Part A	
Class B Tech CSE 4th Year	**Sub: Internet of Things Lab**
Aim: Controlling LED and Buzzer using analog and digital read-write and Potentiometer	
Prerequisite: Basic programming in Arduino IDE and basic electronics	
Outcome: Connections of LEDs and buzzers and controlling active and passive buzzers using variable voltage by potentiometer	
Theory: 1. LED control using Ultrasonic sensor **2. Analog and digital sound using active and passive Buzzers** **3. Controlling active and passive buzzers using variable voltage by Potentiometer**	

Part B (Write for individual)

Steps:

For 2: Analog and digital sound using active and passive Buzzers

1. Open TinkerCad and login using your credentials
2. Create a new circuit
3. Select Arduino,Piezo (Buzzer),Red LED Pin, Resistor and breadboard from the search bar
4. Insert Piezo (Buzzer), Resistor and LED Pin in breadboard.
5. Connect negative terminal of LED pin to ground on Arduino, positive terminal with resistor in breadboard
6. Connect other end of resistor to digital Pin 7.
7. Now ground negative terminal of buzzer(piezo) into Arduino, and positive terminal to Digital pin 2.
8. Open code block, select Text ,program the circuit and stimulate.

For 1: LED control using Ultrasonic sensor

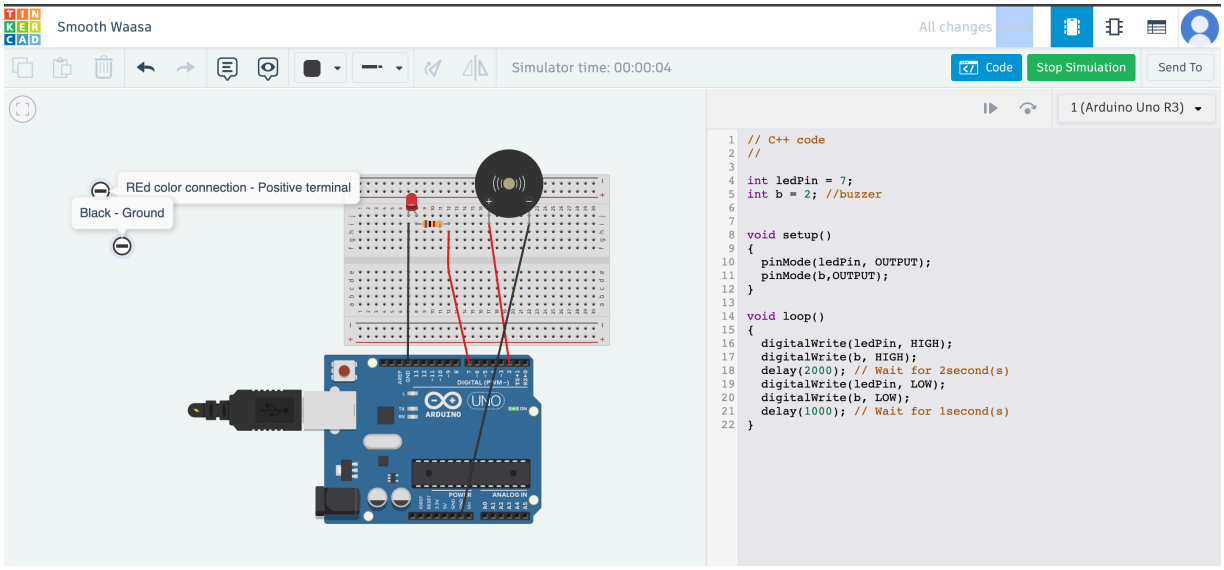
1. Copy the above TinkerCad Circuit file.
2. Select a Ultrasomic sensor, it has 4 pins (Trigpin, Echopin, Vcc, GND)
3. Connect it's GND pin to GND pin on Arduino.
4. Connect it's Trigpin and Echopin on Ardduino's digital pin 3,2 respectively.
5. Connect Vcc(Power source) to Arduino's 5V Power Pin.
6. Now Open the code change the program to use ultrasonic sensor and add for loop to turn on LED pin and Buzzer(Piezo) if distance>1meter.
7. Stimulate the code and observe the serial monitor.

