Creating a game with Arduino!

Basics of Arduino

Introduction

- I’m Eric !

Outline of Workshop

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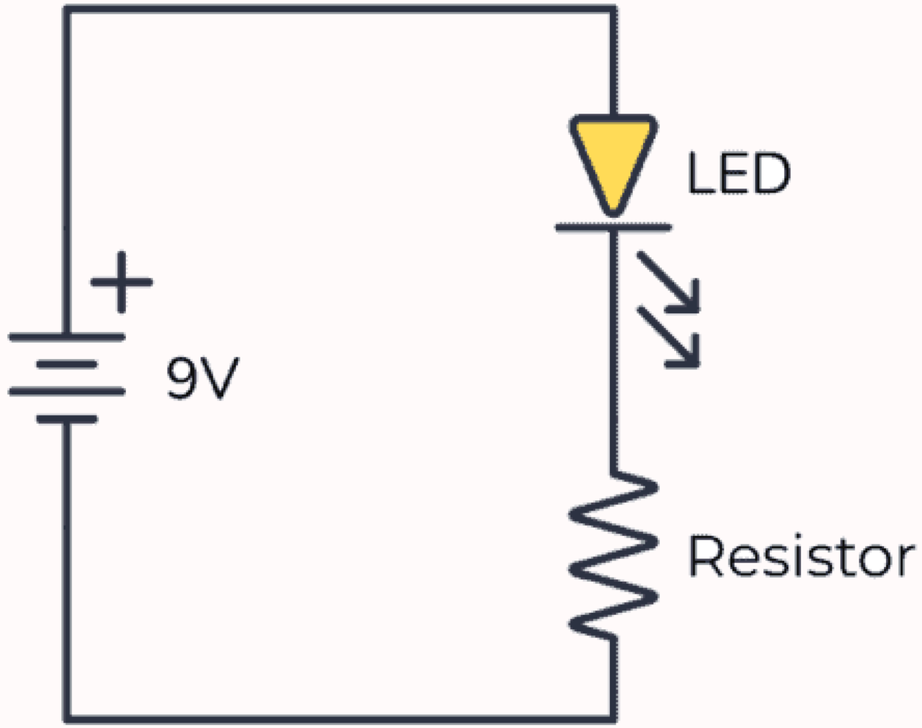
- Basic circuits and electrical wiring
- Integration of Arduino UNO
- Arduino Programming
- Wiring Basic Arduino Circuit
- LCD I2C Interface
- Programming the Game
- Wiring the Game Circuit

Electricity

- Ohm's Law: $V = IR \implies I = \frac{V}{R}$
- Tells us increased resistance = reduced current
- Too much current = some components overheat
  - LEDs, Arduino, etc.



