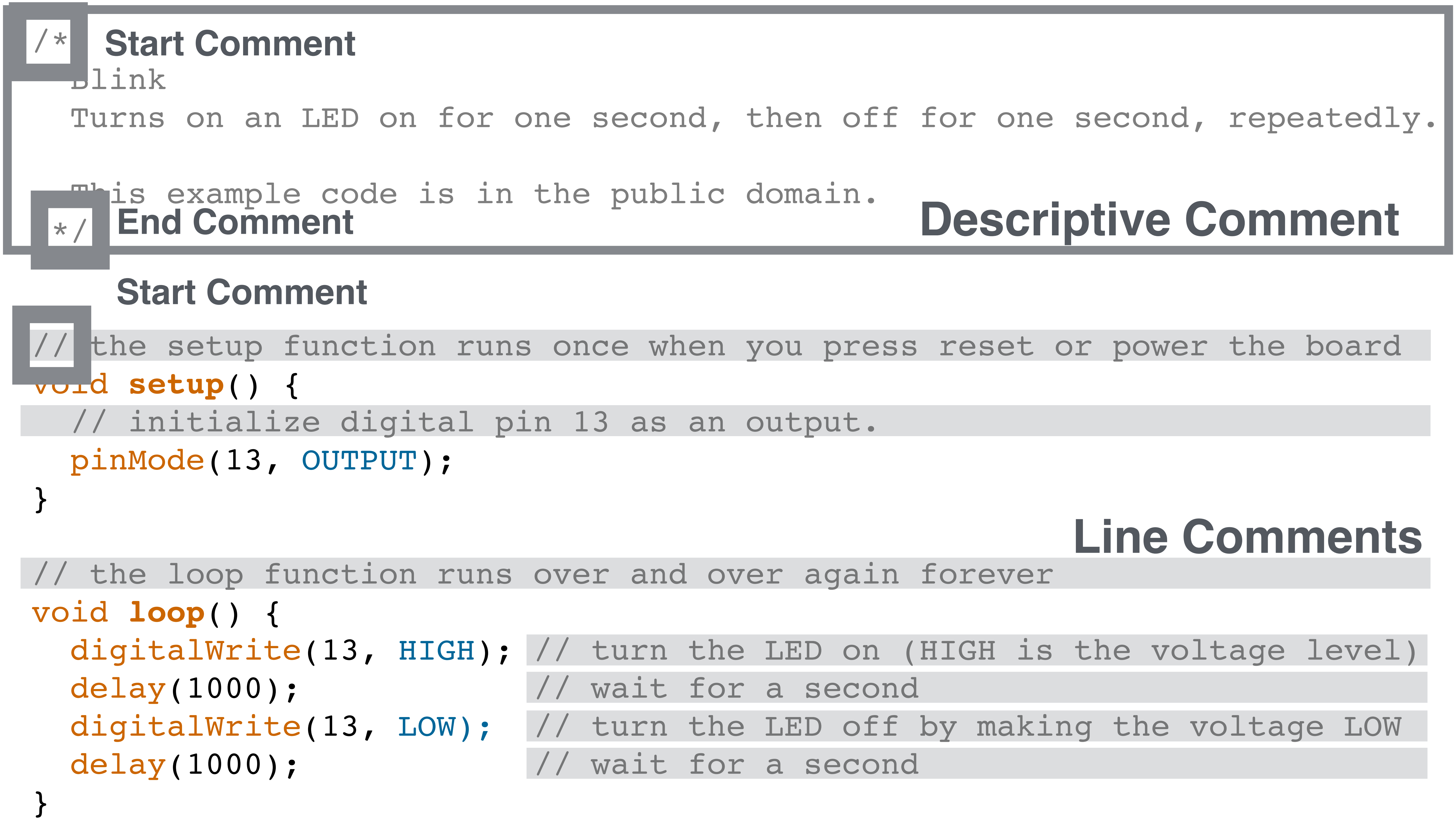
Power & Analog Inputs

Arduino Hardware: UNO

Arduino Software


Upload
Serial Monitor
sketch_sep28a | Arduino 1.0.1
sketch_sep28a
Arduino Sketch Code
Errors
1
Arduino Uno on /dev/tty.usbmodemfa131

Anatomy of a Sketch



```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeatedly.

  This example code is in the public domain.
*/

// the setup function runs once when you press reset or power the board
void setup() {
  // initialize digital pin 13 as an output.
  pinMode(13, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(13, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);              // wait for a second
  digitalWrite(13, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);              // wait for a second
}
```

File > Examples > Basics > Blink

Anatomy of a Sketch

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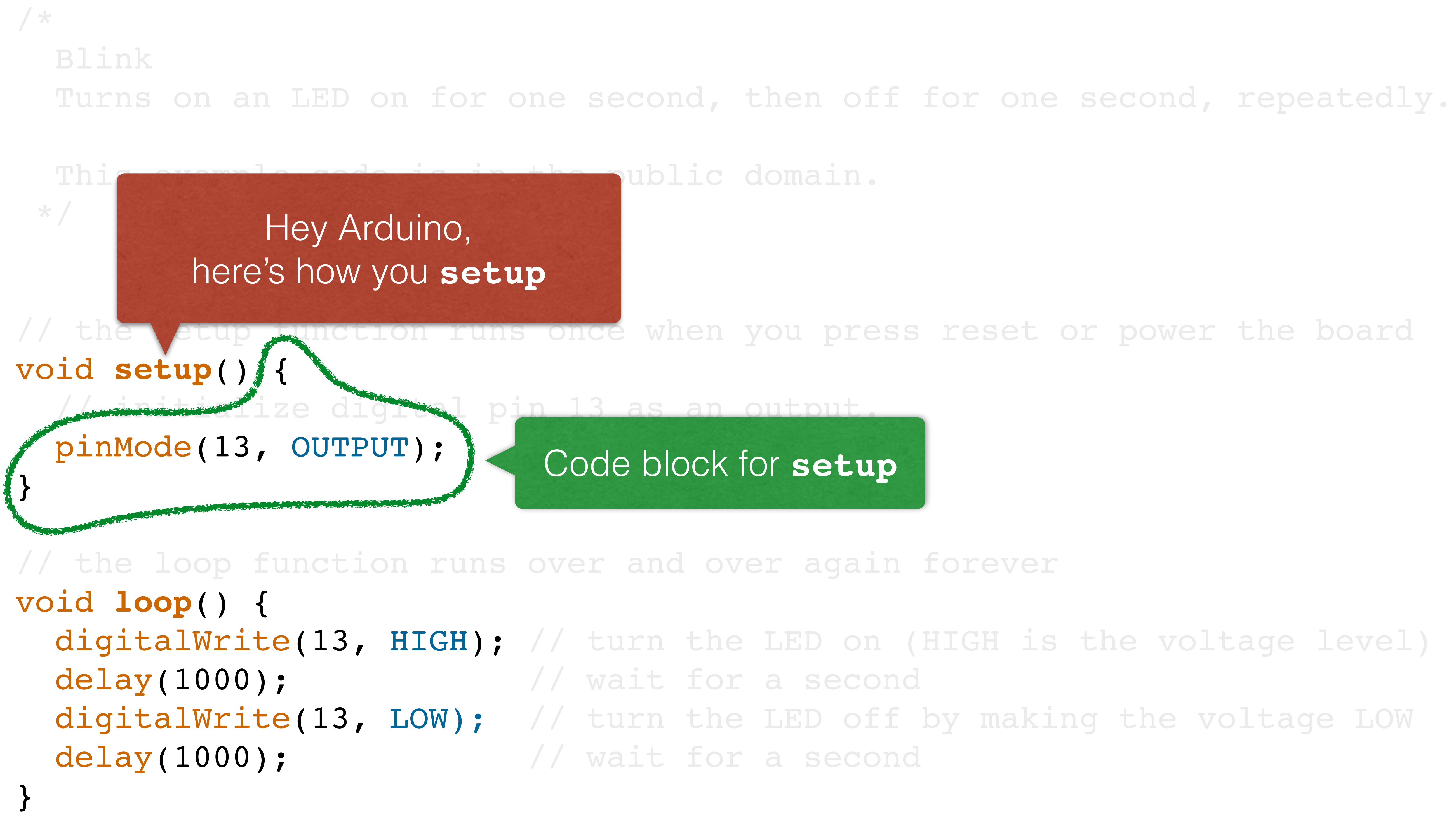
File > Examples > Basics > Blink

