

A

Practical activity Report submitted for  
Engineering Design Project-II (UTA-014)

by

AKARSH NAGPAL (102003195)

GURANSH SINGH DHILLON (102003196)

DEEVANG GOSWAMI(102003197)

HRIDAY JUNEJA(102003198)

VISHNU KHOKHAR(102003199)

**Submitted to**

**DR. SANJEEV RAO**



**THAPAR INSTITUTE**  
OF ENGINEERING & TECHNOLOGY  
(Deemed to be University)

**DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING**

**THAPAR INSTITUTE OF ENGINEERING AND TECHNOLOGY,**

**(A DEEMED TO BE UNIVERSITY), PATIALA, PUNJAB**

**INDIA**

**Jan-June 2022**

## List of Experiments

Sr.No.	Experiment no.	Objective
1	1	Introduction to Arduino Microcontroller
2	2(a)	Write a Program in Arduino to blink a single LED.
3	2(b)	Write a Program in Arduino to blink a multiple LEDs.
4	3	Write a program to design a pattern from sequence of multiple LED using for loop in Arduino.
5	4	Write a program to demonstrate sending data from the computer to the Arduino board and control brightness of LED.
6	5	<p><i>Serial Communications:</i></p> <p>WAP for following pattern using for loop:</p> <p>*****</p> <p>Roll No. _____</p> <p>*****</p> <p>Name: _____</p> <p>*****</p> <p>Branch: _____</p> <p>*****</p>
7	6	WAP for dimmer (Change in intensity of single LED bulb) using analogRead()
8	7	WAP to change the intensity of the given LEDs for the sequence 35214 in for both forward and reverse order.

## Experiment: 1

**Objective:** To introduce to the Arduino IDE and what is Arduino microcontroller

**Software Used:** Tinkercad Simulator **Hardware**

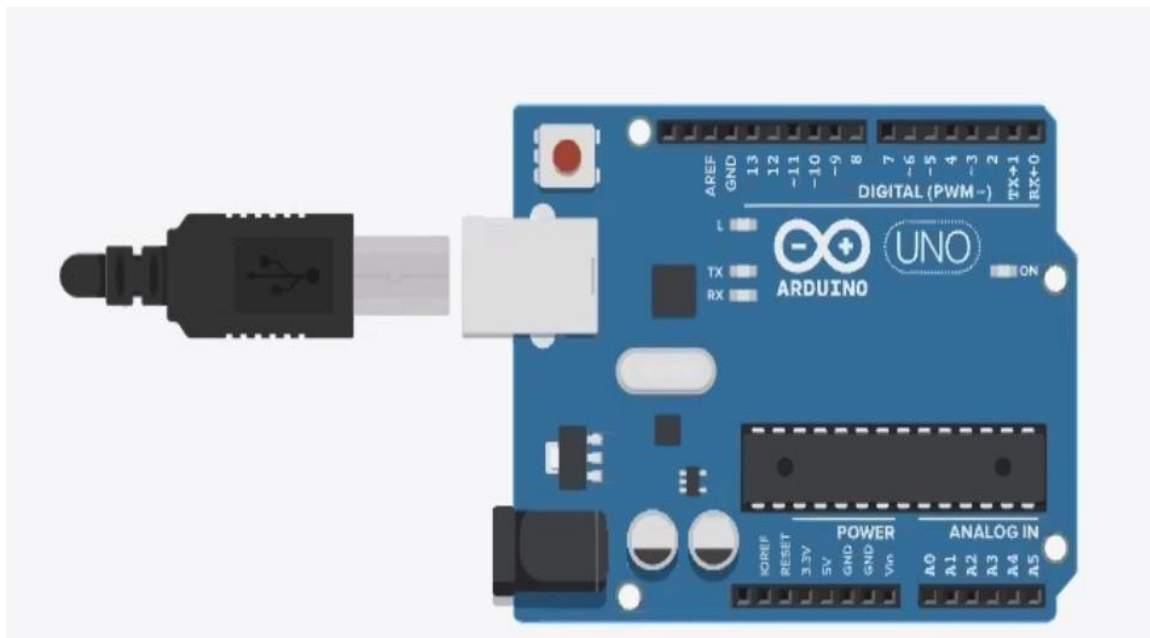
**Component Used:**

Sr. No	Name of Components	Quantity
1.	Arduino Uno R3	1

### Theory:

1. **Arduino Uno R3:** In this project we are using an Arduino Uno microcontroller to burn some code into it which can be further used to manipulate the buggy to perform certain tasks. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