LEDs

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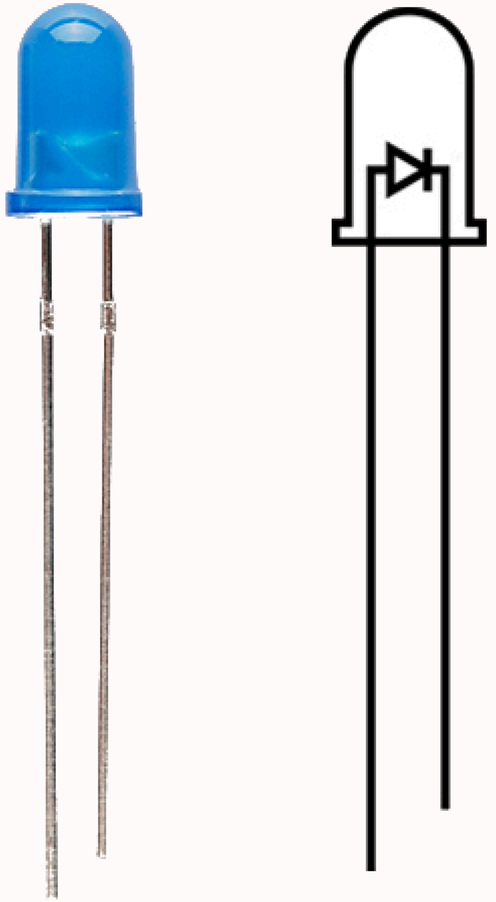
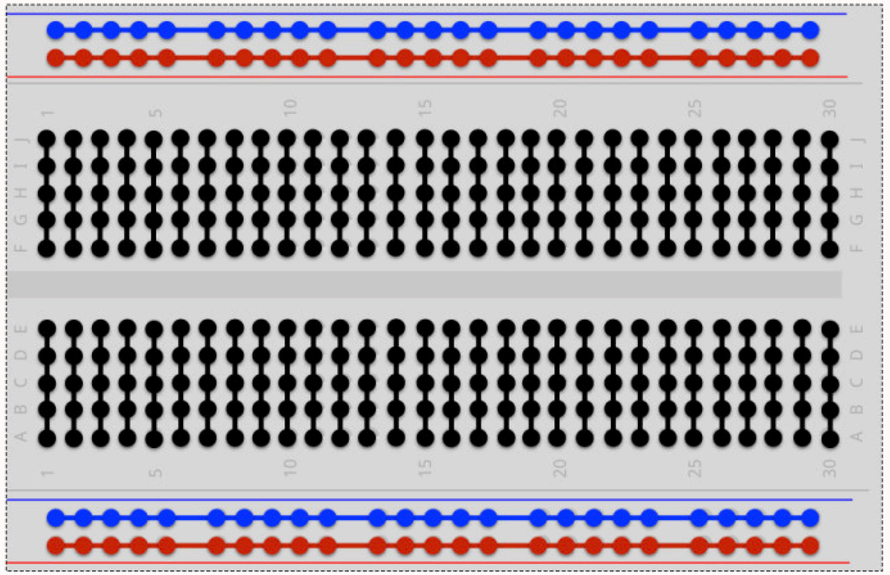
- Light-emitting diode
- Diode lets current go though one direction
- LED = *“thing that lights up when current goes through in a certain direction”*



Circuits and Wiring

- Circuit on breadboard, with wires and other components
  - LEDs, Buttons, LCDs, Arduino, resistor, etc.
- Breadboards make wiring easy to change
  - Great for learning & projects



Arduino

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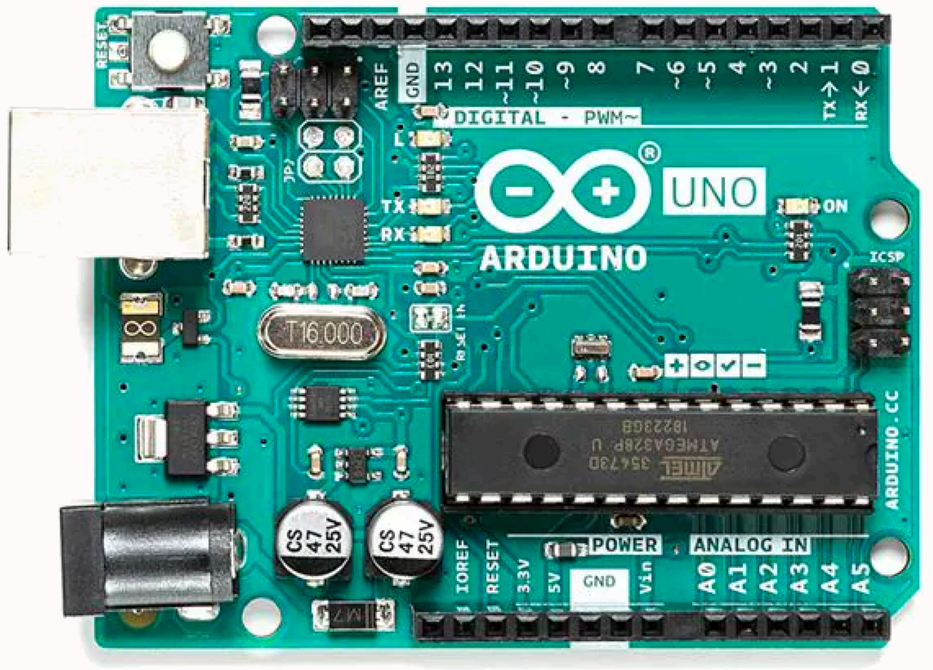
- Has pins for output and input
- Has ground and V5 / V3.3 (constant)
- Computer connects to upload code
- Arduino runs with any power source



