MST Practical Activity Report

Submitted for

ENGINEERING DESIGN-II (UTA024)

Submitted by:

102203638	Bhavya Goyal
102203642	Shreyansh Srivastava
102203649	Shivang Singh
102203662	Aayushi Singh
102203656	Dhruv Wadhawan

BE Second Year

Group – 2CO29

Submitted to:
Dr. Niyaz Ahmad Wani

Computer Science and Engineering Department

TIET, Patiala

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DECLARATION

We declare that this project report is based on our own work carried out during the course of our study in our Engineering-design II Computer Lab under the supervision of Dr Niyaz Ahmad Wani.

We assert that the statements made and conclusions drawn are an outcome of our own research work.

We further certify that the work contained in this report is original and has been done by us under the general supervision of our supervisor.

We have followed the guidelines provided by the University in writing this report.

We also declare that this project is the outcome of our own effort, that it has not been submitted to any other university for the award of any degree.

INDEX

EXPERIMENT-1

OBJECTIVE: Introduction to Arduino Micro-Controller.

SOFTWARE USED: Tinkercad Simulator

HARDWARE USED:

Sr. No	Name of Components	Value
1.	Arduino Uno Micro-Controller	1

LOGIC/CIRCUIT DIAGRAM

Theory -

The **Arduino Uno** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010.
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. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

i. Power USB: Arduino board can be provided power from PC/laptop using power cable
ii. Power Jack: Arduino can be powered directly from the AC power supply.
iii. Reset Button: It is used to reset the Arduino board i.e., start programming from beginning.
iv. Pins: Used to connect different components to the Arduino board, voltage and ground connections.
v. Analog Pins: Used to read analog signals from analog sensors and converts it into digital signal.
vi. Digital Pins: These pins can be configured to work a input or output pins to read logics (0 and 1).
vii. Power Pins: Pins that provide power (operating voltage) and ground connections.
viii. ATmega328P Microcontroller: It is a high performance yet low power consumption 8-bit AVR microcontroller. It can be commonly found in Arduino boards such as Arduino Uno. It is also known as the brain of Arduino.

RESULT ANALYSIS

In this experiment, we get to know about basics of Arduino Uno Microcontroller and its various functions and components.

EXPERIMENT 2

OBJECTIVE: Write a program to blink a single LED using Arduino and breadboard.

SOFTWARE USED: Tinkercad Simulator.

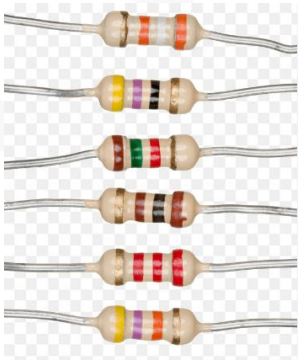
HARDWARE USED:

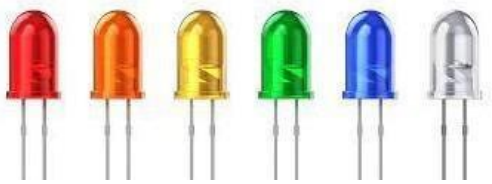
Sr No.	Name of the Component	Value
1.	Arduino Uno Board	1
2.	Breadboard	1
3.	Jumper Wires	3
4.	LED	1
5.	Resistor	1000 ohm

THEORY:

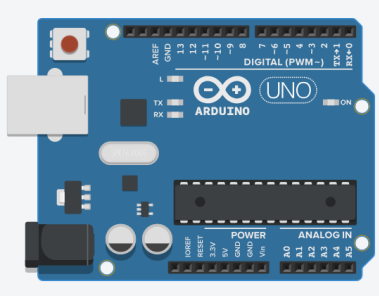
1) **Resistor:** Resistors are used in virtually all electronic circuits and many electrical ones. Resistors, as their name indicates resist the flow of electricity and this function is key to the operation most circuits.

2) **LED:** A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons (Energy packets).

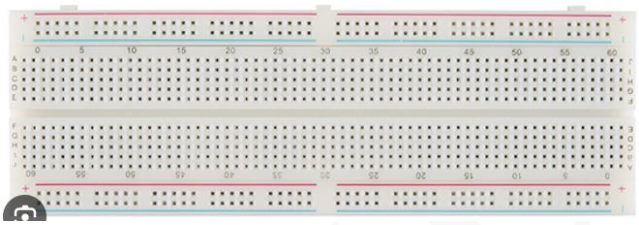




3) **Arduino Uno Board:** The **Arduino Uno** is an open-source microcontroller board basedon the Microchip ATmega328P microcontroller and developed by Arduino.cc.



