IEEE Project Competition

Week 8: Intro to Sensors Workshop

IEEE UCF

UCF | College of Engineering and Computer Science

Updates

- BOM’s due Nov 30th!!! Get to it!
- Intro to sensors workshop. What is tinkercad -> Downloading -> I2C -> LED Button -> Servo Potentiometer -> MISC Items.
- Final time for assistance, may host virtual office hours next Monday 7-8.

Attendance

IEEE UCF

UCF | College of Engineering and Computer Science

How it Works

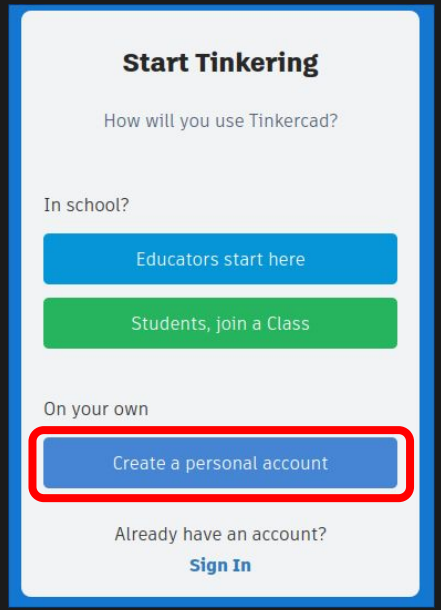
- Use the Arduino IDE or Tinkercad to write code (called a “sketch”) in C++.
  - Example: A sketch might turn an LED on for 1 second, then off for 1 second (Blink code).
- Connect Arduino to your computer via USB, or in Tinkercad, upload virtually.
- The code is uploaded to the Arduino’s microcontroller
- The Arduino microcontroller continuously runs the uploaded code in a loop.
- Inputs are read and processed; outputs are controlled accordingly.
- Key Components
  - Digital Pins: Send HIGH (on) or LOW (off) signals to control LEDs, motors, etc.
  - Analog Pins: Read variable inputs, like sensor data (e.g., light intensity).
  - Power Supply: Arduino can be powered by USB or external sources.

TinkerCad

Tinkercad is a free, web-based platform for designing 3D objects and simulating electronics, including Arduino circuits.

Code and run Arduino projects virtually without needing physical hardware.

Create a free TinkerCad account:
https://www.tinkercad.com/join

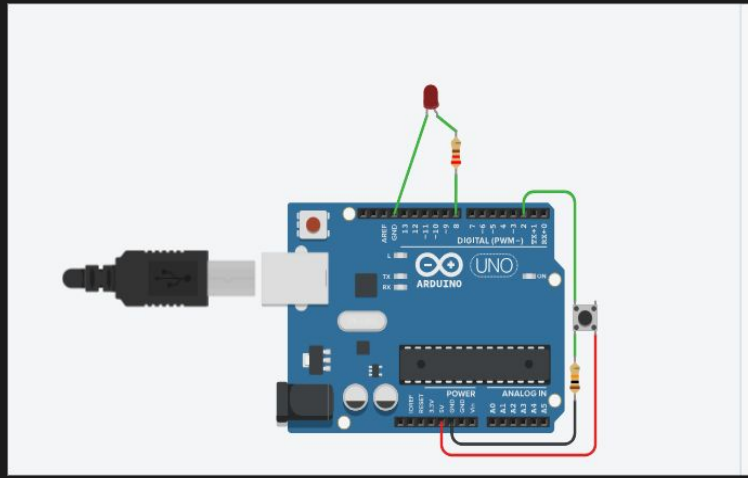


Or you can create an autodesk education account using this link to get access to other autodesk products!

https://www.autodesk.com/education/edu-software/overview?sorting=featured&filters=individual#

LED/Button

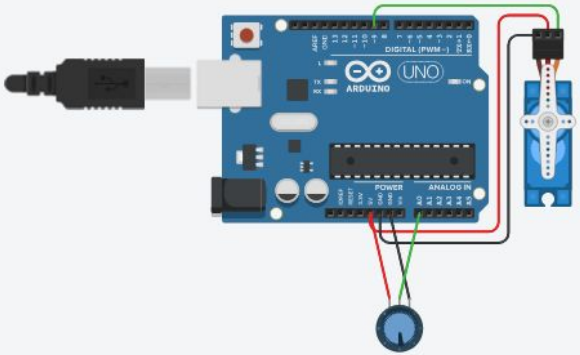
- More Parts:
  - 220 Ω resistor for LED
  - 10k Ω resistor for button
  - Button
- Function:
  - Turns on an LED whenever a button is pressed




```
1
2  int buttonState = 0;
3
4  void setup() {
5    pinMode(2, INPUT);
6    pinMode(8, OUTPUT);
7  }
8
9  void loop() {
10   // read the state of the pushbutton value
11   buttonState = digitalRead(2);
12   // check if pushbutton is pressed.  if it is, the
13   // buttonState is HIGH
14   if (buttonState == HIGH) {
15     // turn LED on
16     digitalWrite(8, HIGH);
17   } else {
18     // turn LED off
19     digitalWrite(8, LOW);
20   }
21   delay(10);
22 }
```