Anatomy of a Sketch



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Hey Arduino,
here's how you **setup**

Code block for **setup**

File > Examples > Basics > Blink

Anatomy of a Sketch

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  pin
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```

Hey Arduino,
here's how you **`loop`**

Code block for **`loop`**

File > Examples > Basics > Blink

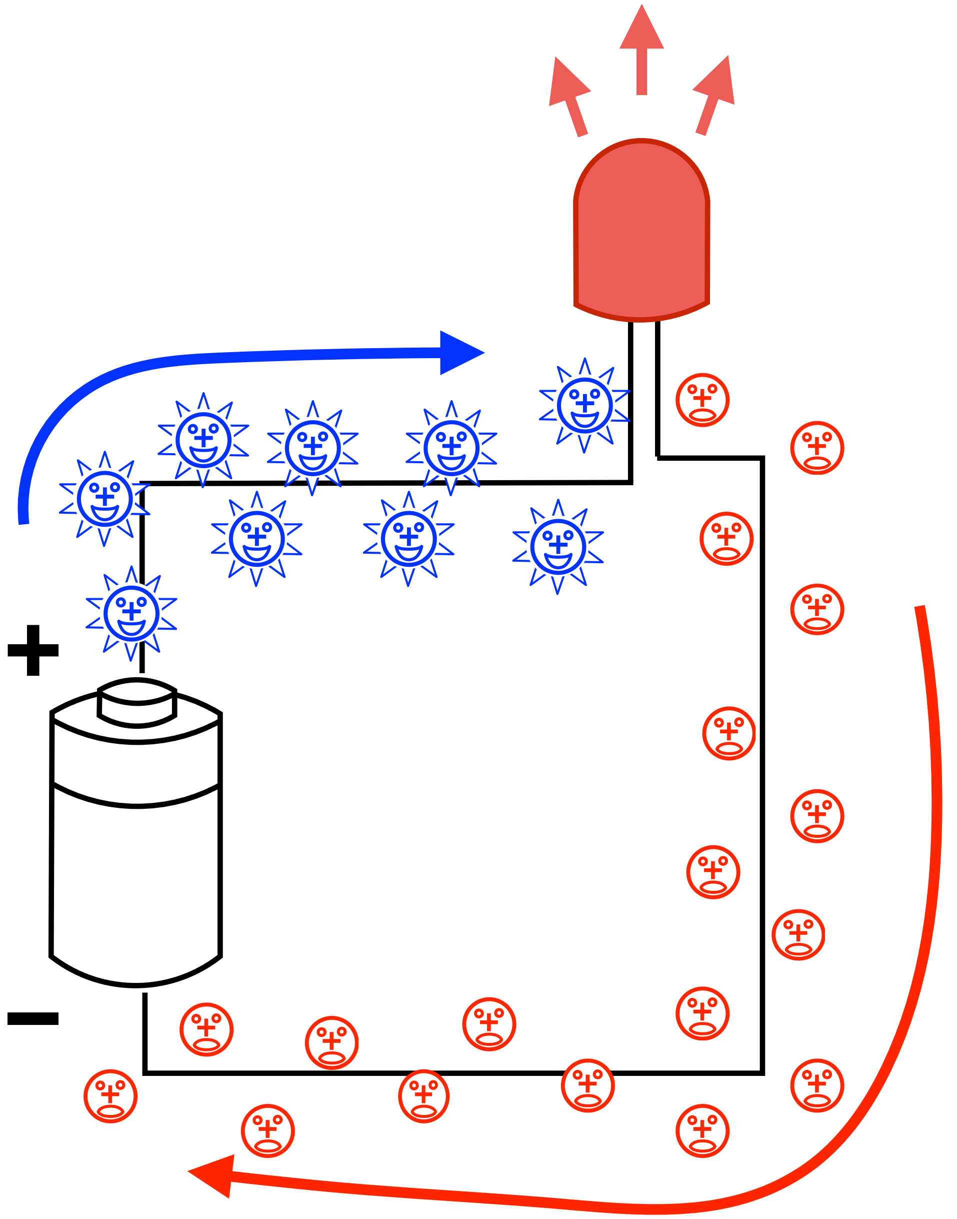
Electronics is…
