

# Introduction to the Arduino



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# Today we will cover:

- An Overview of Microcontrollers
- Geography of your Arduino
- What makes an Arduino an Arduino
- Basics of what the Arduino can do
- Practice using an Arduino
- Writing code for the Arduino

# First ...

Drivers and IDE

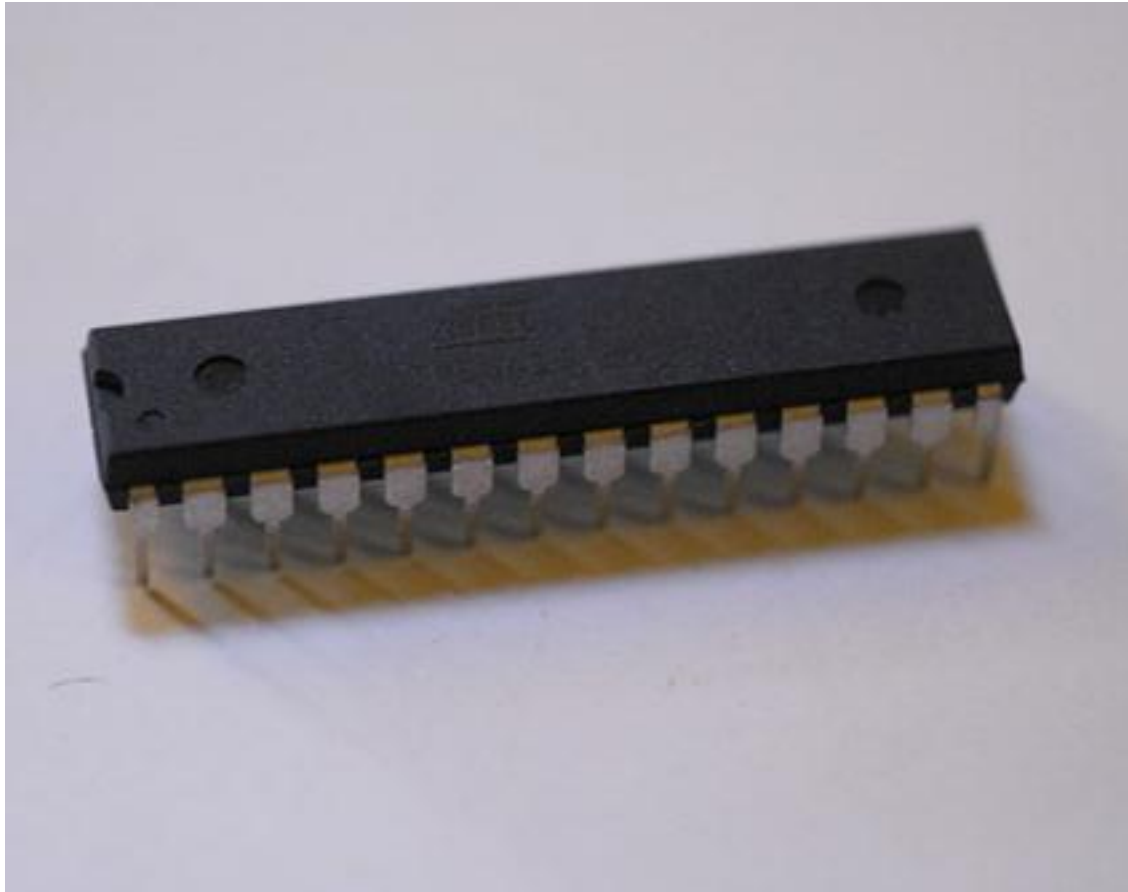
from

[http://\*\*arduino.cc\*\*](http://arduino.cc)

## Secret Installation Tips

- Mac needs X11 to work
- Windows
  - Often need to update USB drivers
  - May need to update Java
  - Try installing with Administrator Privileges

# What is a microcontroller?



- Miniature computer
  - Processor
  - Long term memory (program)
  - Short term memory (calculations)
- Input and Output
  - Digital
  - Analog

# Microcontroller uses

- Art projects
- Robots and Automation
- Prototyping
- Human interface devices such as remote controls
- Office machines and appliances
- Car engine control systems
- Toys
- and more!