**Logical Circuit diagram (Tinkercad Circuit diagram):**



**Coding: void**

```
    setup()
    {
        Serial.begin(9600);
    }

    void loop()
    {
        Serial.println("Hello World"); delay(1000);
    }
```

**Discussion:**

In this experiment, we have learnt how to use the Arduino IDE and use some default functions to print something and display it on the serial monitor. We get to learn some in- built features of the Tinker cad Simulator.

## Experiment: 2(a)

**Objective:** To WAP in Arduino to blink a LED

**Software Used:** Tinkercad Simulator

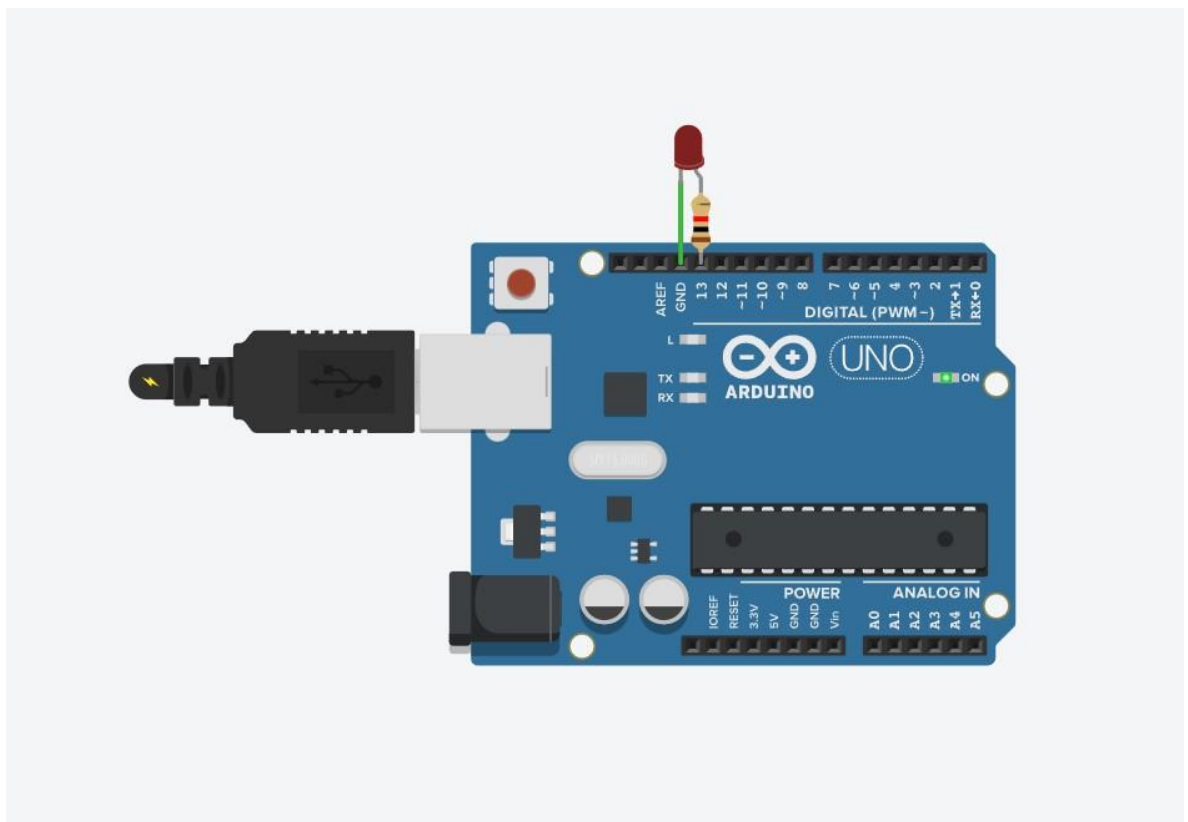
**Hardware Component Used:**

Sr. No	Name of Components	Quantity	Value
1.	Arduino Uno R3	1	
2.	Resistor	1	1k $\Omega$
3.	LED	1	

### Theory:

1. **Arduino Uno R3:** In this project we are using an Arduino Uno microcontroller to burn some code into it which can be further used to manipulate the buggy to perform certain tasks.

