

### Aim

To familiarize with basic operations on Arduino microcontroller chip

### Introduction

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, or a finger on a button - and turn it into an output - activating a motor, or turning on an LED. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so, you use the Arduino programming language (based on Wiring, also an open-source programming framework for microcontrollers), and the Arduino Software (IDE).

To use Arduino, see the getting started guide [1]. If you are looking for inspiration you can find a great variety of Tutorials on Arduino Project Hub [2]. The text of the Arduino getting started guide is licensed under a Creative Commons Attribution-ShareAlike 3.0 License. Code samples in the guide are released into the public domain. Visit <https://www.arduino.cc/en/Tutorial/Foundations> to learn the basics function of Arduino.

Be careful about always connecting a resistor with a diode. Also ensure that the current through any pin never exceeds 20 mA, else it may result in permanently damaging that pin of the Arduino board.

For online lab sessions, these circuits would be simulated using [Tinkercad](http://www.tinkercad.com) ([www.tinkercad.com](http://www.tinkercad.com)).

**Complete the EdPuzzle Assignment on [Introduction to Arduino](#). Do not proceed with this experiment if you have not completed that video assignment.**

Step 1: Join the Tinkercad Class using your IITJ Google Account through the link provided by your lab instructor.

Step 2: Go to <https://www.tinkercad.com/dashboard?type=circuits&collection=designs>

Under Circuits – Create new Circuit – Rename the new blank circuit as per the title of the experiment.

Step 3: Wire the circuit as mentioned in the manual using the circuit elements from the Components tab.

Step 4: Click on the 'Code' button – From the dropdown menu, change code type from Blocks to Text.

Step 5: Write your program in the Editor.

Step 6: Click on 'Start Simulation'. (In order to edit code, stop the simulation, edit the code and then restart the simulation).

Watch a short demo of how to start using Tinkercad here ([https://youtu.be/ B4cdPfRvZI](https://youtu.be/B4cdPfRvZI)).

Your project on Tinkercad Classroom would be evaluated (after submission deadline). On Google Classroom, please submit a single zipped folder containing all your Arduino codes instead PDF lab report. Video report should be submitted as before.

### Experiments

#### 1. [Blinking of two LEDs alternately](#) (Figure 1)

Write a program and simulate the circuit to blink two LEDs alternately after (i) every 0.5 seconds (ii) 2 seconds.

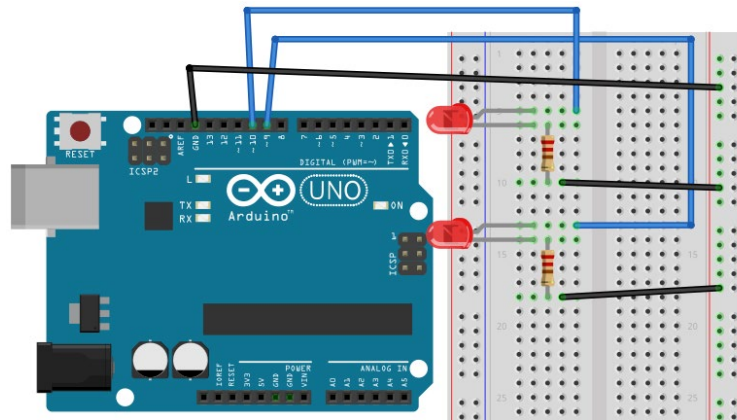


Figure 1

2. **Fading of brightness of LEDs** (<https://www.arduino.cc/en/Tutorial/Fade>) (Figure 2)

Write a program and simulate the circuit such that the brightness of an LED increases in five steps from minimum to maximum and then decreases in five steps from maximum to minimum.

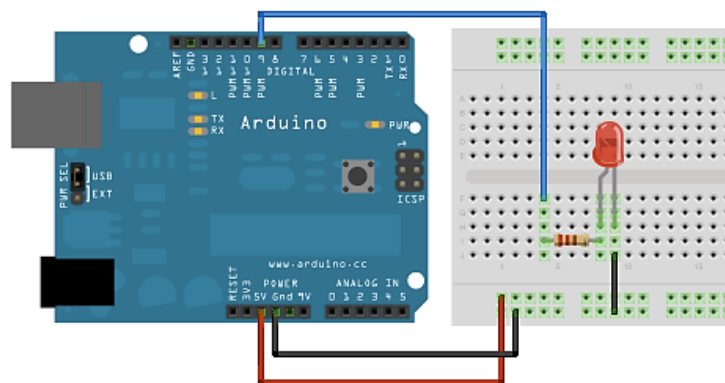


Figure 2

3. **Plotting potentiometer output on Serial Plotter** (<https://www.arduino.cc/en/Tutorial/AnalogReadSerial>) (Figure 3)

Write a program and simulate the circuit such that the analog voltage controlled by a potentiometer is displayed on the Serial Plotter.