Moving Charge

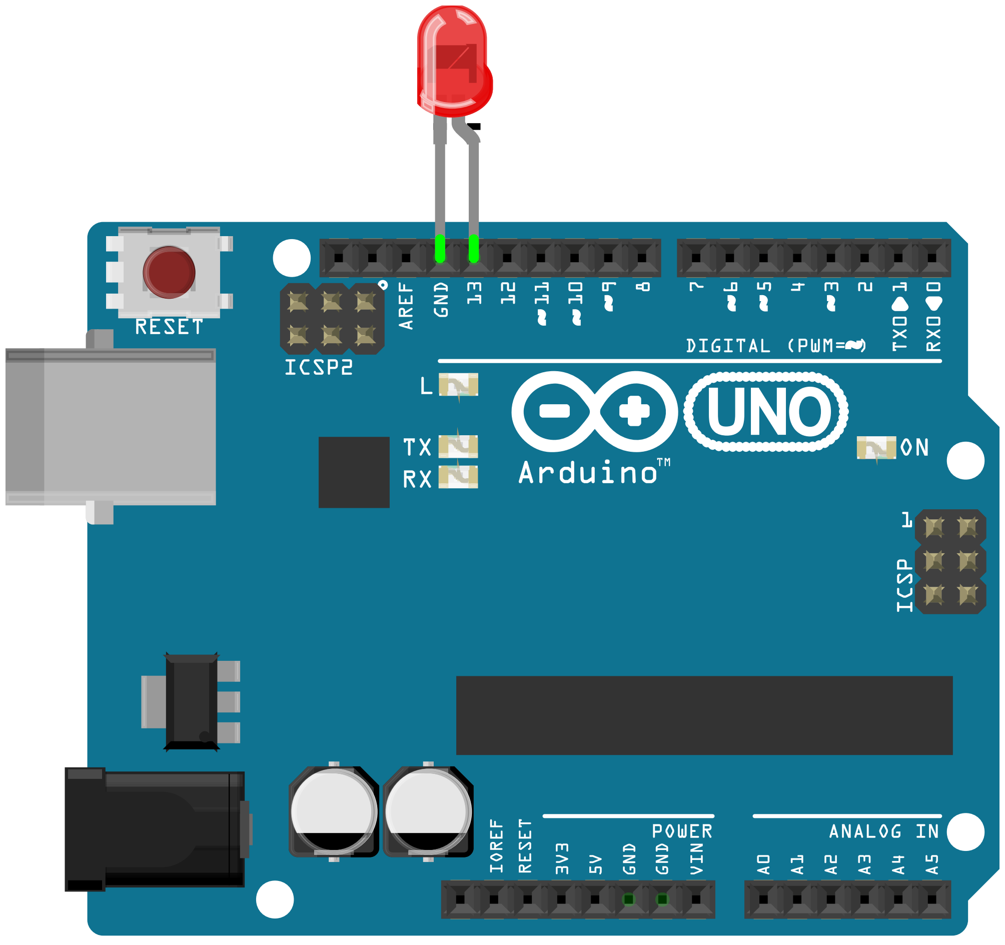
Highly energetic charge particle

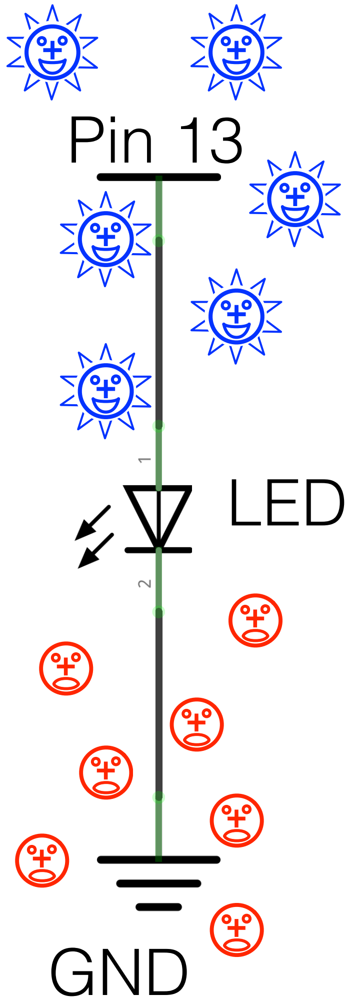
Less energetic charge particle

Exhausted charge particle

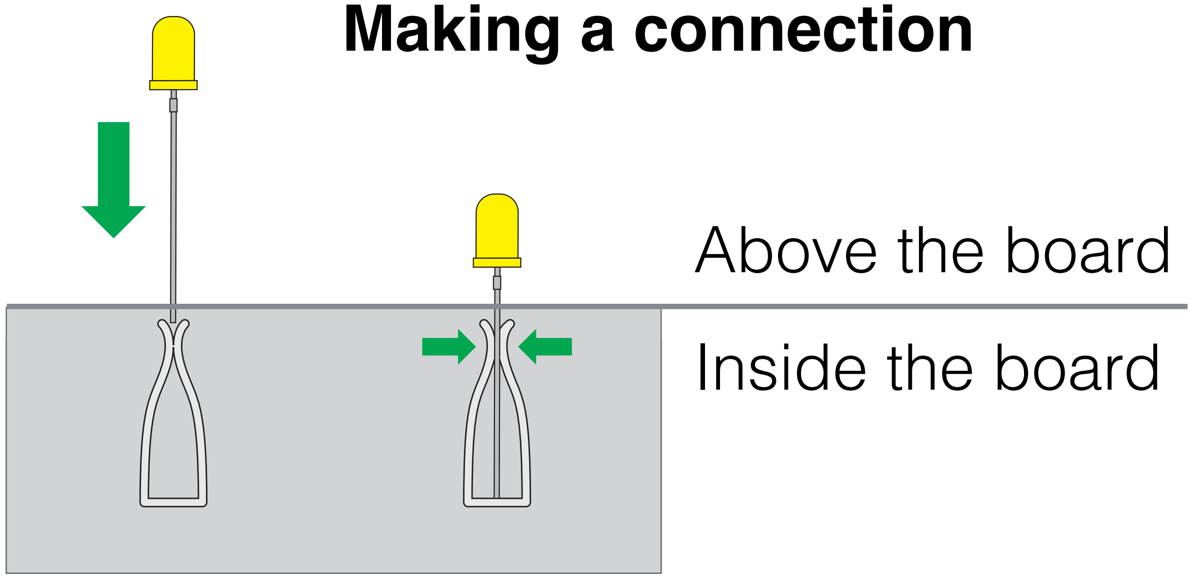
Simple Circuit







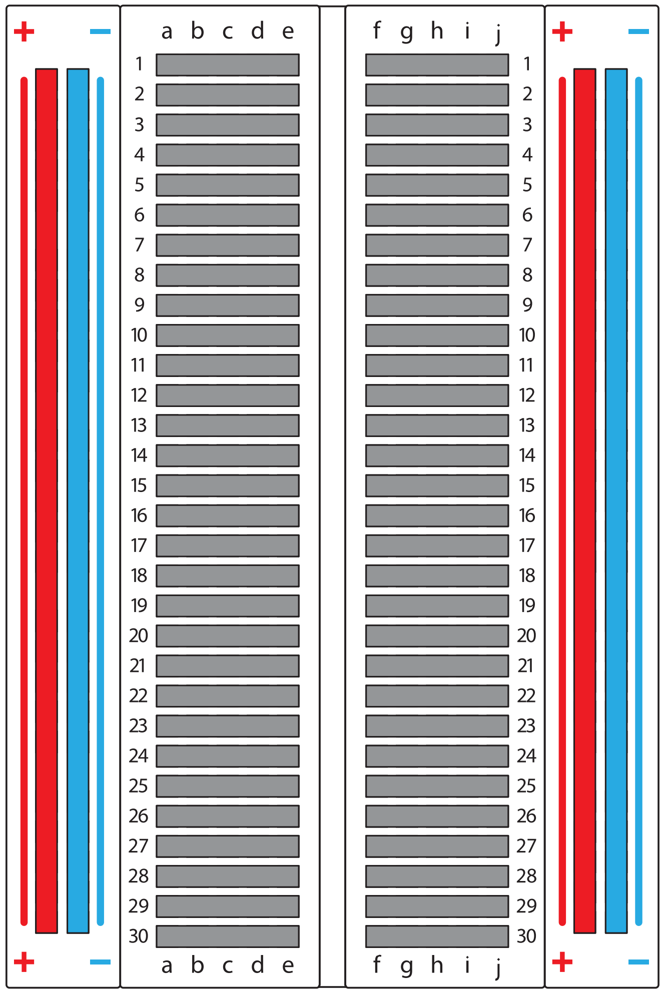
The Breadboard

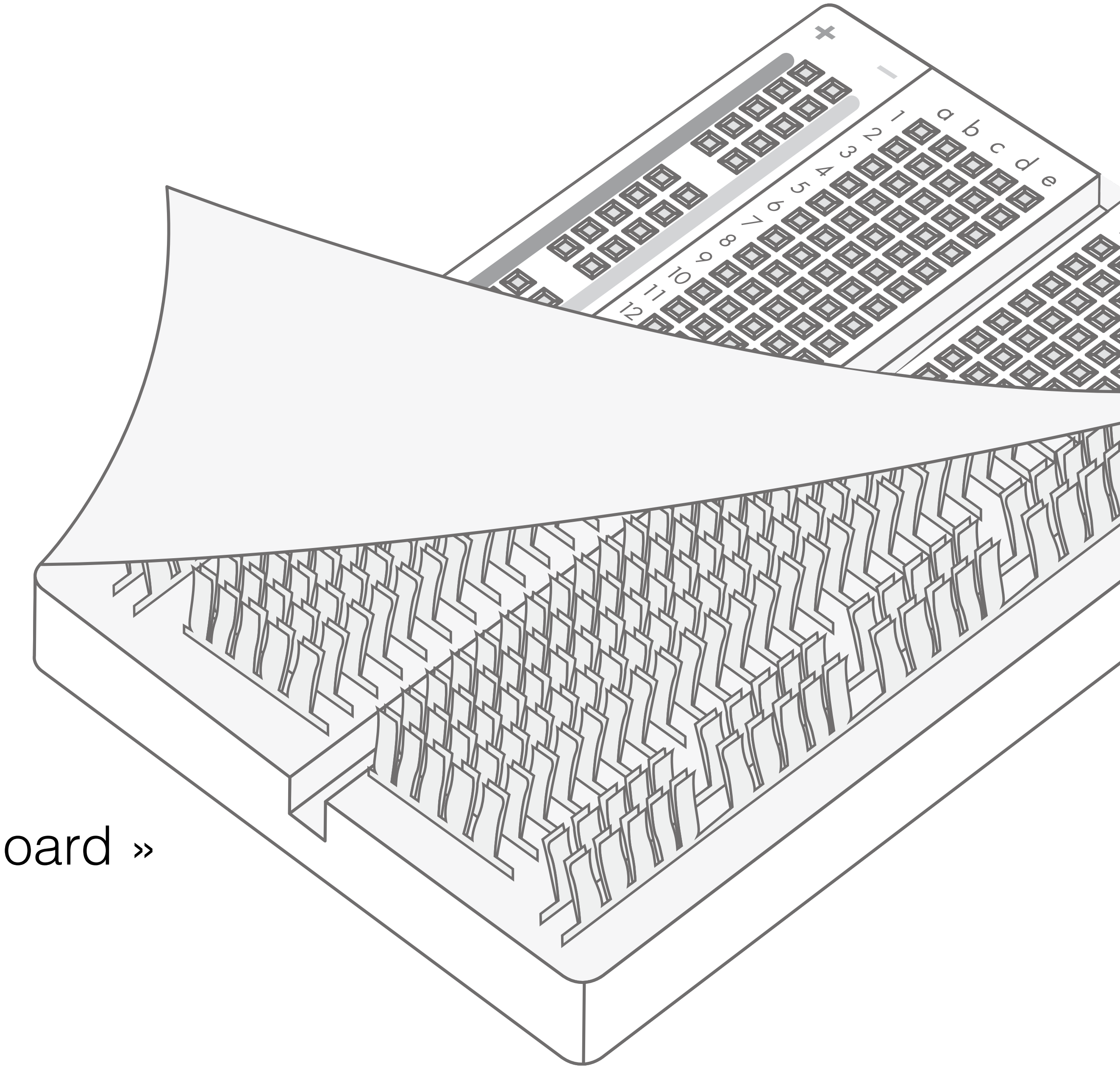


+ Runs power along column

– Runs ground along column

▬ Each numbered row has 5 *connected* sockets





Inside the board »