# Arduino: microcontroller and more



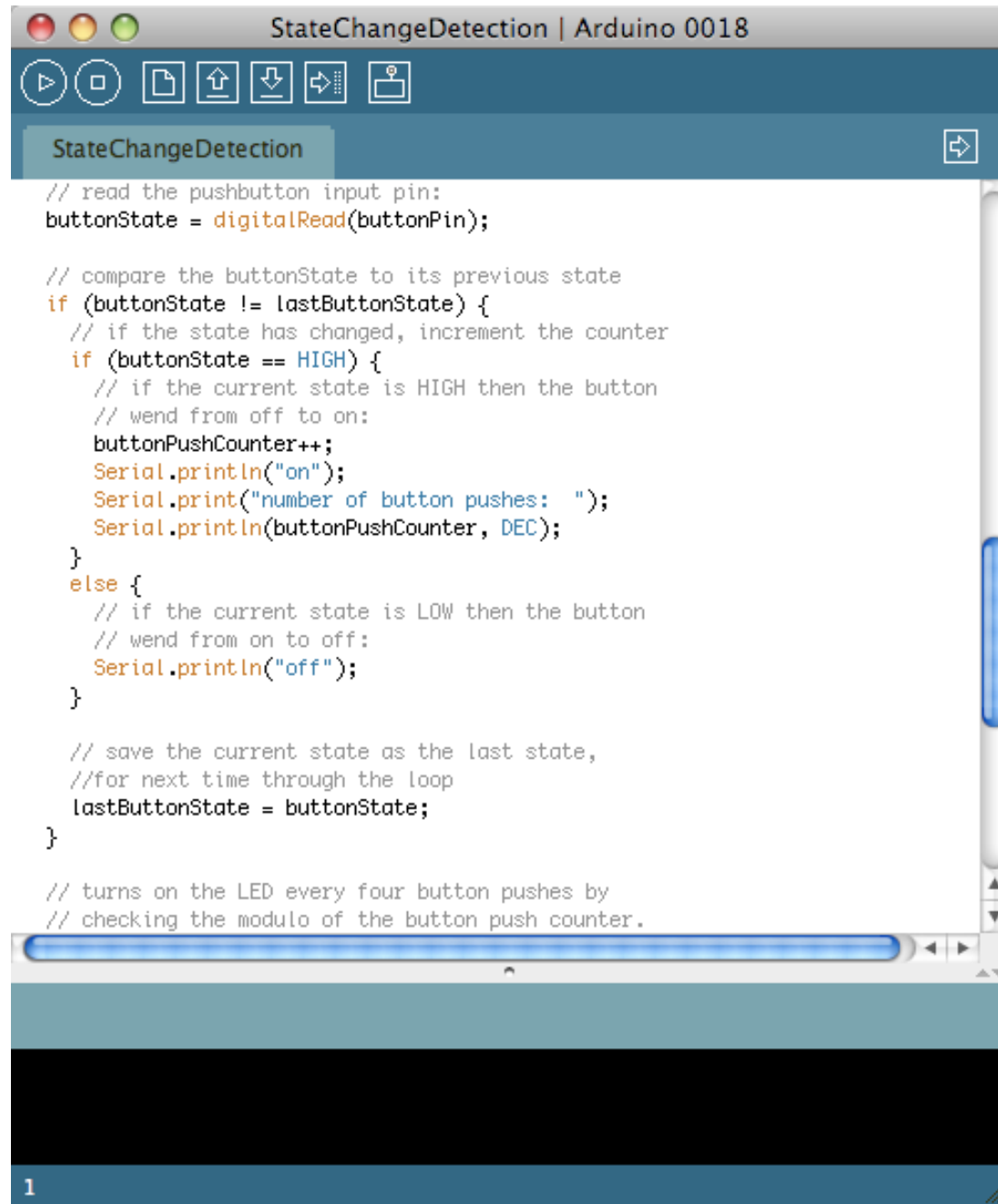
# Your Arduino

- Runs at 16 MHz
- 32 KB Flash memory (30 KB for program)
- 2 KB RAM (calculations)
- 3 counters
- 14 Digital I/O pins
- 6 Analog input pins (10-bit)