**Logical Circuit diagram (Tinkercad Circuit diagram):**



## Coding:

```
// C++ code

//

void setup()

{

    pinMode(13, OUTPUT);

    pinMode(7, OUTPUT);

}

void loop()

{

    digitalWrite(13, HIGH);

    delay(1000); // Wait for 1000 millisecond(s)

    digitalWrite(13, LOW);

    delay(1000); // Wait for 1000 millisecond(s)

}
```

## Discussion:

In this experiment we have learnt how to blink a LED using an Arduino adding a resistor along its anode end so as to protect the LED from getting fused to large amount of current. We learn how to make the correct connections of LED with the resistor.

## Experiment: 2(b)

Objectives: To WAP in Arduino to blink multiple LED

**Software Used:** Tinkercad Simulator

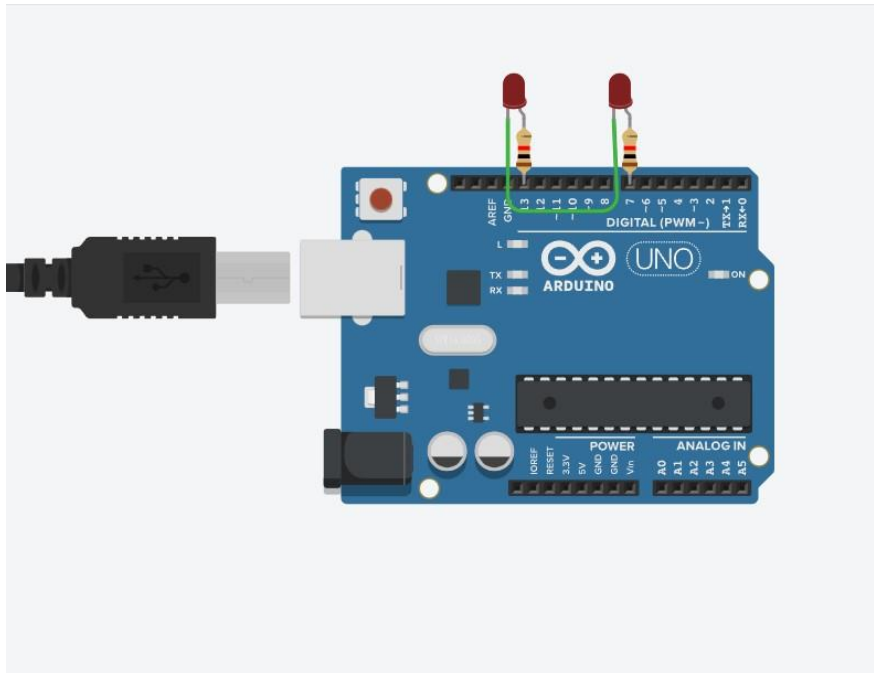
**Hardware Component Used:**

Sr. No	Name of Components	Quantity	Value
1.	Arduino Uno R3	1	
2.	Resistor	3	1kΩ
3.	LED	3	

**Theory:**

1. **Arduino Uno R3:** In this project we are using an Arduino Uno microcontroller to burn some code into it which can be further used to manipulate the buggy to perform certain tasks.
2. **LED:** In this project, we are using LEDs to learn how to control the blinking at certain intervals of time with the help of the coding done in the simulator.
3. **Resistor:** In this project, we are using resistors to keep the current in the circuit at a check so as not to burn the LED when current is supplied to it.

### Logical Circuit diagram (Tinkercad Circuit diagram):



### Coding:

```
void setup()
{
  pinMode(13, OUTPUT);
  pinMode(7, OUTPUT);
}

void loop()
{
  digitalWrite(13, HIGH);
  digitalWrite(7, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(7, LOW);
  //delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(13, LOW);
  delay(1000); // Wait for 1000 millisecond(s) }
```



**Discussion:**

In this experiment we have learnt how to make more than one LED blink at the same time with different patterns of our choice with the help of a few resistors to protect the LEDs from fusing. We have learnt how to use a variable to set the delay speed in the LED's so as to not set new values every case.

### Experiment: 3

Objective: Write a program in Arduino to blink five LEDs in the odd or even pattern.