For 3: Controlling active and passive buzzers using variable voltage by Potentiometer

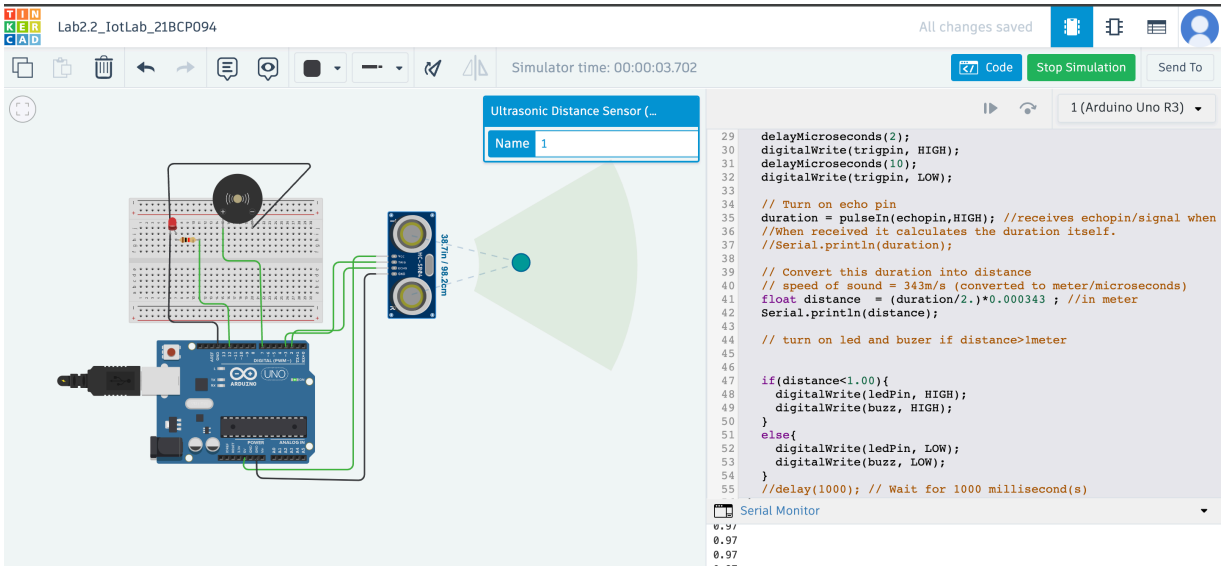
1. Copy the first TinkerCad Circuit file.
2. Select Another Green LED Pin and Potentiometer,it has 3 pins(Middle: GND, Terminals: Positive,Negative) and set the resistance to 100 ohms.
3. Insert LED Pin and Potentiometer breadboard, connect anyone of it's terminal to 5V Power pin and other to GND Pin on Arduino. Connect it's Middle Pin to Analog pin A1
4. Connect Green LED pin's Negative to Red LED pin's Negative, Positive to resistor and Arduino Digital pin 10.
5. Open the code, update it to blink Red LED if Resistance greater than 50 ohms. Otherwise blink Green LED. Now stimulate and observe Serial Monitor.

