windsor mold group

EPIC MAKERS' BASE

LEARN HOW TO USE TINKERCAD

Design, program, and test electrical circuit virtually.

Abstract

This guide will help you to create electrical circuits, program it with Arduino and test it in real time.

TINKERCAD AUTODESK® TINKERCAD®

University of Windsor | EPICentre Entrepreneurship + Practice + Innovation

What is TinkerCAD and what is it used for?

Tinkercad is a free and easy-to-use application for 3D design, electronics, and coding.

From an idea to projects in minutes!

Autodesk's Tinkercad is one of the most popular classroom tools for creating simple designs from scratch and for quickly modifying existing designs. It is a free online 3D design program that you can use in your web browser without downloading any software. Tinkercad is extremely intuitive and easy to use and has built-in Lessons to help you learn the ropes, making it perfect for beginners both young and old.

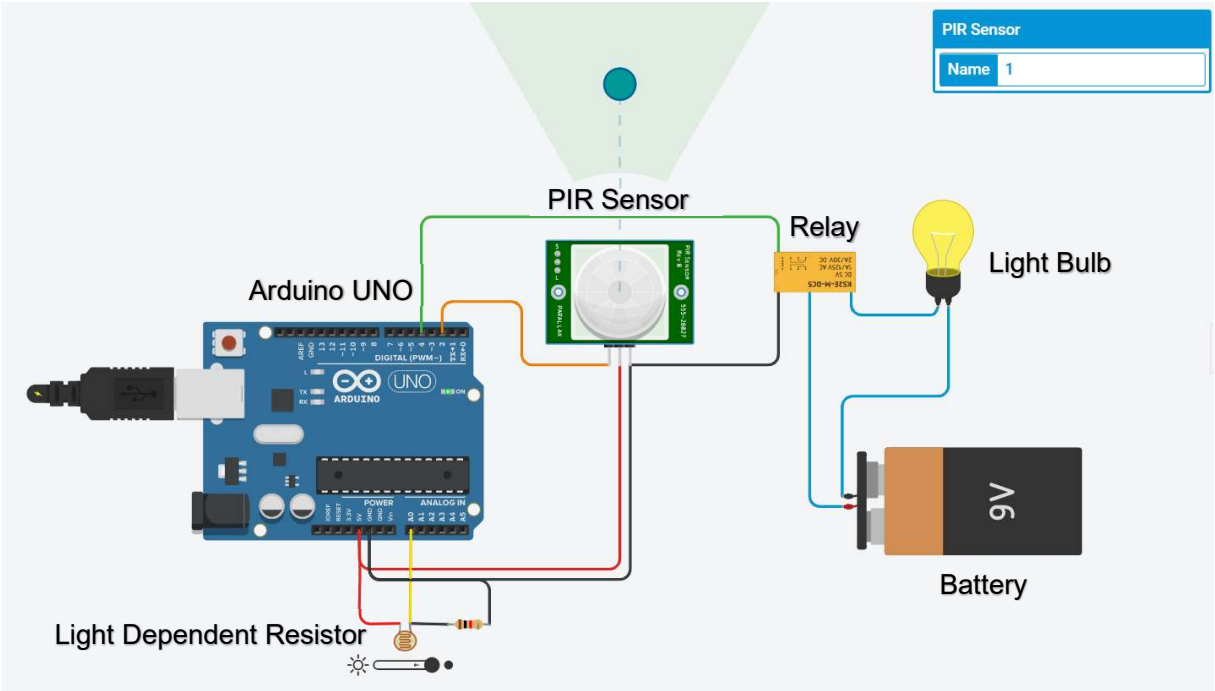
No need to buy any physical components, sensors, Arduino boards or modules.

No destruction of any physical components if circuit is incorrect.

Make your presentation clean and professional.

Aim for this tutorial is:

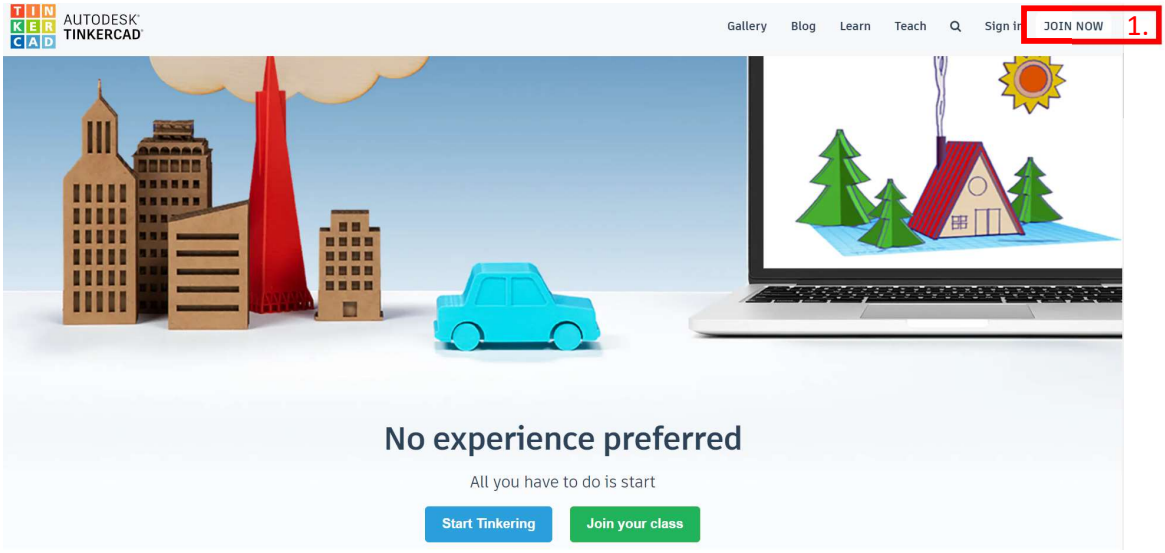
Learn how to select, place and program components using Arduino. This tutorial will guide you by making a motion detection and light detection door light.