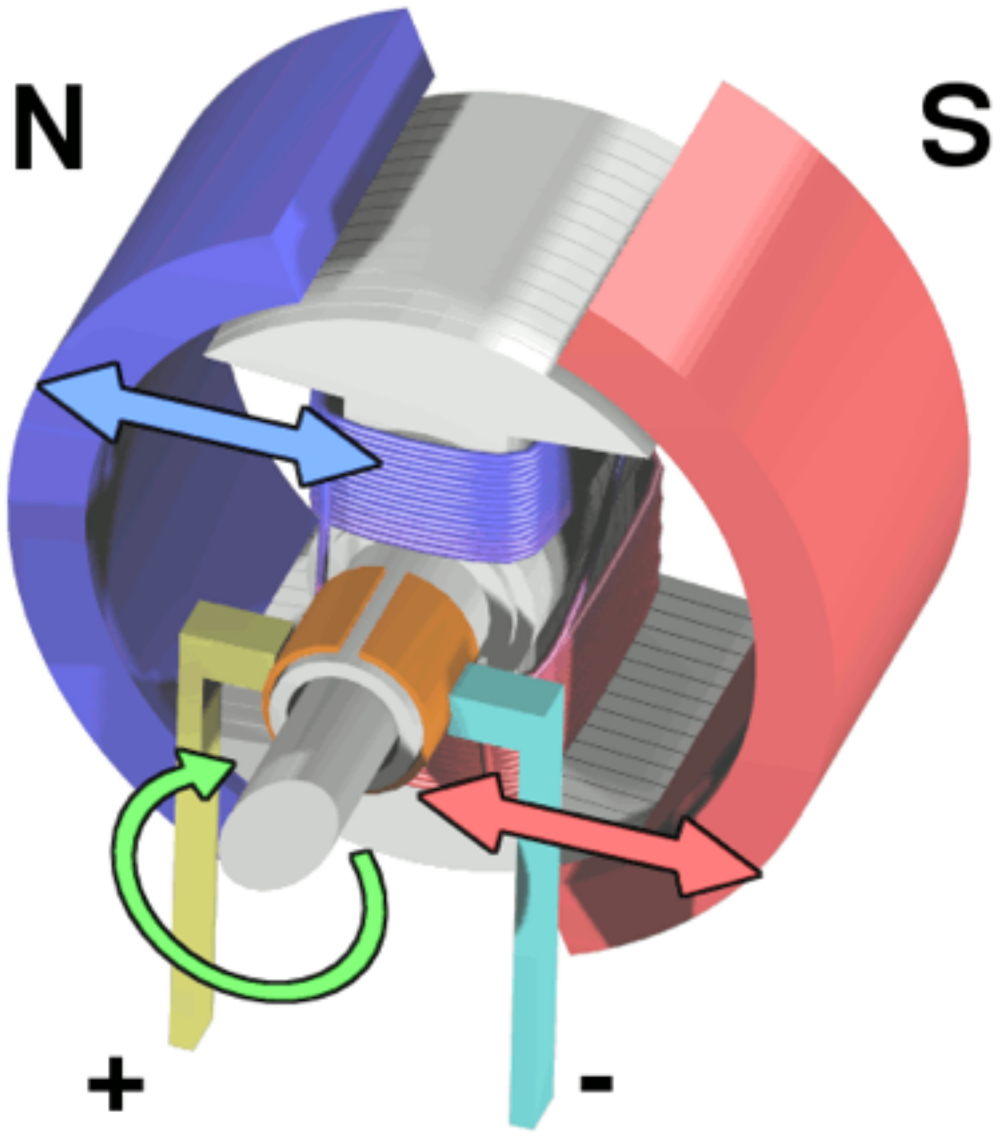
Arduino & Code

Motor Control

Remote Control

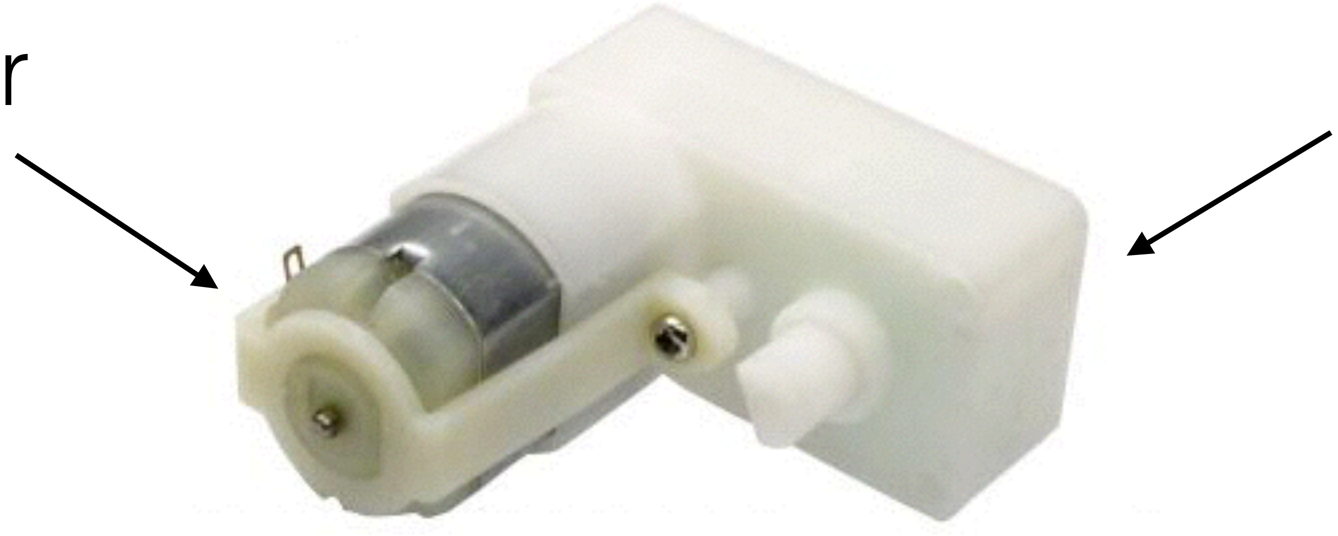
Merging & Integration

Electric Motor



[wikipedia]