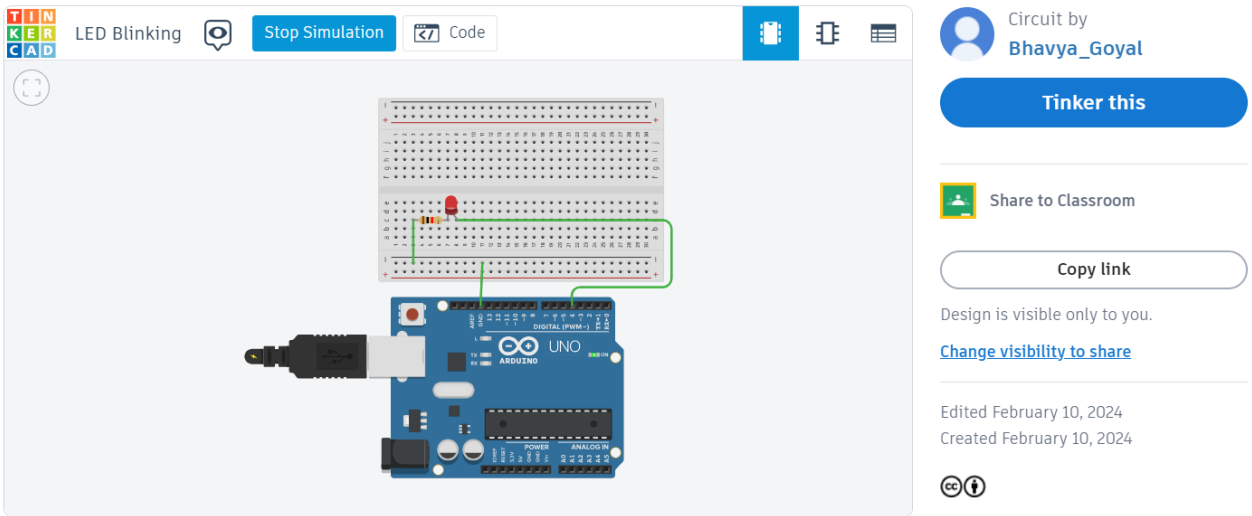
4) **Breadboard:** A breadboard is used to place components (resistor, capacitor, LED's etc.)that are wired together. It is used to make temporary circuits.



5)

5) **Jumper Wires:** A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards.

TINKERCAD DIAGRAM:

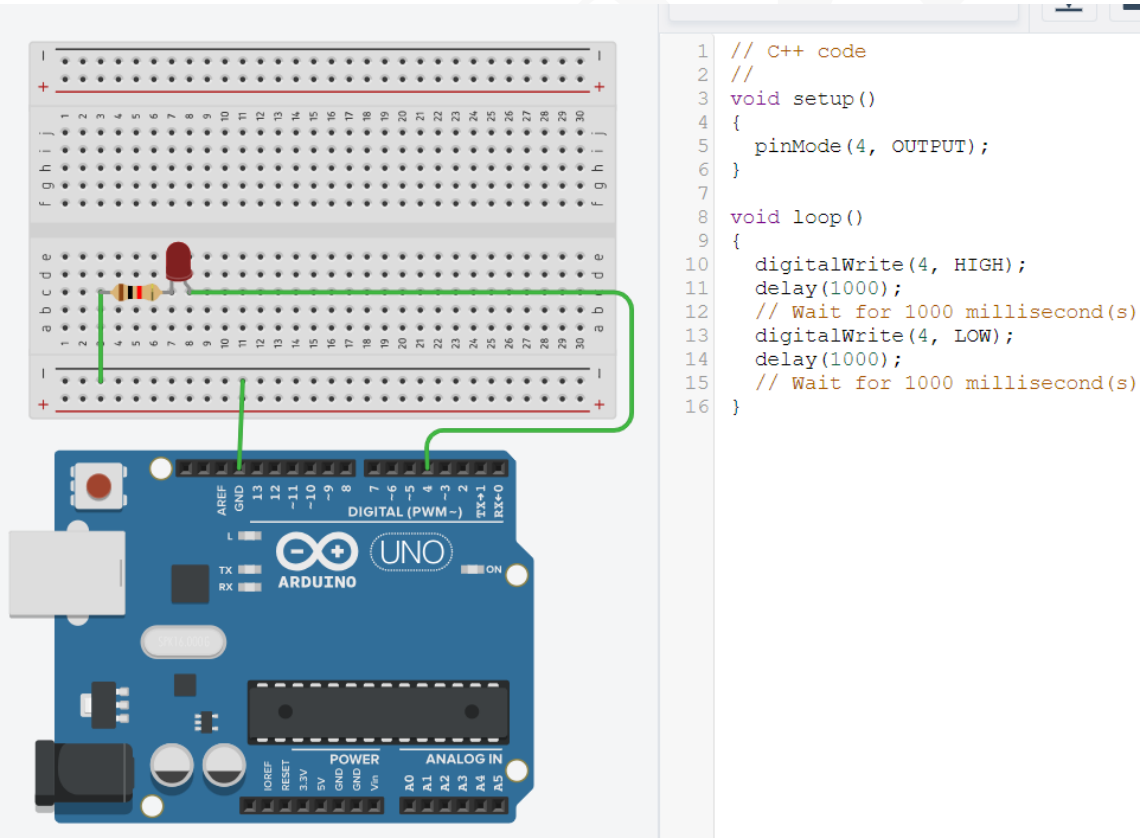


Code –

```
 void setup()
 {
   pinMode(4, OUTPUT);
 }
 void loop()
 {
   digitalWrite(4, HIGH);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(4, LOW);
   delay(1000); // Wait for 1000 millisecond(s)
}
```

RESULTS:

In this experiment, we learnt how to blink an LED using Arduino Uno.



EXPERIMENT 3

OBJECTIVE: To blink multiple LEDs using Arduino Uno and breadboard.

SOFTWARE USED: Tinkercad Simulator.

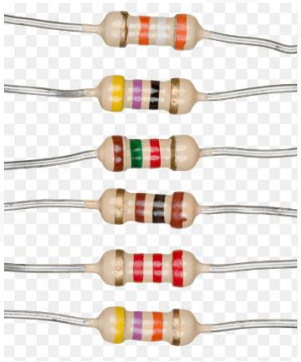
HARDWARE USED:

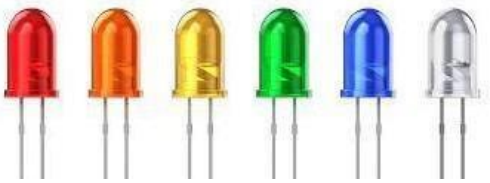
Sr No.	Name of the Component	Value
1.	Arduino Uno Board	1
2.	Breadboard	1
3.	Jumper Wires	11
4.	LED	5
5.	Resistor	1000 ohm

THEORY:

1) **Resistor:** Resistors are used in virtually all electronic circuits and many electrical ones. Resistors, as their name indicates resist the flow of electricity and this function is key to the operation most circuits.

2) **LED:** A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons (Energy packets).





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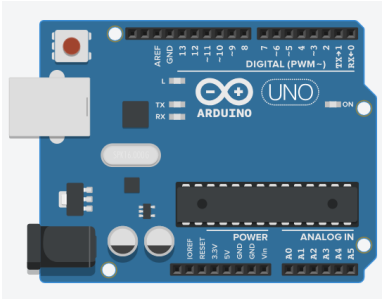
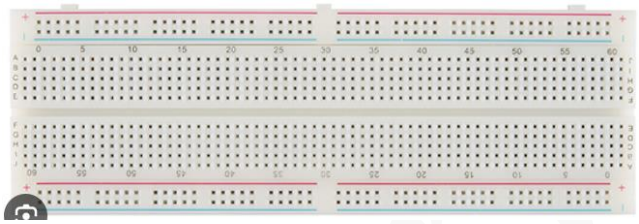
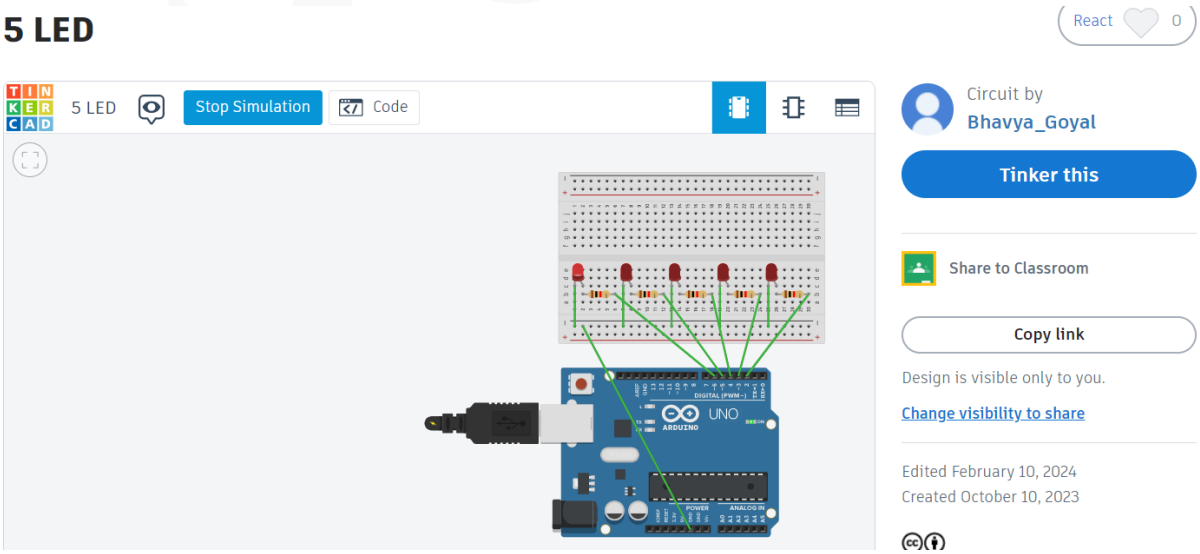