TINKERCAD TUTORIAL

Create a Tinkercad Account and Create a New Project

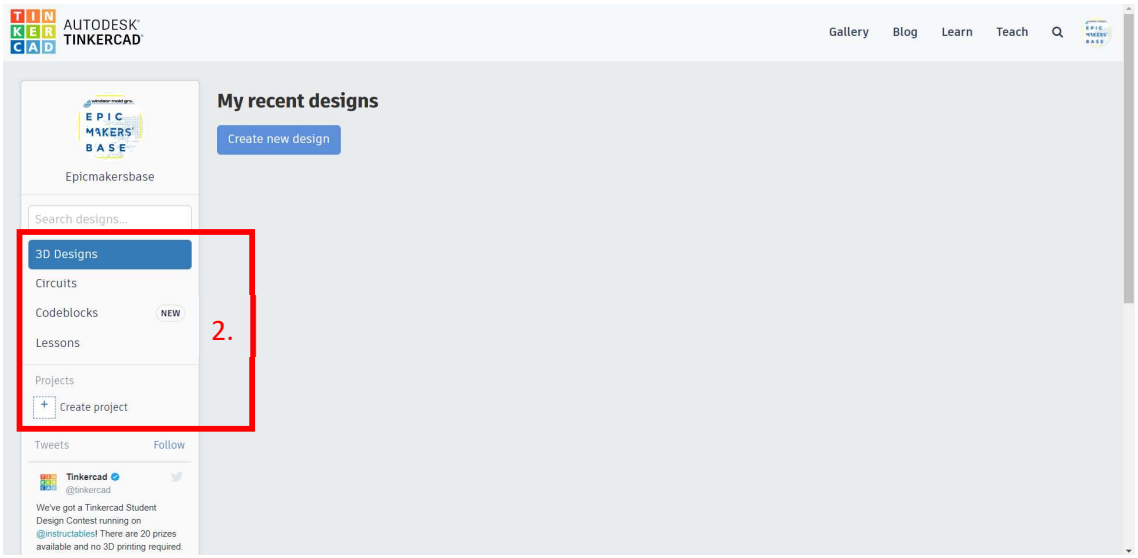
1



1. Click join now and follow online instruction to create an account. Select **Create a personal account**.

TINKERCAD TUTORIAL

Create New Circuit project



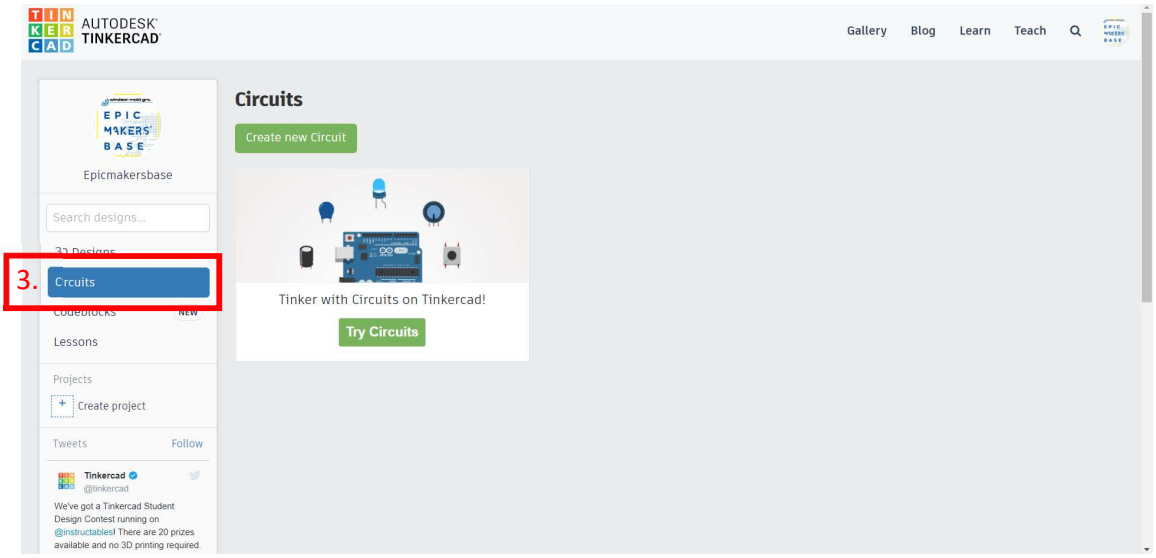
2. **3D Design:** Tinkercad is similar to a CAD software where you can design 3D models for 3d printing. The CAD software is based on constructive solid geometry (CSG), which allows users to create complex models by combining simpler objects together.

   Circuits: This option helps create a virtual circuit, program it, and test it in real time.

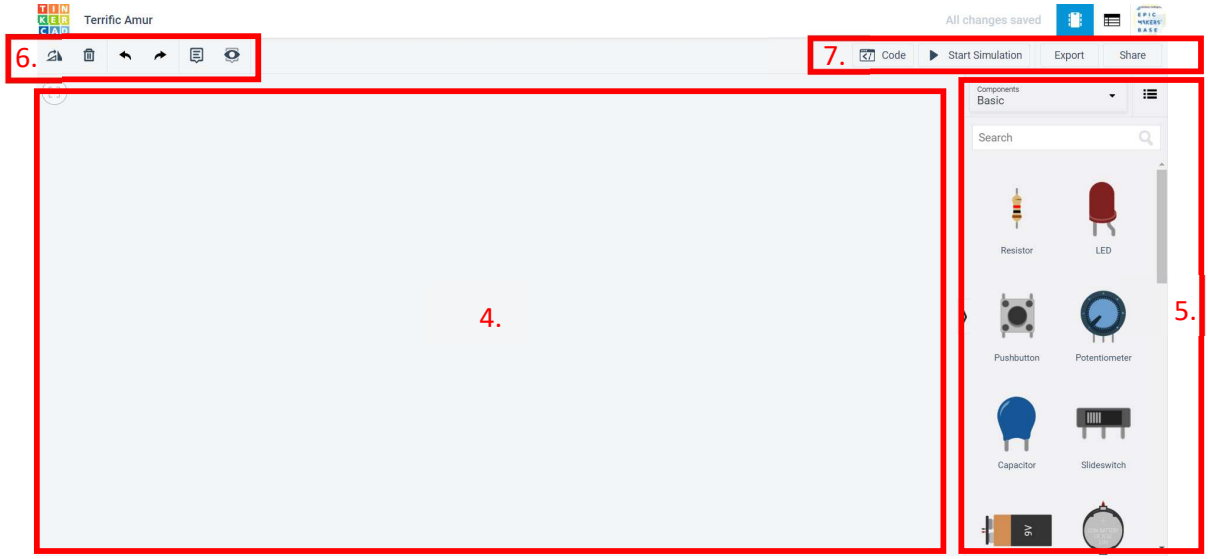
   Codeblocks: This new feature helps you create a block programming tree, where the 3D models are formed step by step following the tree instructions.