# A brand new IDE



```
// read the pushbutton input pin:
buttonState = digitalRead(buttonPin);

// compare the buttonState to its previous state
if (buttonState != lastButtonState) {
  // if the state has changed, increment the counter
  if (buttonState == HIGH) {
    // if the current state is HIGH then the button
    // went from off to on:
    buttonPushCounter++;
    Serial.println("on");
    Serial.print("number of button pushes: ");
    Serial.println(buttonPushCounter, DEC);
  }
  else {
    // if the current state is LOW then the button
    // went from on to off:
    Serial.println("off");
  }

  // save the current state as the last state,
  //for next time through the loop
  lastButtonState = buttonState;
}

// turns on the LED every four button pushes by
// checking the modulo of the button push counter.
```

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**GO TO [Arduino.cc](http://Arduino.cc)**

# Talking to the Arduino

```
void setup() {  
  Serial.begin(9600);  
}  
  
void loop() {  
  Serial.println("success!");  
}
```

# Digital Output



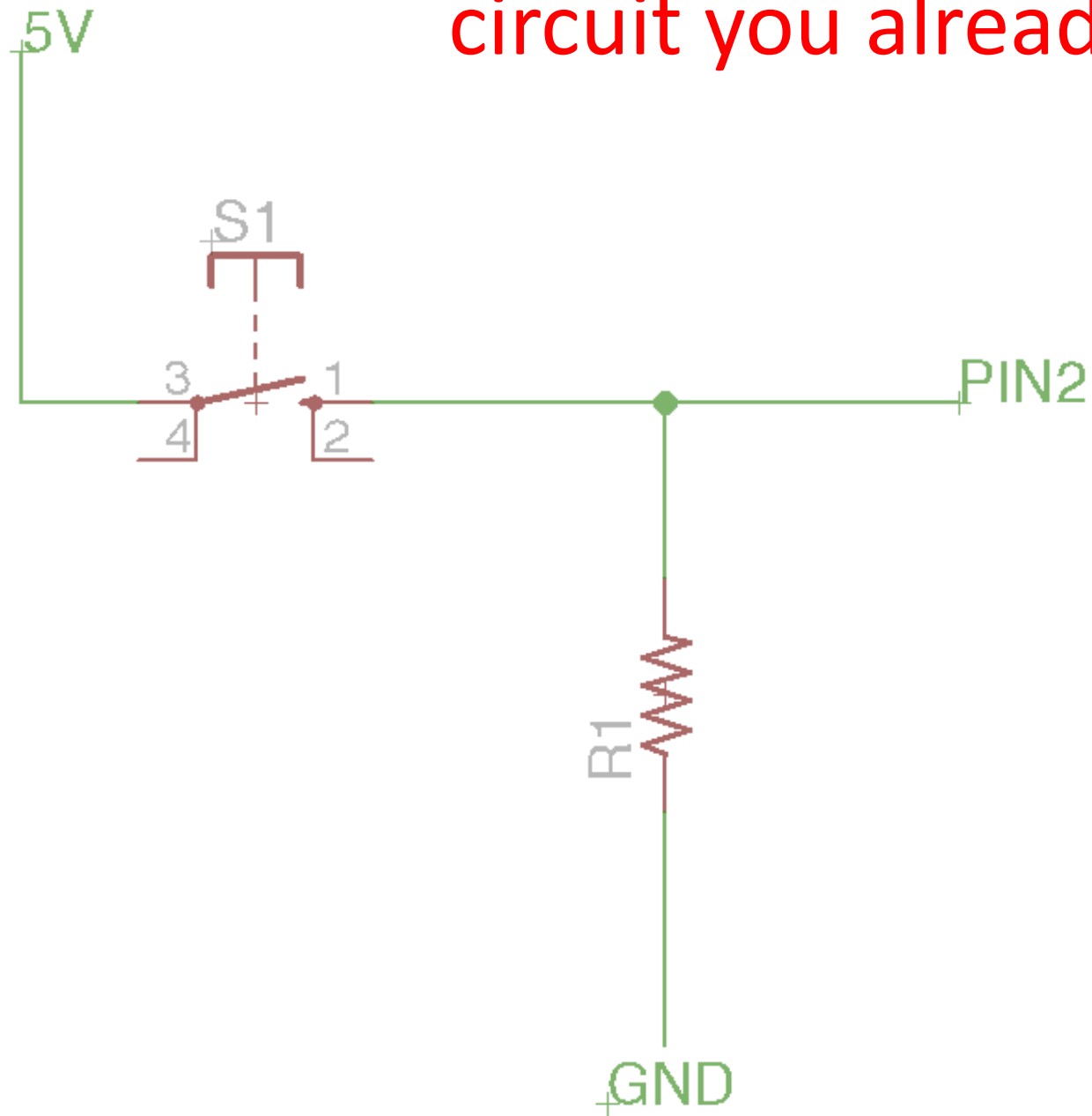
# Digital Output

```
void setup() {  
  pinMode(3, OUTPUT);  
}
```

```
void loop() {  
  digitalWrite(3, HIGH);  
  delay(500);  
  digitalWrite(3, LOW);  
  delay(500);  
}
```