Arduino Code

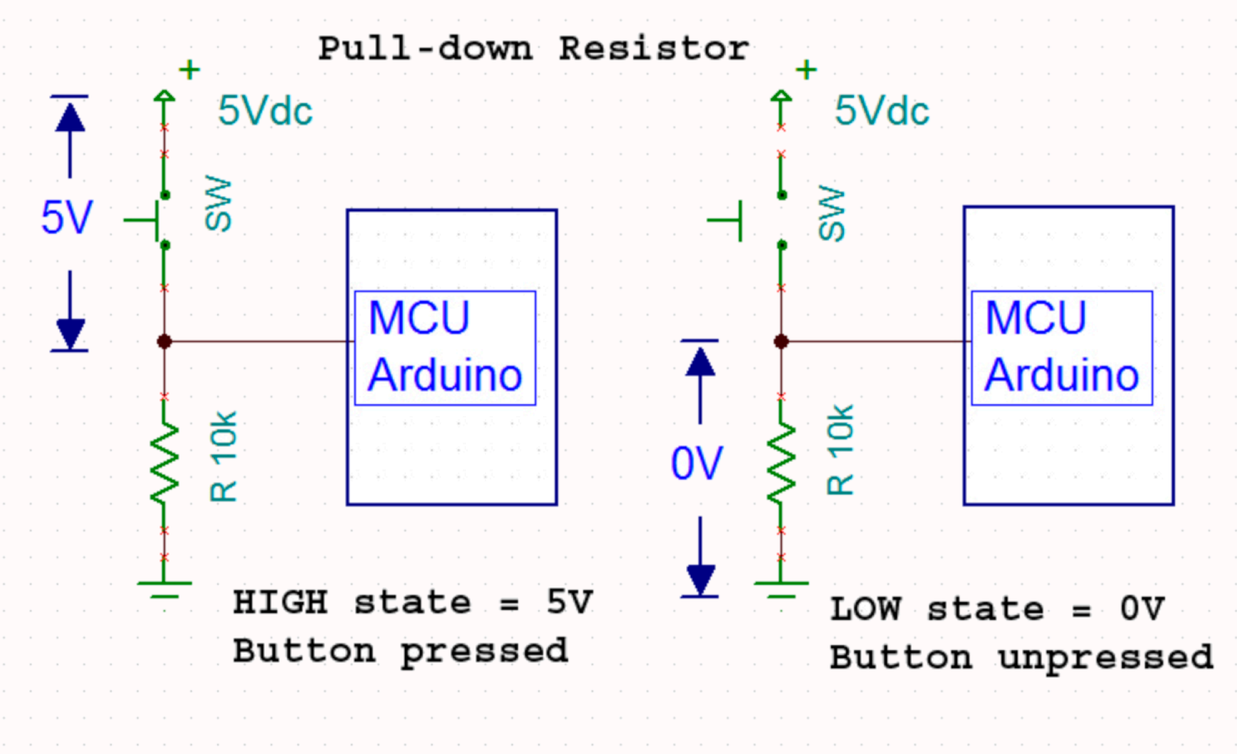
- Uses Arduino language (C++ with special built-in functions)
  - *digitalWrite*(…), *delay*(…), *analogRead*(…), etc.
- Runs **setup**, then **loop** function

Code that turns LED on and off

```
const int LED_PIN = 6; // digital 6 pin

void setup() {
  pinMode(LED_PIN, OUTPUT); // set pin to output
}

void loop() {
  digitalWrite(LED_PIN, HIGH); // turn on
  delay(1000); // in milliseconds

  digitalWrite(LED_PIN, LOW); // turn off
  delay(1000); // in milliseconds
}
```

Buttons

- Controls when wires are connected
- “Pull-Down Resistors” are necessary in Arduino
  - Get rid of excess charge (sends it to ground)



Code with Button Logic

```
const int BUTTON_PIN = 10; // digital 10 pin
const int LED_PIN = 6;

void setup() {
  pinMode(LED_PIN, OUTPUT);
  pinMode(BUTTON_PIN, INPUT); // set pin to input
}

void loop() {
   //checks if there is high or low input to the pin
  if (digitalRead(BUTTON_PIN) == HIGH) {
     // flash light once
    digitalWrite(LED_PIN, HIGH);
    delay(100);
    digitalWrite(LED_PIN, LOW);
    delay(100);
  }
}
```

LCD I2C Protocol

- Uses two signals
  - SDA used to transmit data
  - SCL used to synchronize data
- Two other pins are…
  - VCC, just constant voltage
  - GND, just zero voltage