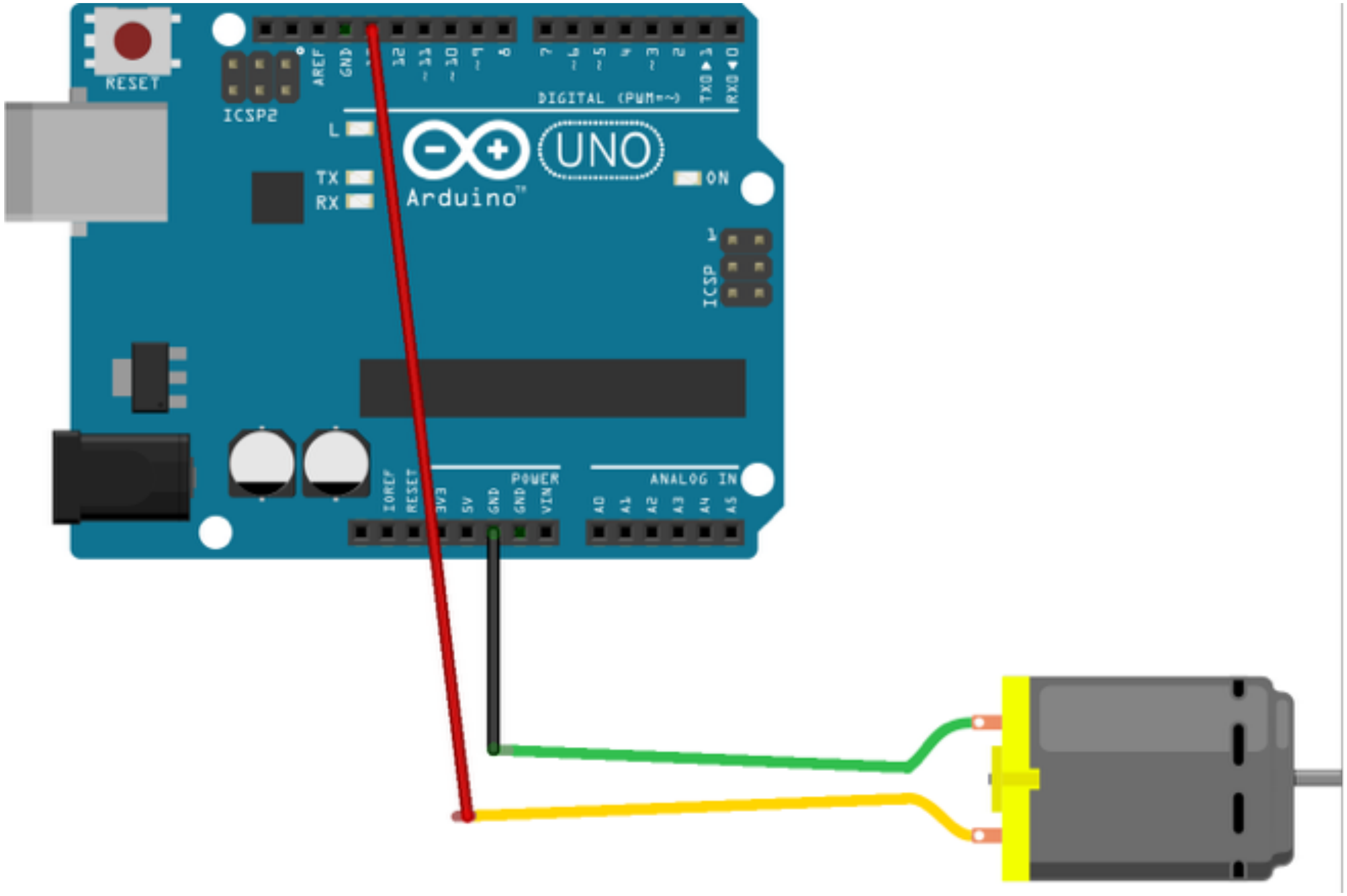
The Gearmotor



DC Motor

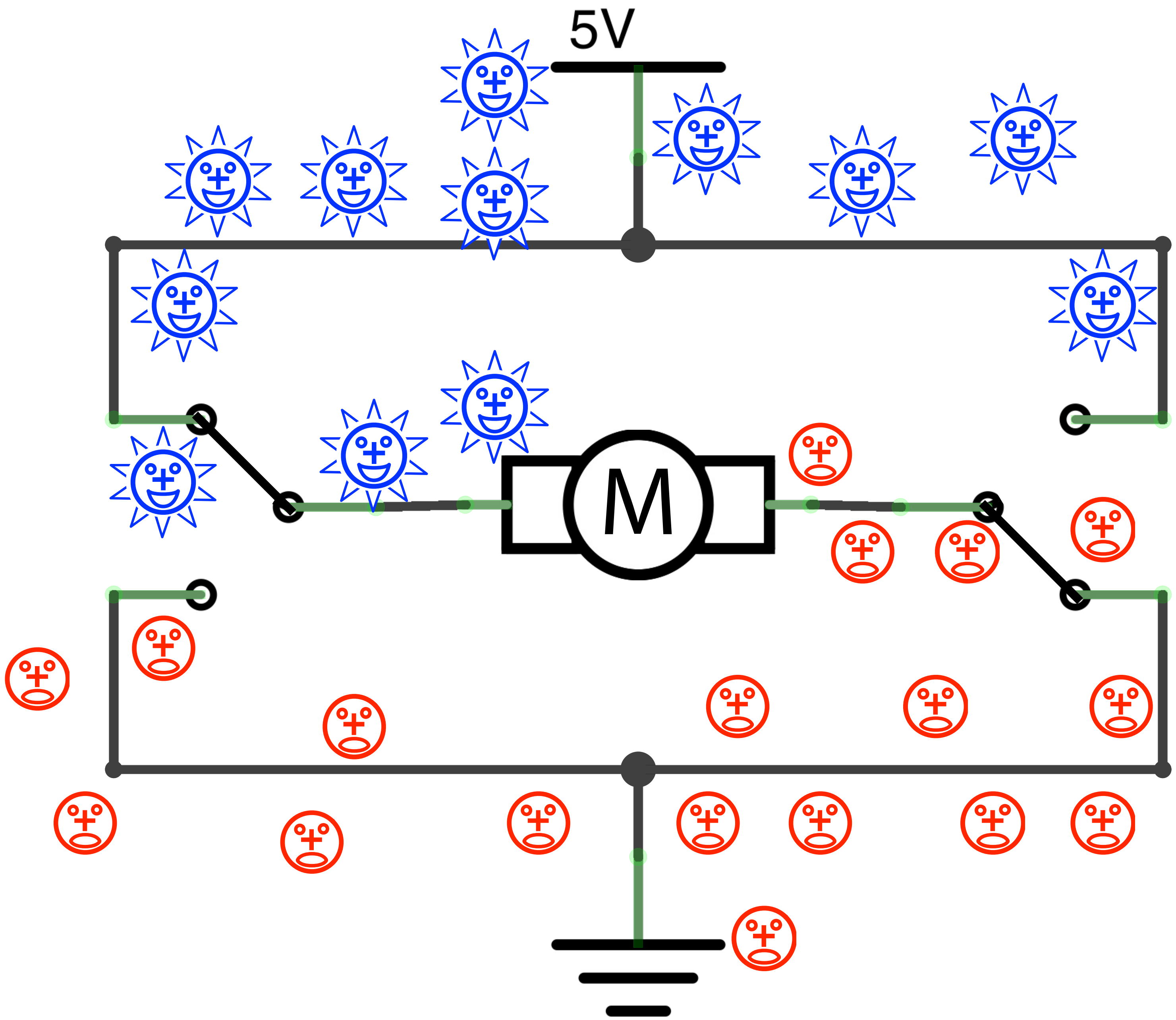