   Lessons: Tinkercad has feature where one can learn from lessons created by different users online and can access later with this option.

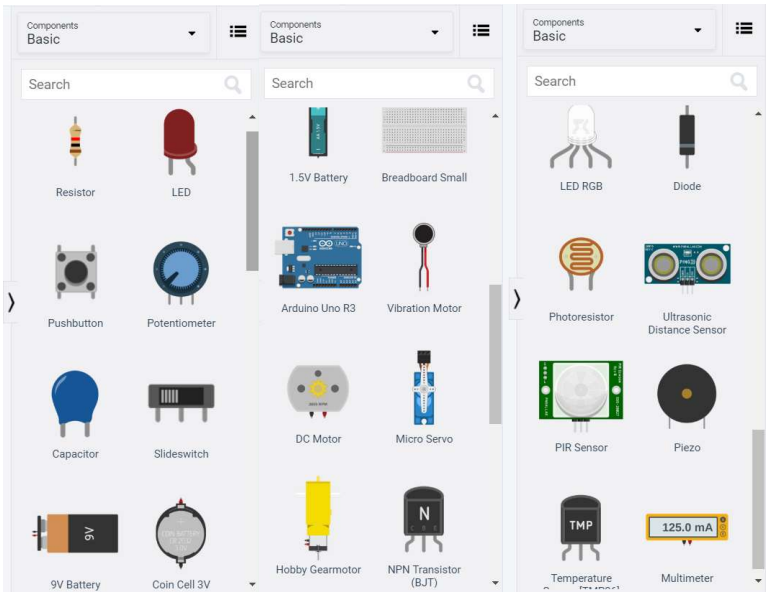
   Create project: This will create a directory where you can store all 3D models and circuit for one specific project.



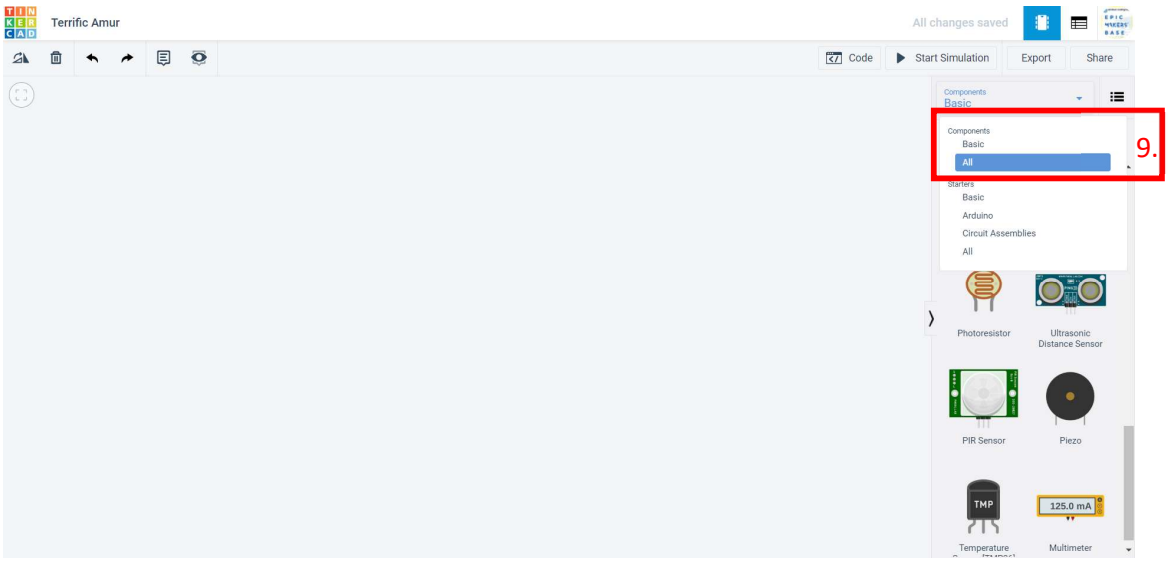
3. Select the Circuits option and Create new Circuit.



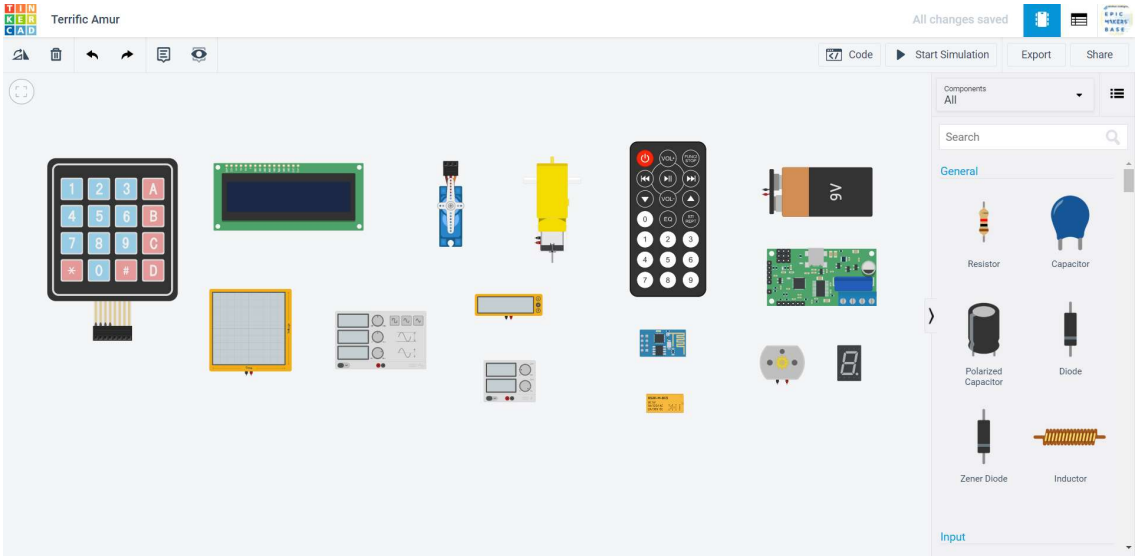
4. This space is where we will place all the components. The components can be moved around, edited, and wired together.
5. This section holds all the components. Scroll down to access component types.
6. Use this tab to rotate, delete, undo or redo. It also helps users to create and name labels for components.
7. This option helps you program Arduino, use serial monitor, start real time simulation, export code, and share your projects.