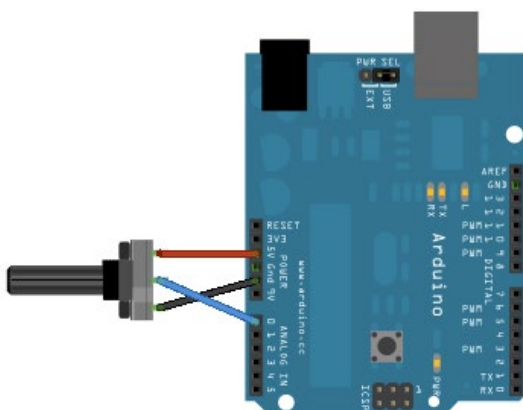


Figure 3

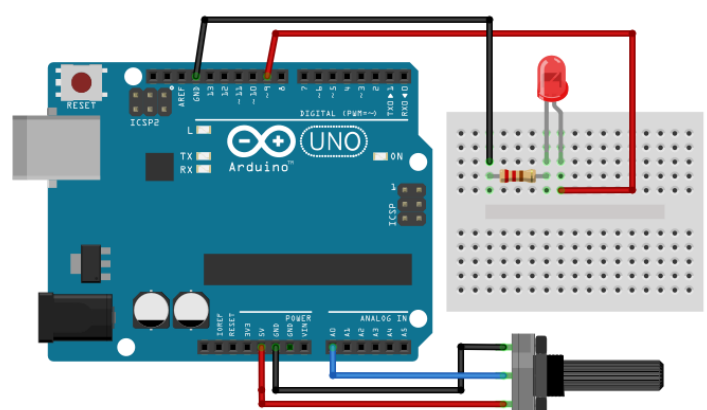


Figure 4

4. **Controlling LED brightness using Potentiometer** (Figure 4)

Write a program and simulate the circuit where the brightness of an LED can be controlled using a potentiometer. Use a potentiometer with a resistance range of 0 – 1 k $\Omega$ .

5. **Changing brightness of LED using Pushbutton** (Figure 5)

Write a program and simulate the circuit to control the brightness of an LED using a pushbutton such that the brightness reaches from minimum to maximum in five pushes on the button. The intensity should again decrease to zero in the sixth push, and so on.

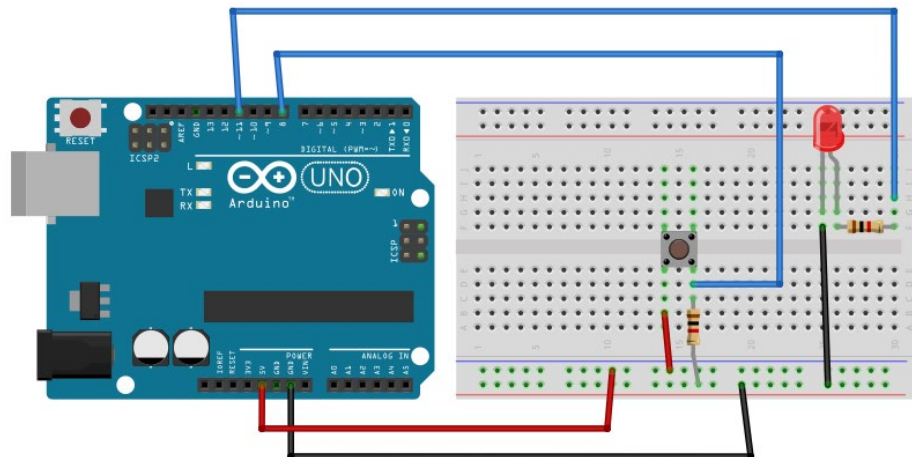


Figure 5

6. **Ultrasonic Distance Alarm** (for proximity detection) (Figure 6)

Write a program and simulate the circuit to devise a proximity alarm for a car using Ultrasonic Sensor (HC-SR04). The circuit should ring an alarm (piezo buzzer) out a tone of 330 Hz and glow an LED if the distance between the Ultrasonic Sensor and the object is less than 40 cm. The distance of the object at any instant (in cm) should also be displayed on the Serial Monitor.

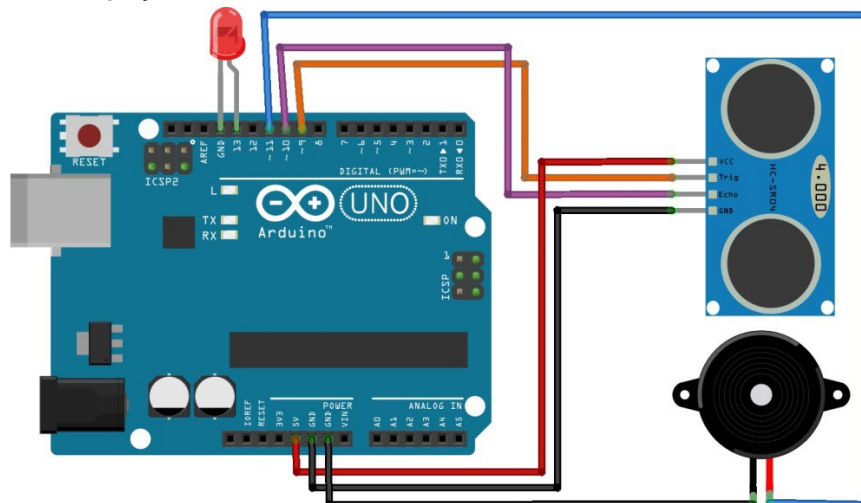


Figure 6

## References

1. Getting started with Arduino: <https://www.arduino.cc/en/Guide/HomePage>
2. Arduino Project Hub: <https://create.arduino.cc/projecthub>
3. You can learn Arduino in 15 minutes (<http://afrotechmods.com/tutorials/2017/03/17/you-can-learn-arudino-in-15-minutes/>)
4. Introduction to Tinkercad (<https://youtu.be/B4cdPfRvZI>)
5. Controlling LED Brightness using Arduino (<https://youtu.be/QasuGrrM3Zw>)