Gearbox

Testing the Motor

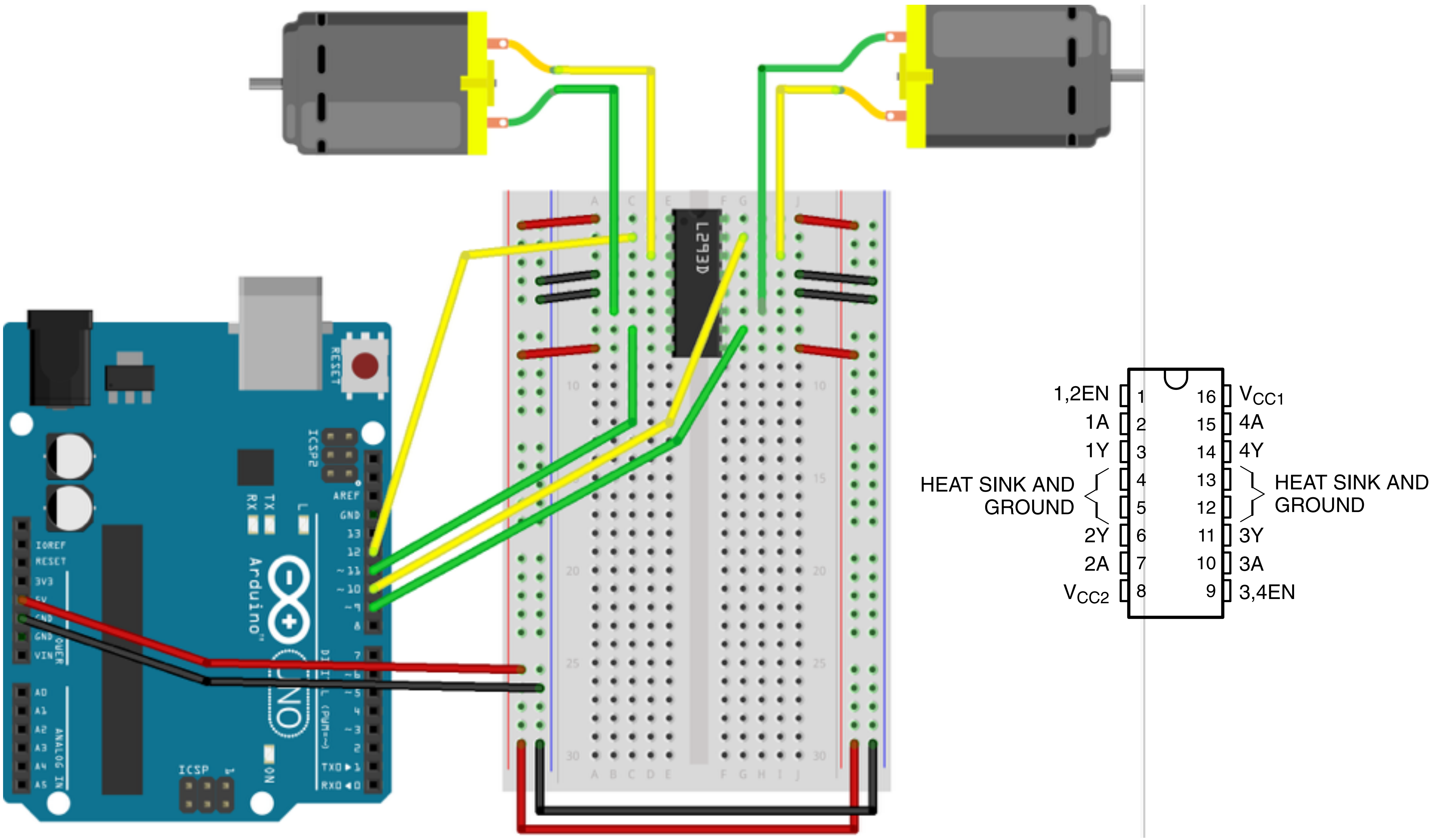


problem?

Pin-controlled Switch!