8. These are the components available in the basic option.



9. To get access to more components select All option.

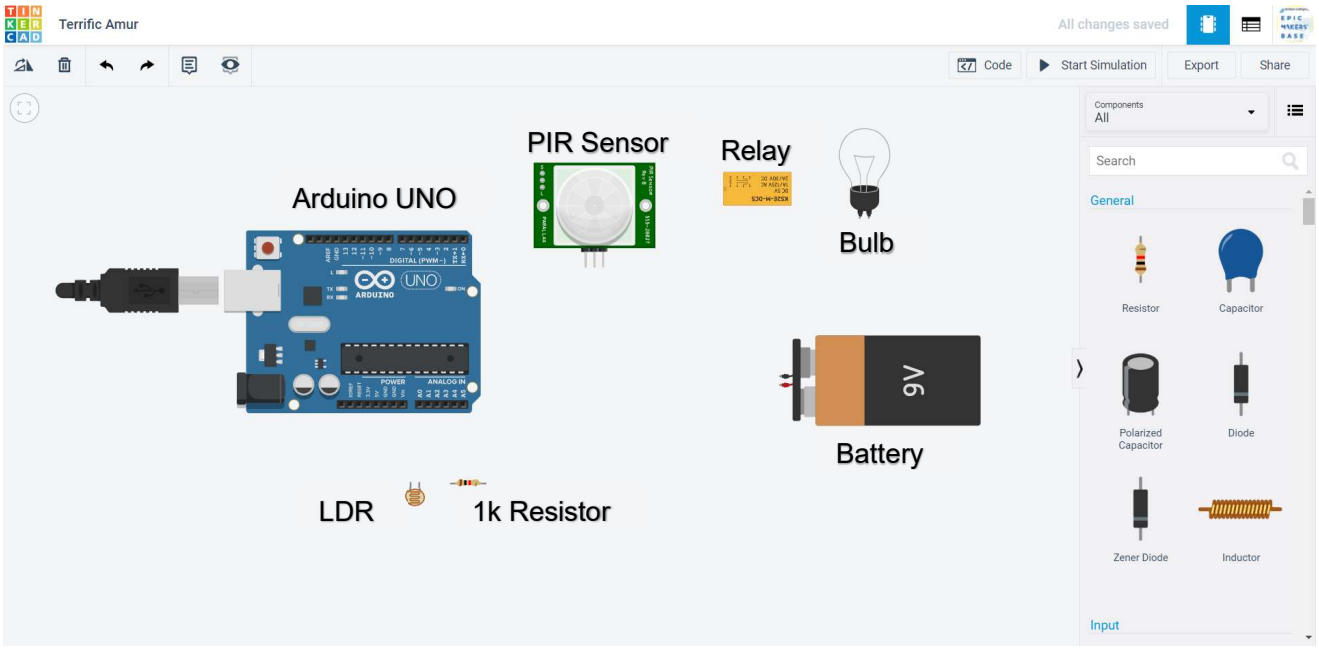


10. Tinkercad has many components and modules which can be used with Arduino UNO, some of the examples are shown in image above.