4) **Breadboard:** A breadboard is used to place components (resistor, capacitor, LED's etc.)that are wired together. It is used to make temporary circuits.



5) **Jumper Wires:** A jumper wire is an electric wire that connects remote electric circuitsused for printed circuit boards.

TINKERCAD DIAGRAM:



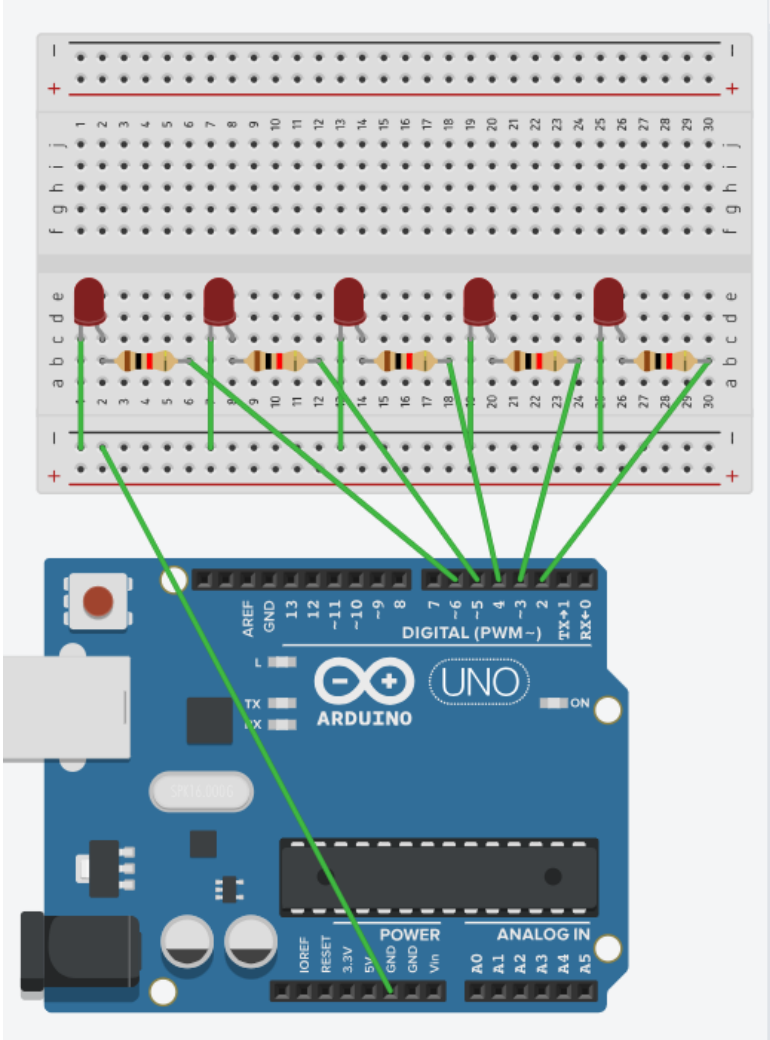
Code –

```
 void setup()
 {
   pinMode(6, OUTPUT);
   pinMode(5, OUTPUT);
   pinMode(4, OUTPUT);
   pinMode(3, OUTPUT);
   pinMode(2, OUTPUT);
 }
 void loop()
 {
   digitalWrite(6, HIGH);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(6, LOW);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(5, HIGH);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(5, LOW);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(4, HIGH);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(4, LOW);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(3, HIGH);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(3, LOW);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(2, HIGH);
   delay(1000); // Wait for 1000 millisecond(s)
   digitalWrite(2, LOW);
   delay(1000); // Wait for 1000 millisecond(s)
}
```

RESULTS:

In this experiment, we learnt how to blink multiple LEDs using Arduino Uno and breadboard.