Motor Driver



Motor Programming

```
/*
  Motor Tester

  Scaffolding to figure out
  motor directions.
 */

int motorRightForward   = 9;
int motorRightReverse   = 10;
int motorLeftForward    = 11;
int motorLeftReverse    = 12;

void setup() {
  pinMode(motorRightForward, OUTPUT);
  pinMode(motorRightReverse, OUTPUT);
  pinMode(motorLeftForward, OUTPUT);
  pinMode(motorLeftReverse, OUTPUT);
}

void forward() {
  digitalWrite(motorRightForward, HIGH);
  digitalWrite(motorRightReverse, LOW);
  digitalWrite(motorLeftForward, HIGH);
  digitalWrite(motorLeftReverse, LOW);
}
```

```
void halt() {
  digitalWrite(motorRightForward, LOW);
  digitalWrite(motorRightReverse, LOW);
  digitalWrite(motorLeftForward, LOW);
  digitalWrite(motorLeftReverse, LOW);
}

void loop() {
  forward();
  delay(1000);
  halt();
  delay(1000);
}
```

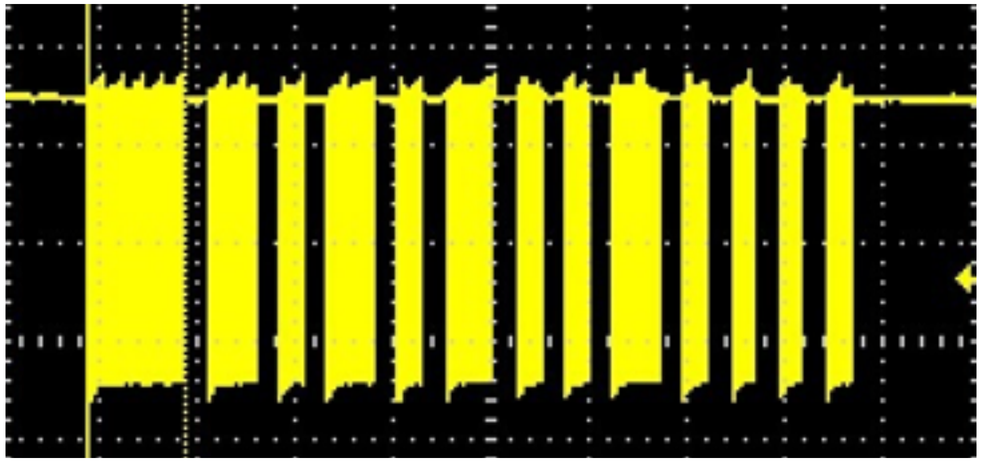
Arduino & Code

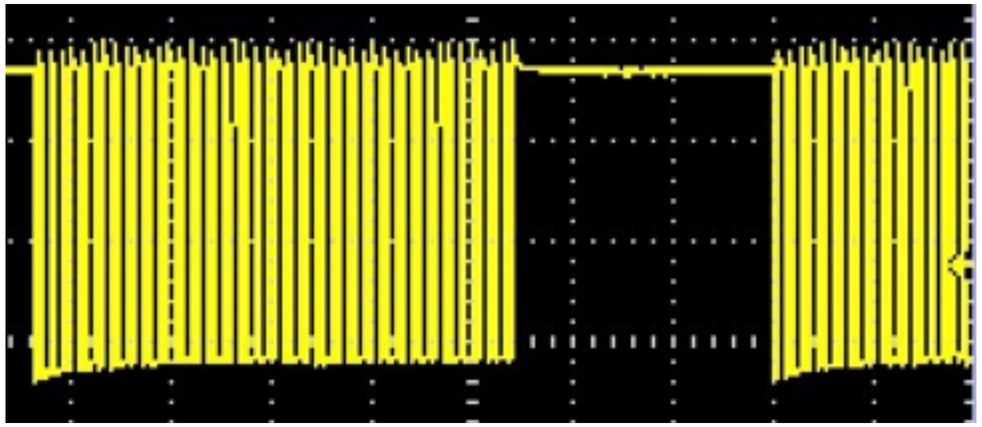
Motor Control

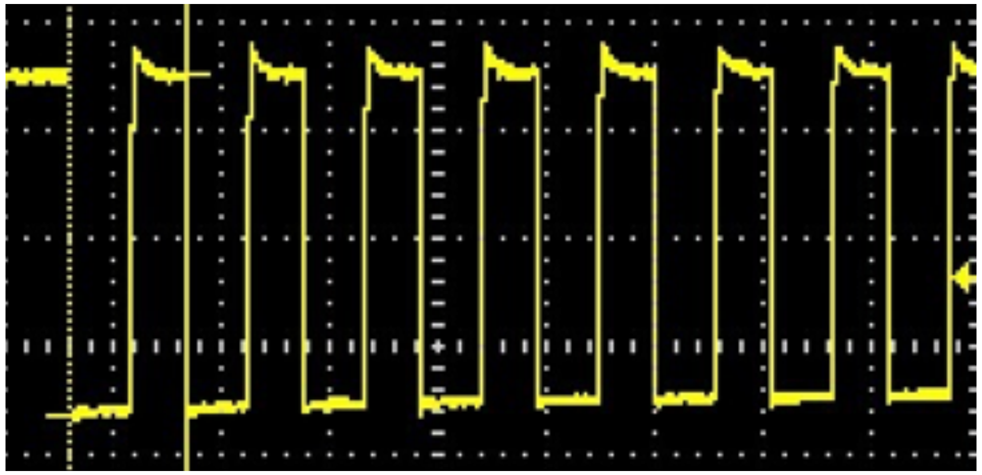
Remote Control

Merging & Integration

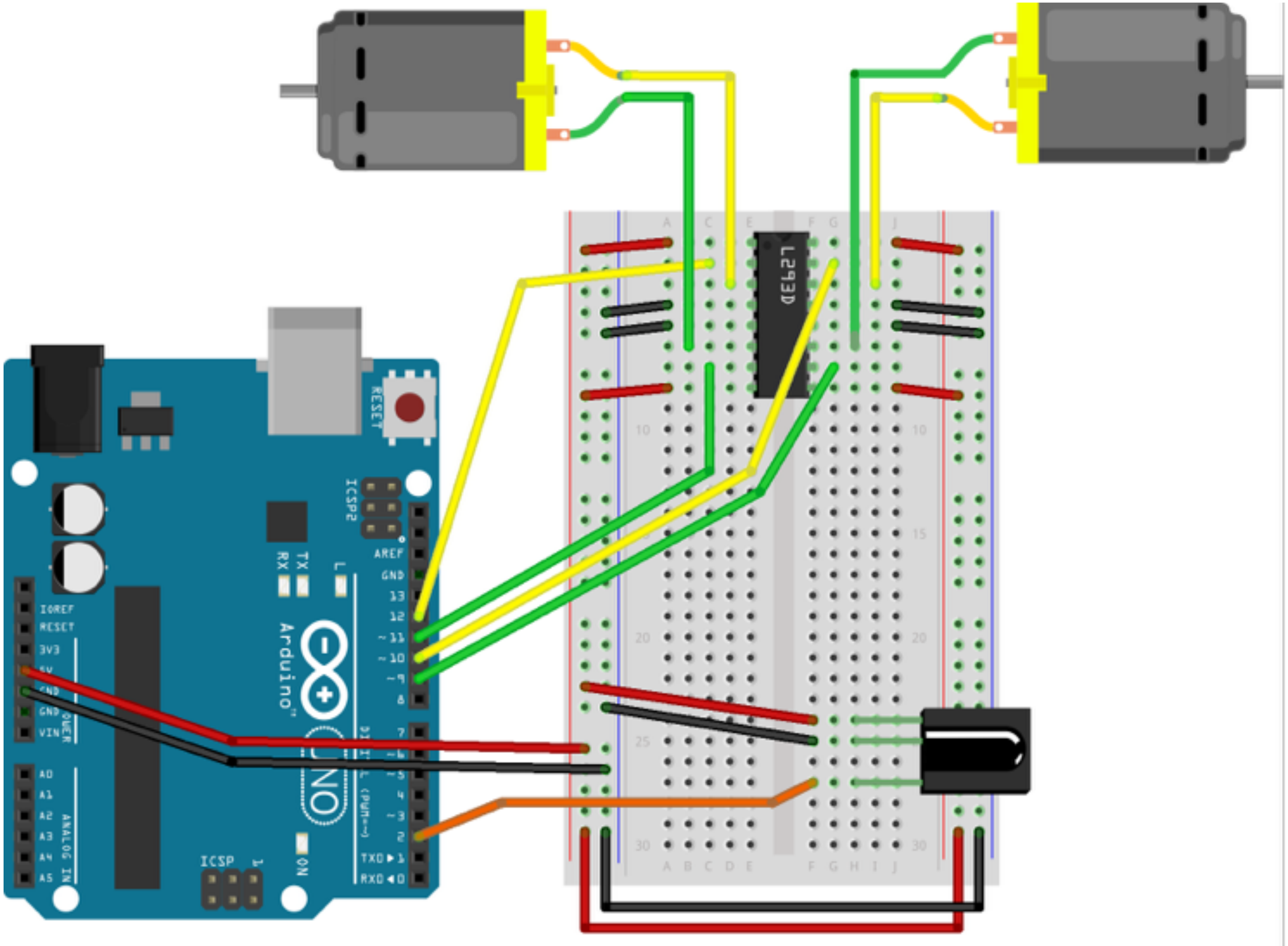
IR Theory







IR Receiver


L293D
RESET
ICSP2
AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX0 ▶ 1
RX0 ◀ 0
DIGITAL (PWM~)
TX
RX
L
Arduino
UNO
ON
ICSP
IOREF
RESET
3V3
5V
GND
GND
VIN
POWER
A0
A1
A2
A3
A4
A5
ANALOG IN
A B C D E F G H I J
10
15
20
25
30

IR Receiver Library

- We’ll need to use the IRremote library to use this IR Receiver.
- Visit Sketch > Include Library > Manage Libraries…