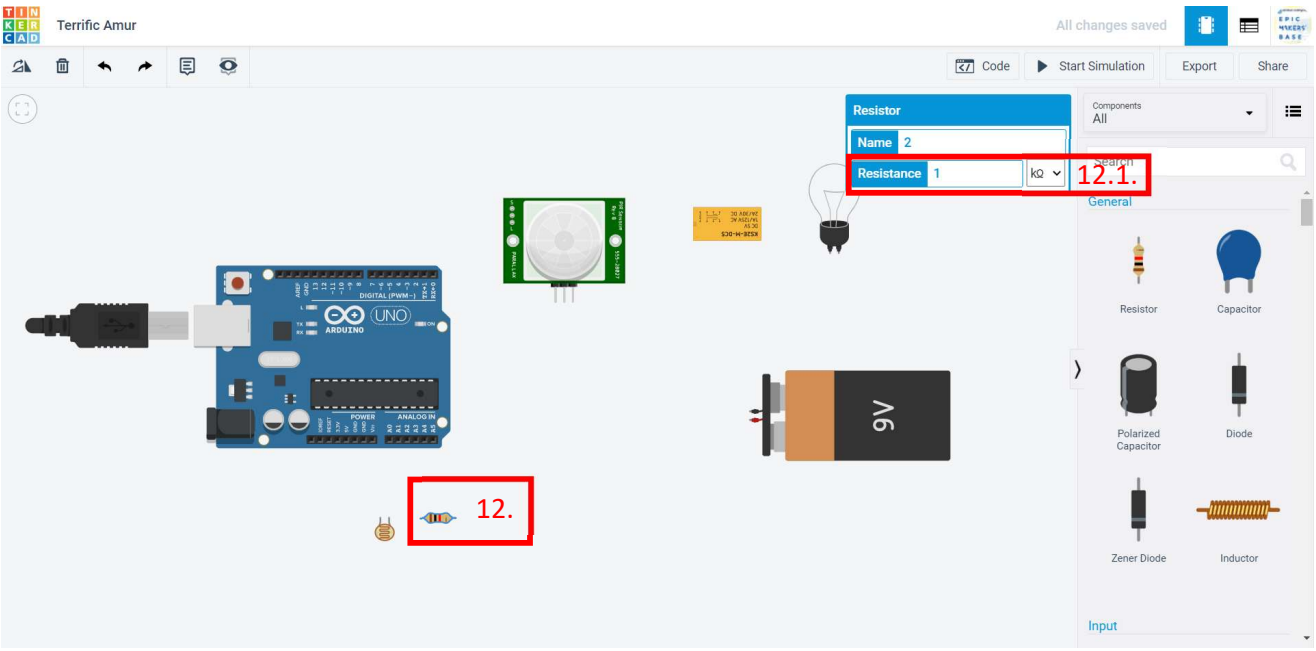
TINKERCAD TUTORIAL

Building the Circuit

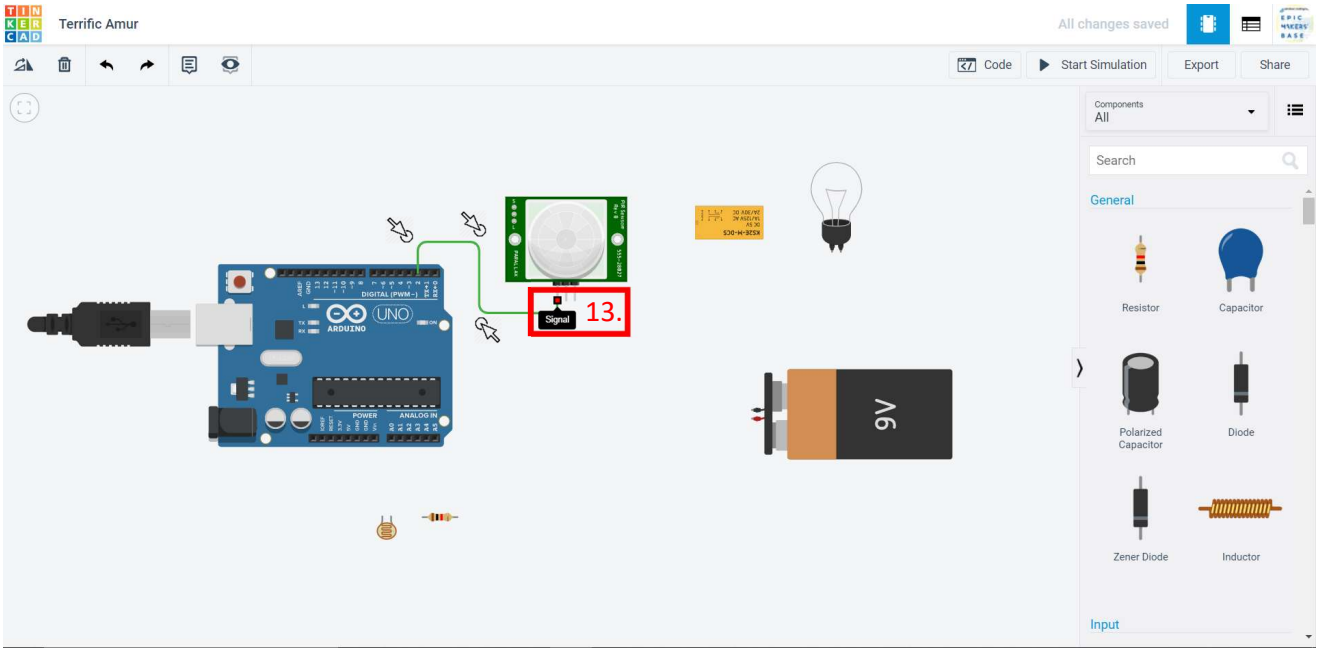
3



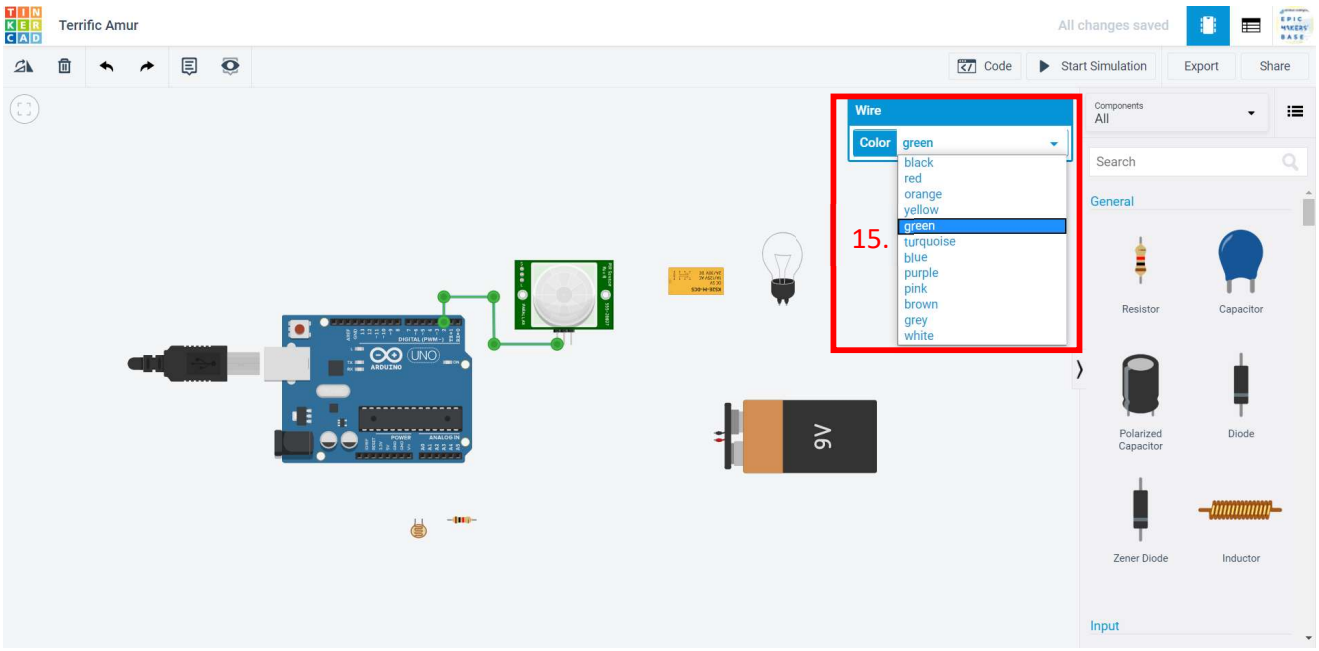
11. Place all the components as image above by selecting them from the components section on right side. Click on the component to select and click again anywhere on workspace to place.