# Digital Input

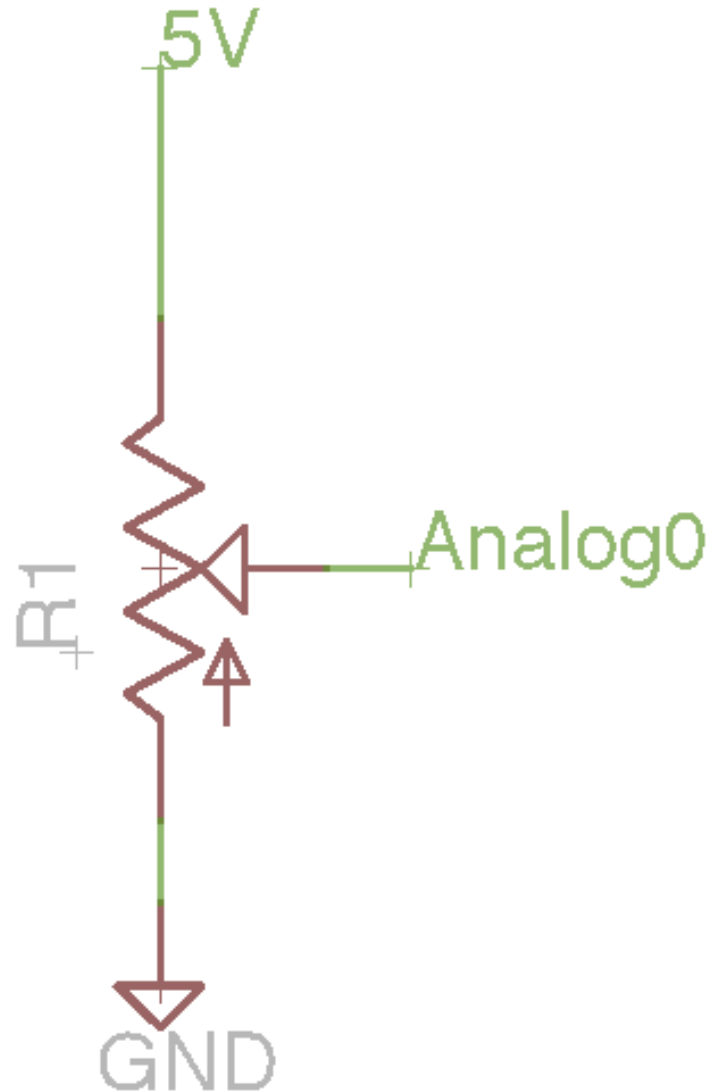
ADDING ON to the circuit you already have



# Digital Input

```
void setup() {  
  pinMode(3, OUTPUT);  
  pinMode(2, INPUT);  
}  
  
void loop() {  
  if (digitalRead(2) == HIGH)  
  {  
    digitalWrite(3, HIGH);  
  } else  
  {  
    digitalWrite(3, LOW);  
  }  
}
```

# Reading analog values with Serial





# Reading analog values with Serial

```
void setup() {  
  //no setup required for analog inputs  
  //need to set up Serial  
  Serial.begin(9600);  
}  
  
void loop() {  
  Serial.println(analogRead(0));  
  delay(30);  
}
```

# Higher level stuff to touch on

- Options for powering
  - USB vs. DC adapter
  - Vin pin vs. 5V pin
- Pulse Width Modulation (the way to control intensity on the digital pins)
  - Controls LED brightness or color of RGB LEDs

# Other workshops to consider

- Arduino Programming
  - programming basics like functions, loops, and conditionals
- Arduino Shields
  - mount peripheral electronics onto permanent daughterboards