#### Software Used:

Tinkercad Simulator

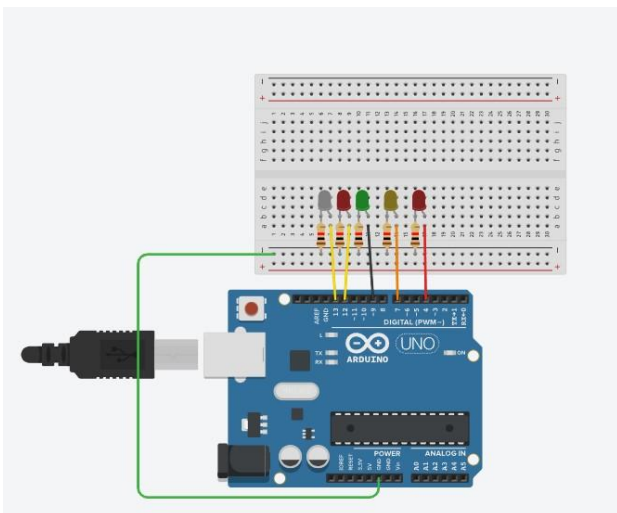
#### Hardware Component Used:

Sr. No	Name of Components	Value
1.	Resistor	220 $\Omega$
2.	LED	-
3.	Arduino	-
4.	Connecting Wires	-

#### Theory:

1. **Resistor**: Resistors are electronic components that implements electrical resistance as a circuit element. They keep the current in the circuit in check so an to not burn the LED.
2. **Arduino UNO R3**: It is a microcontroller used to burn some code into it which can eb further used in different instances, for example, to manipulated the buggy's movements.
3. **LEDs**: Light emitting diodes are used here so as to ascertain the intervals of time with the help of coding done in the simulator.

#### Logical Circuit diagram (Tinkercad Circuit diagram):



## Code

```
void setup()
{
  for (int i=4; i<=13; i++)
    pinMode(i, OUTPUT);
}

void loop()
{
  for (int i=4; i<=13; i++) {
    if (i%2 == 0)
      digitalWrite(i, HIGH);
    else
      digitalWrite(i, LOW);
  }
  delay (1000);
  for (int i=4; i<=13; i++) {
    if (i%2 == 1)
      digitalWrite(i, HIGH);
    else
      digitalWrite(i, LOW);
  } delay(1000); }
```

## Discussion:

In this experiment, we have learnt how to connect five LEDs to the Arduino and write a code that allows these LEDs to blink one after the other when the circuit is simulated using delay() and for() loops separately.

## Experiment: 4

**Objective:** WAP in Arduino to control the brightness of an LED. The intensity of the LED should be changed based on the values provided from the serial input.

**Software Used:** Tinkercad Simulator

### Hardware Component Used:

Sr. No	Name of Components	Quantity	Value
1.	ArduinoUno R3	1	
2.	Resistor	1	1k $\Omega$
3.	LEDs	1	
4.	Breadboard Small	1	

### Theory:

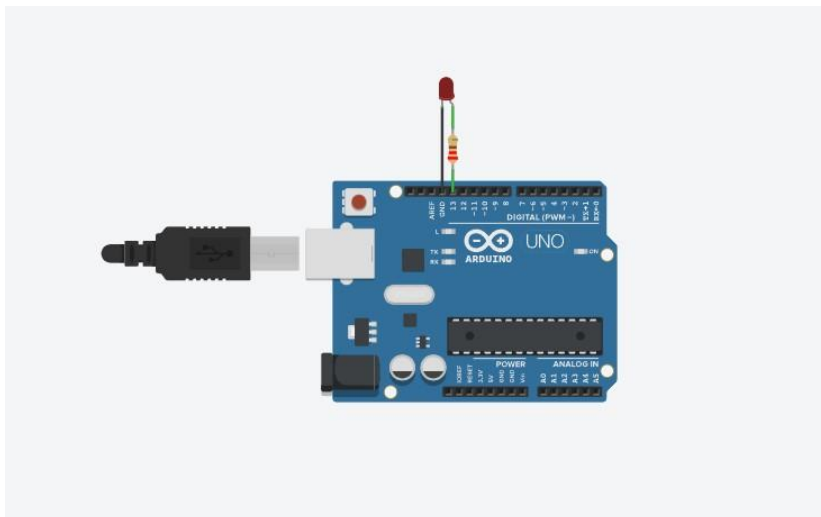
**Arduino Uno R3:** In this project we are using an Arduino Uno microcontroller to burn some code into it which can be further used to manipulate the buggy to perform certain tasks.