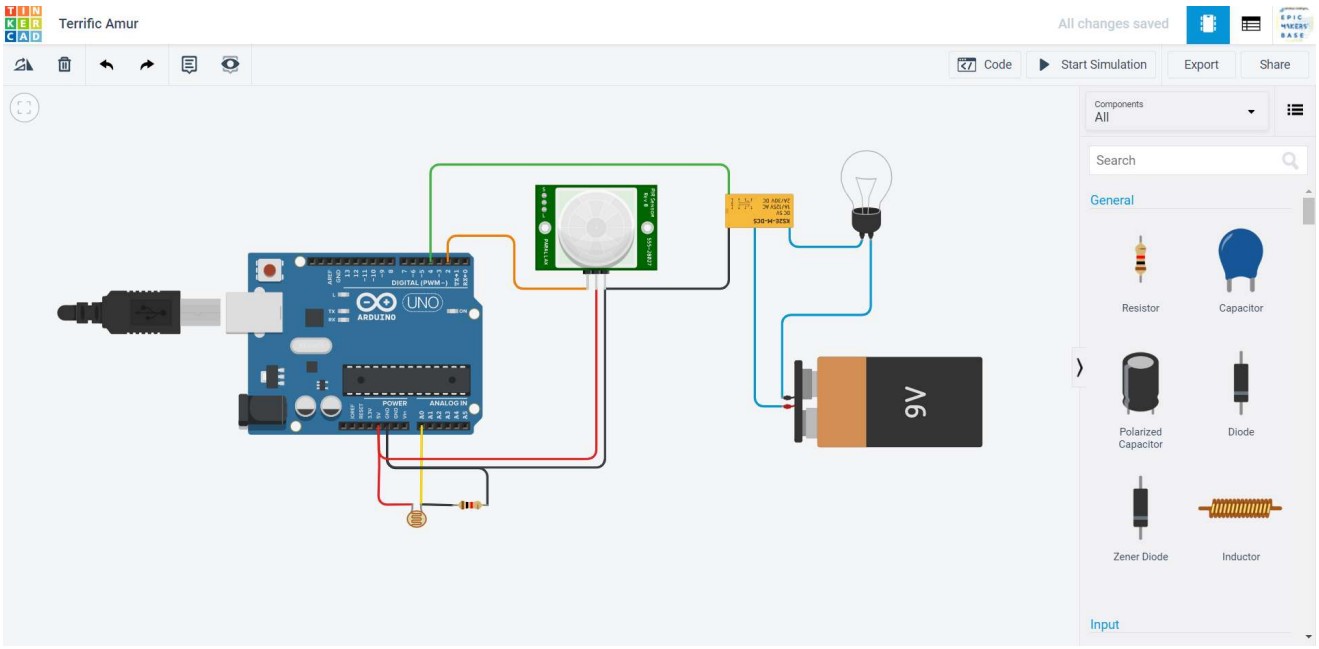
12. For changing the components value, select the component and change value at 12.1.



13. Hover over the points of the module to know the output name and click it to start wiring the components.
14. While wiring click to bend the wire as show in image above.



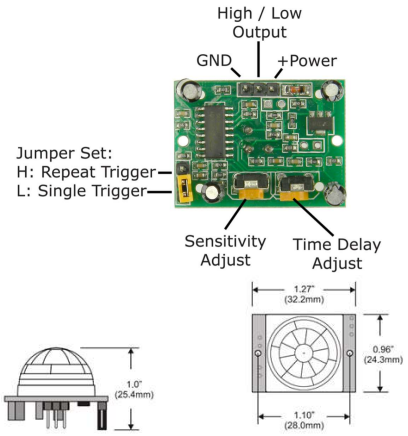
15. Click on wire to select the wire colour. This helps in differentiating between wire use. For example, 5v wire colour is Red and for GND(Ground) wire colour is Black.



16. Wire all the components as shown in the image above. Details of components and wiring is as below.

Components and Wiring

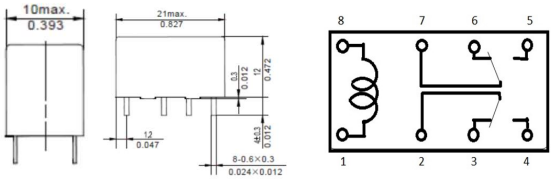
PIR Sensor



Product Name	HC-SR501 Body Sensor Module
Operating Voltage Range	5-20VDC
Quiescent Current	<50uA
Level output	High 3.3 V /Low 0V
Delay time	5-300S(adjustable) Range (approximately .3Sec -5Min)
Board Dimensions	32mm*24mm
Angle Sensor	<110° Cone Angle
Operation Temp	-15 to +70 degrees

Pin GND ➡ Arduino GND
Pin POW ➡ Arduino 5V
Pin Output ➡ Arduino D2

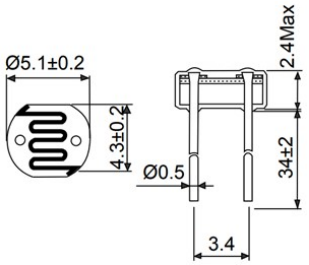
Relay



Product Name	KS23-M-DC5
Operating Voltage	5VDC
Coil Power	0.20W
Dimension	21 x 10 x 12mm
Max switch power and voltage	48W 60VA 24Vdc 220Vac
Operating Temp	-30 to 70 degrees