Output:

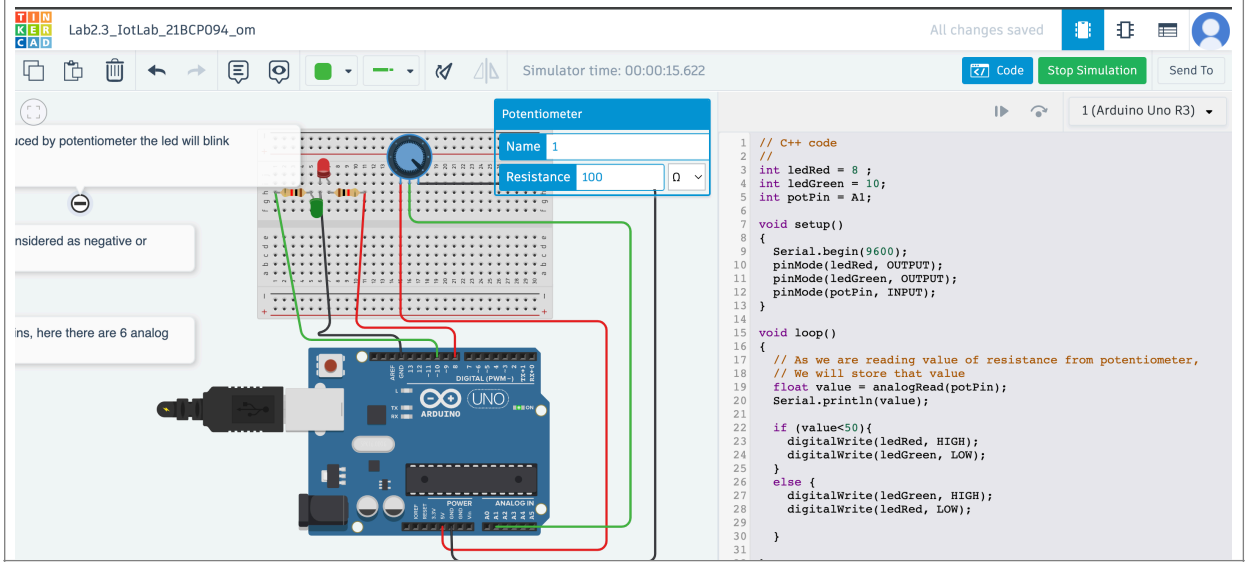
For 2:



For 1:



For 3:



Observation & Learning:

For 2: Analog and digital sound using active and passive Buzzers

We can observe LED Pin blink, Buzzer buzz together for 2 second and then turned off for 2 seconds.

For 1: LED control using Ultrasonic sensor

We can observe LED Pin blink, Buzzer buzz together If distance lesser than 1m and then turned off if distance greater than 1m also the distance is being displayed on Serial Monitor. This happens as Ultrasonic bombards ultrasonic sound waves through trig pin, which acts as Input device and it get's collected by receiver-echo pin acting as Output device. Which helps to calculate the distance as they know the time it took from transmitter to receiver and speed of sound.

For 3: Controlling active and passive buzzers using variable voltage by Potentiometer

We can observe the green pin Turning on as we lower the resistance below 50 and red pin Turning on and green turning off as we increase resistance above 50. Also the value of the resistance is being displayed on Serial Monitor

Conclusion:

Through the observations and experiments conducted with buzzers, ultrasonic sensors, and potentiometers, several key insights into the functioning and control of electronic components were gained:

1. Analog and Digital Sound Control with Buzzers:By synchronizing an LED and buzzer to operate together for set intervals, we learned how to effectively integrate visual and auditory signals. This demonstrated the straightforward yet effective method of using buzzers to indicate events through sound.

2. LED Control Using Ultrasonic Sensors:The use of an ultrasonic sensor to measure distance and control an LED and buzzer provided valuable insights into real-time feedback systems. The capability to accurately measure distance using the time-of-flight of sound waves highlighted the practical application of ultrasonic sensors in distance measurement and obstacle detection.

3. Variable Voltage Control with Potentiometers: The experiment with potentiometers illustrated the principle of varying resistance to control output. Observing the change in LED activation based on resistance values reinforced the concept of using variable resistors for fine control in electronic circuits. The ability to display real-time resistance values on a serial monitor further emphasized the utility of potentiometers in monitoring and adjusting electronic parameters.

Overall, these experiments provided us hands-on experience with essential electronic components and their applications, enhancing our understanding of basic electronics and the interaction between different devices.