**Resistor:** In this project, we are using resistors to keep the current in the circuit at a check so as not to burn the LED when current is supplied to it.

**LED:** In this project, we are using LEDs to learn how to control the blinking at certain intervals of time with the help of the coding done in the simulator.

**Breadboard Small:** In this project, we are using a breadboard which is a soldered base for making small connections. The horizontal lines are connected to each other but not across the divider, similarly the vertical running lines are connected to each other but not across

### Logical Circuit diagram (Tinkercad Circuit diagram):



Coding:

```
char c;  
int val;  
void setup(){  
  pinMode(3, OUTPUT);  
  Serial.begin(9600);  
}  
void loop(){ if(Serial.available()>0){  
  val=Serial.parseInt();  
  analogWrite(3,val);  
  Serial.println(val);  
}  
}
```

## Experiment: 5

**Objective:** Write a program in Arduino to print the following pattern using for() loop:

\*\*\*\*\*

RollNo.

\*\*\*\*\* Name:

\*\*\*\*\*

Branch:

\*\*\*\*\*

## Software Used:

Tinkercad Simulator

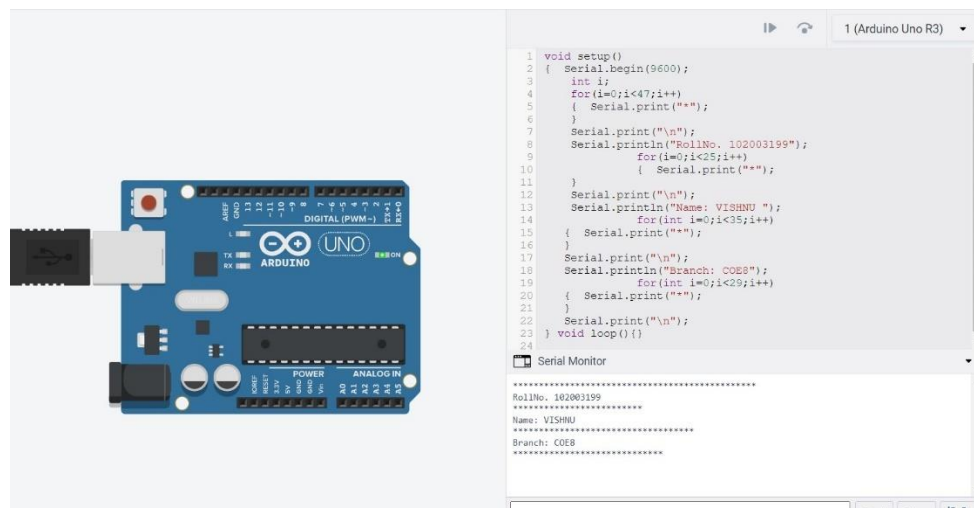
## Hardware Component Used:

Sr. No	Name of Components	Value
1.	Arduino	-

## Theory:

1. **Arduino UNO R3:** It is a microcontroller used to burn some code into it which can be further used in different instances, for example, to manipulate the buggy's movements.

## Logical Circuit diagram (Tinkercad Circuit diagram):



## Code:

```
void setup()
{ Serial.begin(9600);
  int i;
  for(i=0;i<47;i++)
  { Serial.print("*");
  }
  Serial.print("\n");
  Serial.println("RollNo. 102003199");
  for(i=0;i<25;i++)
  { Serial.print("*");
  }
  Serial.print("\n");
  Serial.println("Name: VISHNU ");
  for(int i=0;i<35;i++)
  { Serial.print("*");
  }
  Serial.print("\n");
  Serial.println("Branch: COE8");
  for(int i=0;i<29;i++)
  { Serial.print("*");
  }
  Serial.print("\n");
} void loop()
{
}
```

## OUTPUT:

A screenshot of a 'Serial Monitor' window. The window has a title bar with a close button and the text 'Serial Monitor'. Below the title bar, the output text is displayed. It starts with a line of asterisks, followed by 'RollNo. 102003199', another line of asterisks, 'Name: VISHNU', a third line of asterisks, 'Branch: COE8', and a final line of asterisks. The text is left-aligned and appears to be in a monospaced font. The window has a scrollbar on the right side.

```
*****  
RollNo. 102003199  
*****  
Name: VISHNU  
*****  
Branch: COE8  
*****
```

## Discussion:

In this experiment, we have learnt how to implement `Serial.println` to display some output in the Serial monitor.