Pin 8 ➡ Arduino D4
Pin 1 ➡ Arduino GND
Pin 2 ➡ Battery +
Pin 4 ➡ Bulb Terminal 1

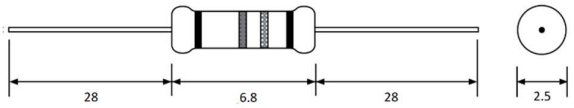
LDR



Product Name	NSL-19M51
Max AC or DC voltage	320V
Current	75mA
Operating Temp	-60 to 75 degree
Cell Resistance 1000Lux 10Lux	400Ω 9KΩ
Dark Resistance	1 MΩ

Terminal 1 ➡ Arduino 5v
Terminal 2 ➡ Arduino A0

Resistor



Product Name	Carbon Film Fix Resistor
Value	1000Ω
Power	1/4W

Terminal 1 ➡ Arduino A0
Terminal 2 ➡ Arduino GND

Bulb

Note: Any AC or DC Bulb or LED or load can be used with relay.

9V Bulb

Terminal 1 ➡ Relay Pin 4
Terminal 2 ➡ Battery GND

Battery (Power Source)

Note: Any suitable power source can be used according to Bulb, LED, or load requirements.

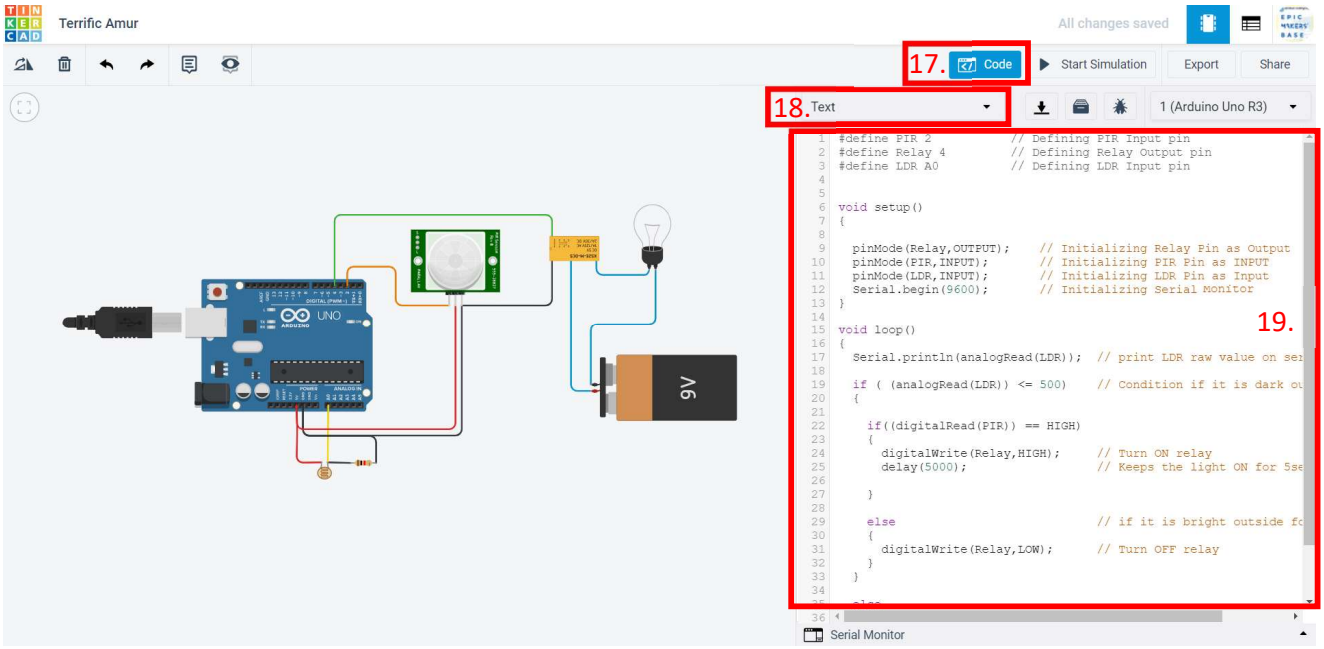
9v Battery

Terminal + ➡ Relay pin 2
Terminal - ➡ Bulb Terminal 2

TINKERCAD TUTORIAL

Programming with Arduino

4

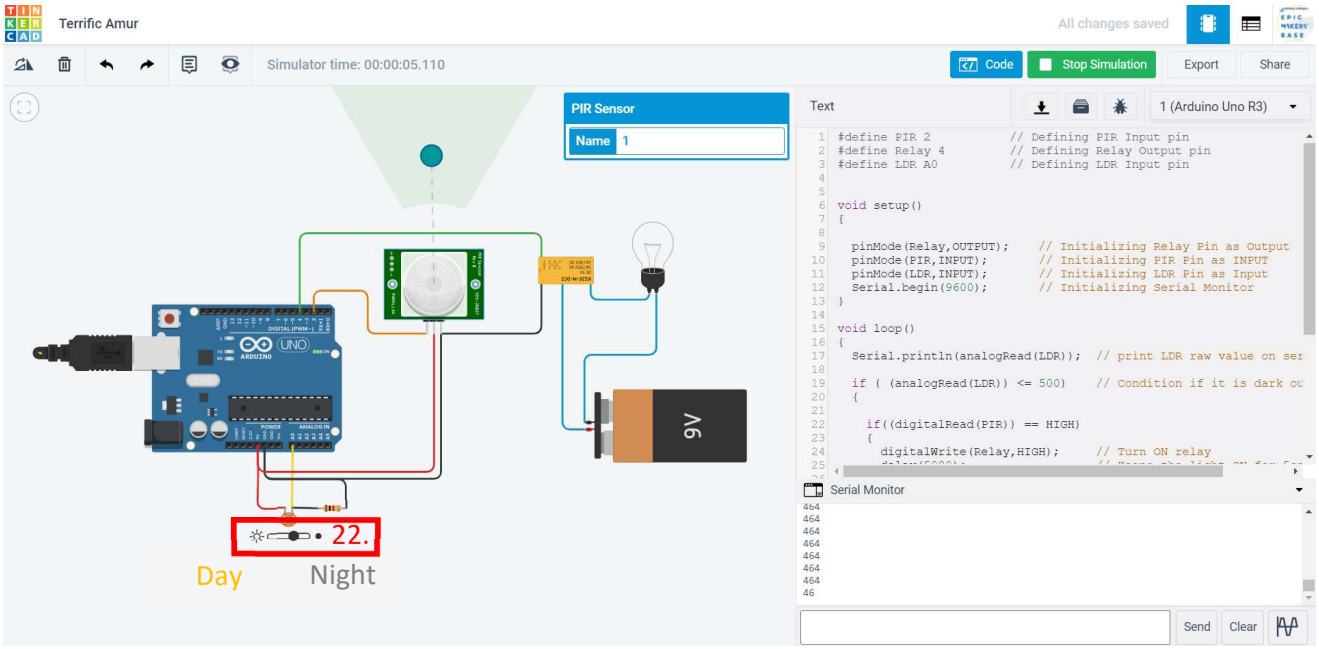


17. Once wiring is complete, select the code option to start coding.
18. Use the Text option to write the code for this tutorial or use block coding.
19. This is where all code can be written. Copy and paste the code shown on next page.

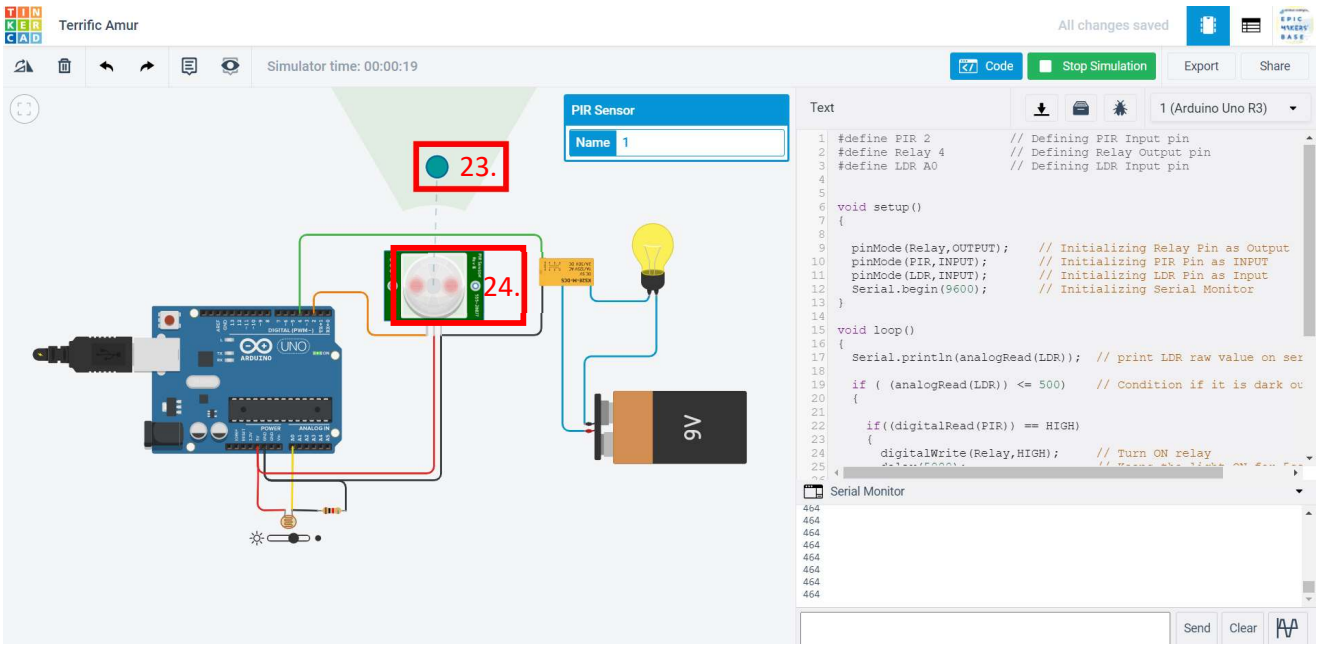
Arduino Code

```
#define PIR 2                                   // Defining PIR Input pin
#define Relay 4                                 // Defining Relay Output pin
#define LDR A0                                  // Defining LDR Input pin

void setup()
{
  pinMode(Relay,OUTPUT);                        // Initializing Relay Pin as Output
  pinMode(PIR,INPUT);                           // Initializing PIR Pin as INPUT