- Filter search for IRremote
- Click the Install button

IR Programming

```
/*
  IR Receiver Print
  Reads values from the IR receiver and print them over Serial.
 */

#include <IRremote.h>

int remoteInputPin = 2;
IRrecv receiver(remoteInputPin);

decode_results results;

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

void loop() {
  if (receiver.decode(&results)) {
    Serial.println(results.value, HEX);

    if (results.value == 0xABCD) {
      Serial.println("FORWARD");
    } else if (results.value == 0x0000) {
      Serial.println("HALT");
    }

    receiver.resume();
  }
}
```

Arduino & Code

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Remote Control

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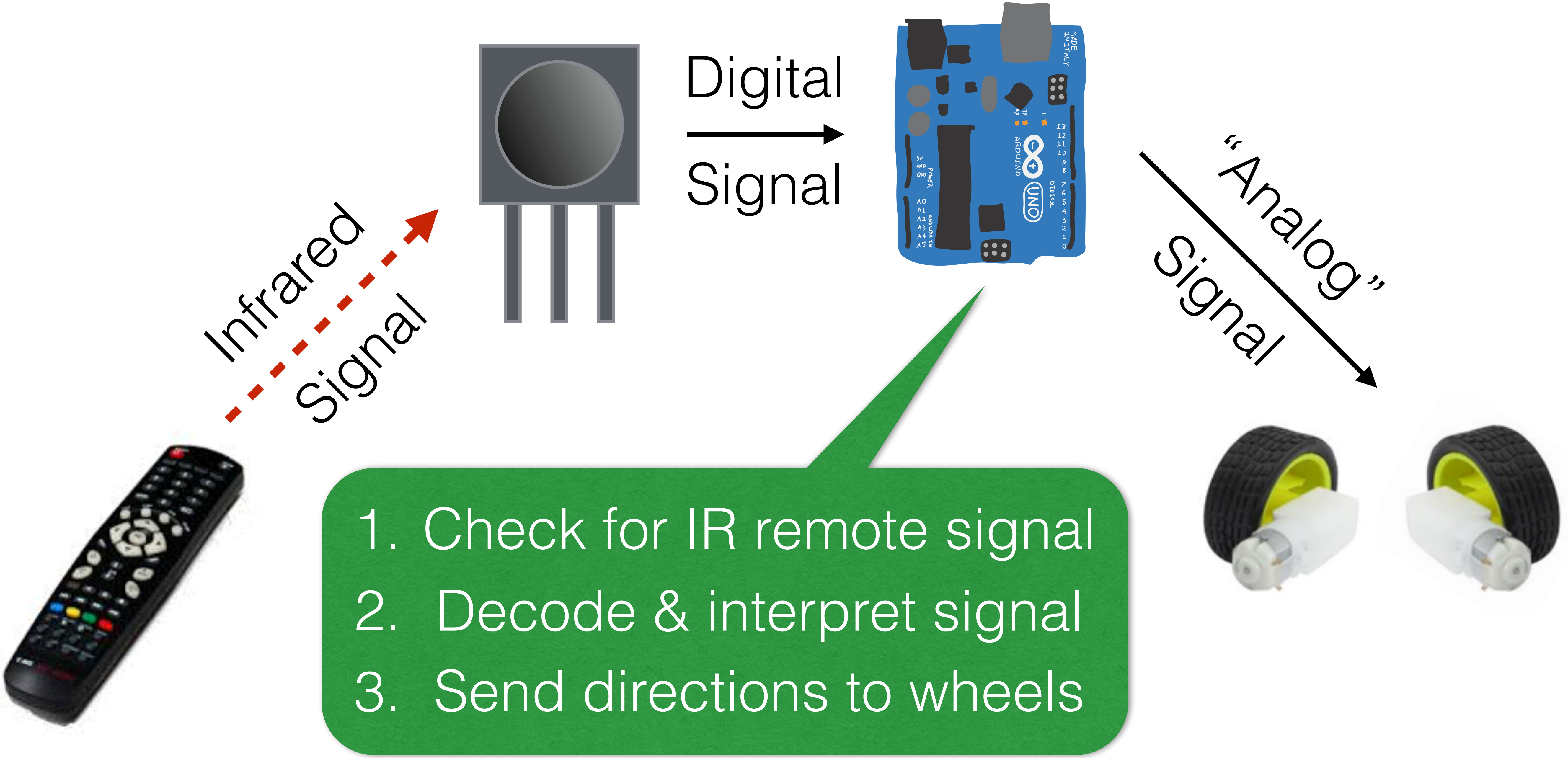
System Integration



Infrared Signal

Digital Signal

"Analog" Signal

1. Check for IR remote signal
2. Decode & interpret signal
3. Send directions to wheels

Merging Sketches

1. Use the remote-testing code as the **base** sketch; copy the **motor** sketch into this one.

2. Copy the **motor code** that's **outside of the setup and loop functions** into the **base** sketch: **keep it outside** the setup and loop functions.

3. Copy the **motor code** that's **inside the setup function** into the **base** sketch: **keep it inside** the setup function.

4. Update the **base** sketch; where you currently have Serial.println("FORWARD"), etc., add a call to the forward function: *forward();*