## Experiment: 6

**Objective:** WAP for dimmer (Change in intensity of single LED bulb) using analogwrite ().

**Software Used:** Tinkercad Simulator

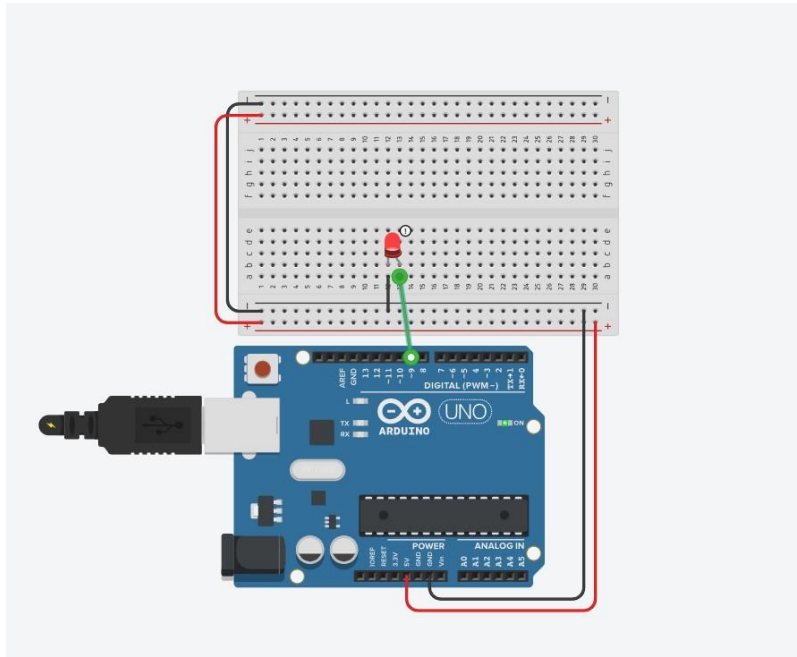
### Hardware Component Used:

Sr. No	Name of Components	Value
1.	Resistor	220 $\Omega$
2.	LED	-
3.	Arduino	-
4.	Connecting Wires	-

### Theory:

4. **Resistor**: Resistors are electronic components that implements electrical resistance as a circuit element. They keep the current in the circuit in check so as to not burn the LED.
5. **Arduino UNO R3**: It is a microcontroller used to burn some code into it which can be further used in different instances, for example, to manipulate the buggy's movements.
6. **LEDs**: Light emitting diodes are used here so as to ascertain the intervals of time with the help of coding done in the simulator.

### Logical Circuit diagram (Tinkercad Circuit diagram):



CODE:

```
int brightness=0;
```

```
void setup()
```

```
{
```

```
  pinMode(9, OUTPUT);
```

```
}
```

```
void loop()
```

```
{
```

```
  for(brightness=0;brightness<=255;brightness+=5)
```

```
  {
```

```
    analogWrite(9, brightness);
```

```
    delay(30); // Wait for 30 millisecond(s)
```

```
  }
```

```
  for(brightness=255;brightness>=0;brightness-=5);
```

```
  {
```

```
    analogWrite(9, brightness);
```

```
    delay(30); // Wait for 1000 millisecond(s)
```

```
  }
```

```
}
```

**Discussion:**

In this experiment we have learnt how that the default function `analogwrite()` can be used to write either of the pins whether it is digitalpins or analog pins.