  pinMode(LDR,INPUT);                           // Initializing LDR Pin as Input
  Serial.begin(9600);                           // Initializing Serial Monitor
}
void loop()
{
  Serial.println(analogRead(LDR));              // print LDR raw value on serial monitor

  if ((analogRead(LDR)) <= 500)                 // Condition if it is dark outside
  {

    if((digitalRead(PIR)) == HIGH)              // Condition if we detect any movement on sensor
    {
      digitalWrite(Relay,HIGH);                 // Turn ON relay
      delay(5000);                              // Keeps the light ON for 5sec

    }

    else                                        // if it is bright outside follow this
    {
      digitalWrite(Relay,LOW);                  // Turn OFF relay
    }
  }

  else
  {
    digitalWrite(Relay,LOW);                    // Turn OFF relay
  }
}
```

20. Start the simulation after writing the code.
21. Click serial monitor to see the real time value of the LDR sensor output. This helps us know if its Day or Night.



Slide the point on bar towards Day or Night, it detects the brightness intensity. The Raw values can be seen on Serial Monitor. We have identified 500 as threshold in the code. Any value below 500 means it is dark outside and any value above 500 means it is bright.



22. Click and drag the blue dot to create a physical movement in front of sensor.
23. If the sensor detects any movement it will turn red and the bulb will turn ON.

Contact Information

Contact us for any information at makerspace@uwindsor.ca

Website: www.epicentreuwindsor.ca

Follow us on social media:

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