Servo w/ Potentiometer

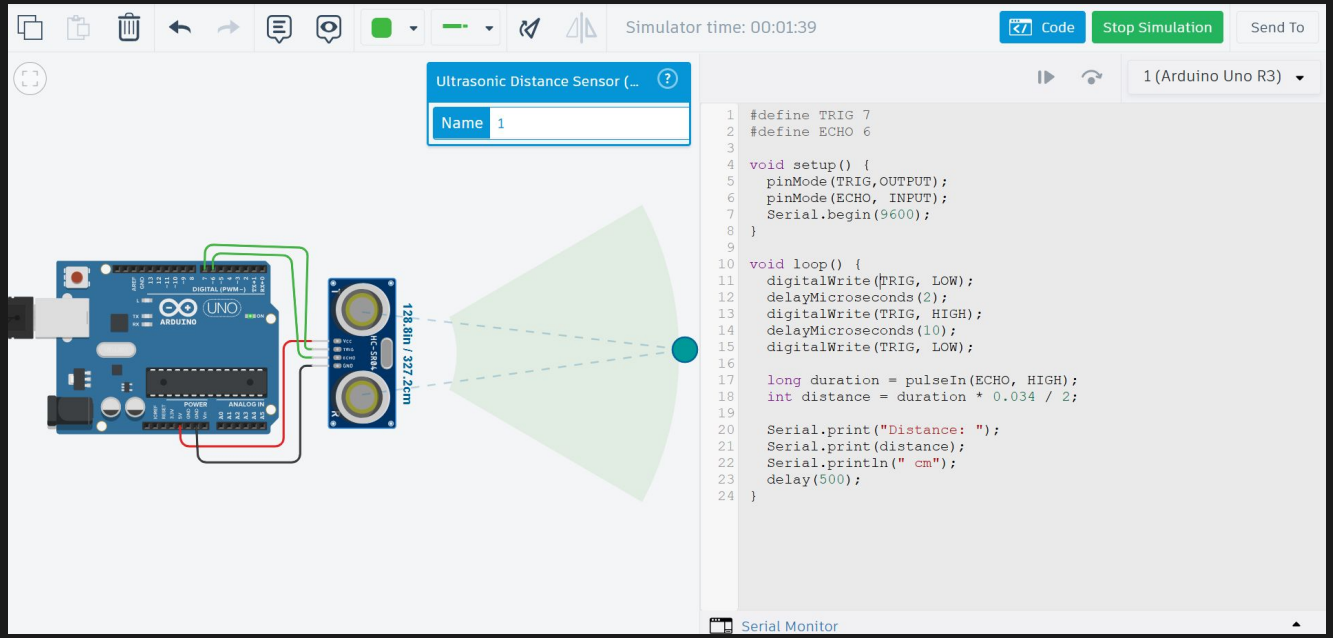
- Parts:
  - Arduino Uno R3
  - Servo
  - Potentiometer
- Function:
  - Control a servo's position by using a potentiometer




```
#include <Servo.h>

int sensorValue = 0;

int pos = 0;

Servo servo_9;

void setup() {

  pinMode(A0, INPUT);
  servo_9.attach(9, 500, 2500);
  Serial.begin(9600);
}

void loop() {

  // read the input on analog pin 0
  sensorValue = analogRead(A0);
  // print out the value you read
  Serial.println(sensorValue);
  // change scale from analog input to degrees
  pos = map(sensorValue, 0, 1023, 0, 180);
  // write new position to servo
  servo_9.write(pos);

  delay(10);
}
```

Measuring Distance with an Ultrasonic Sensor

- Parts:
  - Arduino Uno R3
  - Ultrasonic Sensor
- Function:
  - Measure the distance of an object.



I2C

I2C (Inter-Integrated Circuit) is like a simple communication system for electronics. It uses only two wires:

1. SDA (Data Line): Carries the actual data between devices.
2. SCL (Clock Line): Keeps everything synchronized.

There’s always one "master" device that controls the communication and one or more "slave" devices that respond. Each device has a unique address, so the master knows who it’s talking to. It’s efficient because multiple devices can share the same two wires, making it great for connecting sensors, displays, and other components.

Timeline and Important Dates

Weekly Meetings - Estimated Timeline

~~Week 1~~	~~Week 2~~	~~Week 3~~	~~Week 4~~	~~Week 5~~	~~Week 6~~	~~Week 7~~	~~Week 8~~	~~Week 9~~	Week 10
~~Introduction~~	~~Microcontrollers – Erik~~	~~Fusion 360/Solidworks – Matias~~	~~KiCAD - Tino~~	~~General Project Management Skills/ Github/ BOM's~~	~~Technical Assistance Focused~~	~~Git and GitHub Workshop~~	~~Technical Assistance Focused (Veterans Day)~~	~~Intro to Sensors~~	Winter Break (BOMs due 30th Nov)

Questions?

Updates

- NOV 30th!
- Virtual assistance 7-8PM Monday discord!