## Experiment: 7

**Objective:** To WAP to change the intensity of the given LEDs for sequence 35214 for both forward and reverse order.

**Software Used:** Tinkercad Simulator **Hardware**

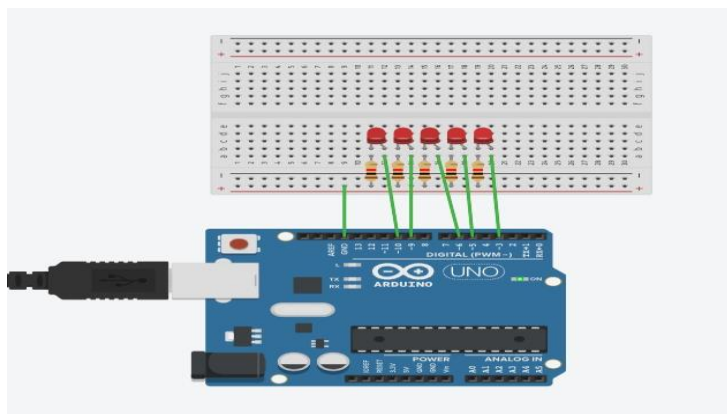
**Component Used:**

Sr. No	Name of Components	Quantity	Value
1.	Arduino Uno R3	1	
2.	Resistor	5	1k $\Omega$
3.	LED	5	
4.	Breadboard Small	1	

### Theory:

1. **Arduino Uno R3:** In this project we are using an Arduino Uno microcontroller to burn some code into it which can be further used to manipulate the buggy to perform certain tasks.
2. **Resistor:** In this project, we are using resistors to keep the current in the circuit at a check so as not to burn the LED when current is supplied to it.
3. **LED:** In this project, we are using LEDs to learn how to control the blinking at certain intervals of time with the help of the coding done in the simulator.
4. **Breadboard Small:** In this project, we are using a breadboard which is a soldered base for making small connections. The horizontal lines are connected to each other but not across the divider, similarly the vertical running lines are connected to each other but not across.

**Logical Circuit diagram (Tinkercad Circuit diagram):**



```
The bightness of LED2 is: 149
The bightness of LED5 is: 201
The bightness of LED3 is: 51
The bightness of LED5 is: 101
The bightness of LED2 is: 151
The bightness of LED1 is: 201
The bightness of LED4 is: 251
```



### Coding:

// C++ code

```
int lrd,brightness;
```

```
void setup()
```

```
{
```

```
pinMode(3,OUTPUT);
```

```
pinMode(5,OUTPUT);
```

```
pinMode(6,OUTPUT);
```

```
pinMode(9,OUTPUT);
```

```
pinMode(10,OUTPUT);
```

```
Serial.begin(9600);
```

```
}
```

```
void loop()
```

```
{
```

```
for(brightness=1;brightness<=50;brightness++)
```

```
{
```

```
analogWrite(6,brightness);
```

```
delay(20);
```

```
}

Serial.print("The bightness of LED3 is: ");

Serial.println(brightness);

for(;brightness<=100;brightness++)

{

    analogWrite(3,brightness);

    delay(20);

}

Serial.print("The bightness of LED5 is: ");

Serial.println(brightness);

for(;brightness<=150;brightness++)

{

    analogWrite(9,brightness);

    delay(20);

}

Serial.print("The bightness of LED2 is: ");

Serial.println(brightness);

for(;brightness<=200;brightness++)

{

    analogWrite(10,brightness);

    delay(20);

}

Serial.print("The bightness of LED1 is: ");
```

```
Serial.println(brightness);

for(;brightness<=250;brightness++)

{

analogWrite(5,brightness);

delay(20);

}

Serial.print("The bightness of LED4 is: ");

Serial.println(brightness);

delay(100);

Serial.println();

for(brightness=250;brightness>=50;brightness--)

{

analogWrite(5,brightness);

delay(20);

}

Serial.print("The bightness of LED4 is: ");

Serial.println(brightness);

for(brightness=200;brightness>=100;brightness--)

{

analogWrite(10,brightness);

delay(20);

}

Serial.print("The bightness of LED1 is: ");
```

```
Serial.println(brightness);

for(brightness=150;brightness>=150;brightness--)

{

analogWrite(9,brightness);

delay(20);

}

Serial.print("The bightness of LED2 is: ");

Serial.println(brightness);

for(brightness=100;brightness<=200;brightness++)

{

analogWrite(3,brightness);

delay(20);

}

Serial.print("The bightness of LED5 is: ");

Serial.println(brightness);

for(brightness=50;brightness<=250;brightness++)

{

analogWrite(6,brightness);

delay(20);

}

}
```



**Discussion:** In this experiment we have learnt how to use the function *analogWrite()* to make the LED's blink in an order which is not in serial order but can be in a random order. We have learnt we can use as many LED's and create a pattern both reverse and forward