OUTPUT:




```
// C++ code
//
void setup()
{
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(2, OUTPUT);
}

void loop()
{
  digitalWrite(6, HIGH)
  delay(1000);
  digitalWrite(6, LOW);
  delay(1000);
  digitalWrite(5, HIGH)
  delay(1000); // Wait
  digitalWrite(5, LOW);
  delay(1000); // Wait
  digitalWrite(4, HIGH)
  delay(1000); // Wait
  digitalWrite(4, LOW);
  delay(1000); // Wait
  digitalWrite(3, HIGH)
  delay(1000); // Wait
  digitalWrite(3, LOW);
  delay(1000); // Wait
  digitalWrite(2, HIGH)
  delay(1000); // Wait
  digitalWrite(2, LOW);
  delay(1000); // Wait
}
```

EXPERIMENT 4

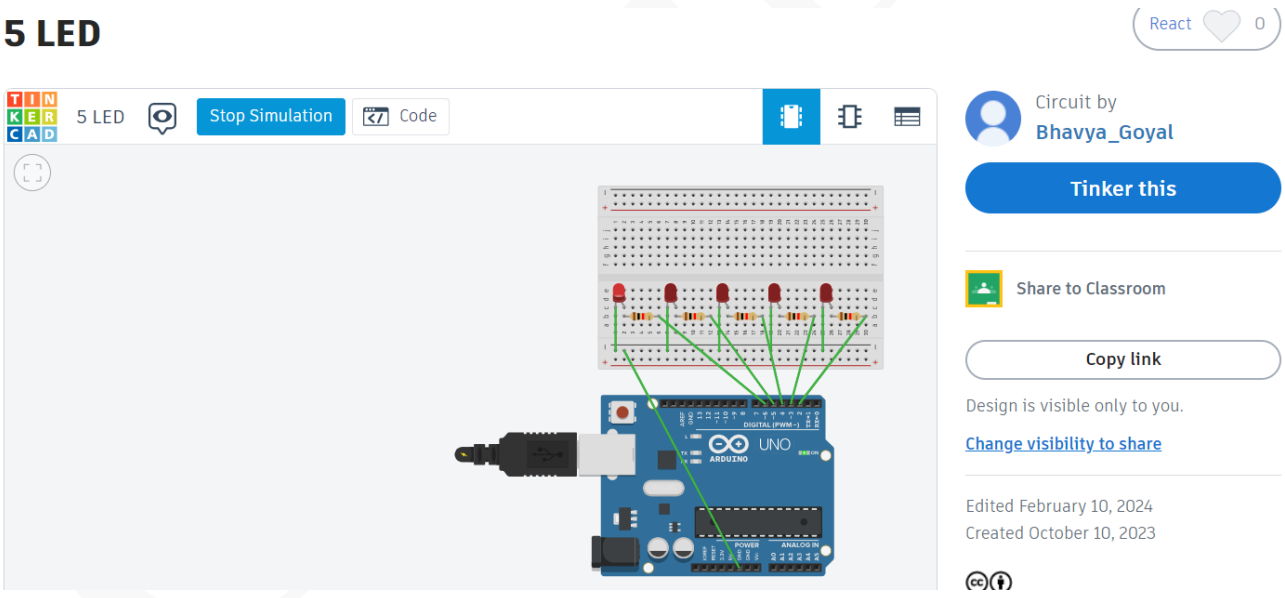
OBJECTIVE: Write a program to design a pattern of sequence of multiple LED's using for loop in Arduino.

SOFTWARE USED: Tinkercad Simulator.

HARDWARE USED:

Sr No.	Name of the Component	Value
1.	Arduino Uno Board	1
2.	Breadboard	1
3.	Jumper Wires	11
4.	LED	5
5.	Resistor	1000 ohm

TINKERCAD DIAGRAM:



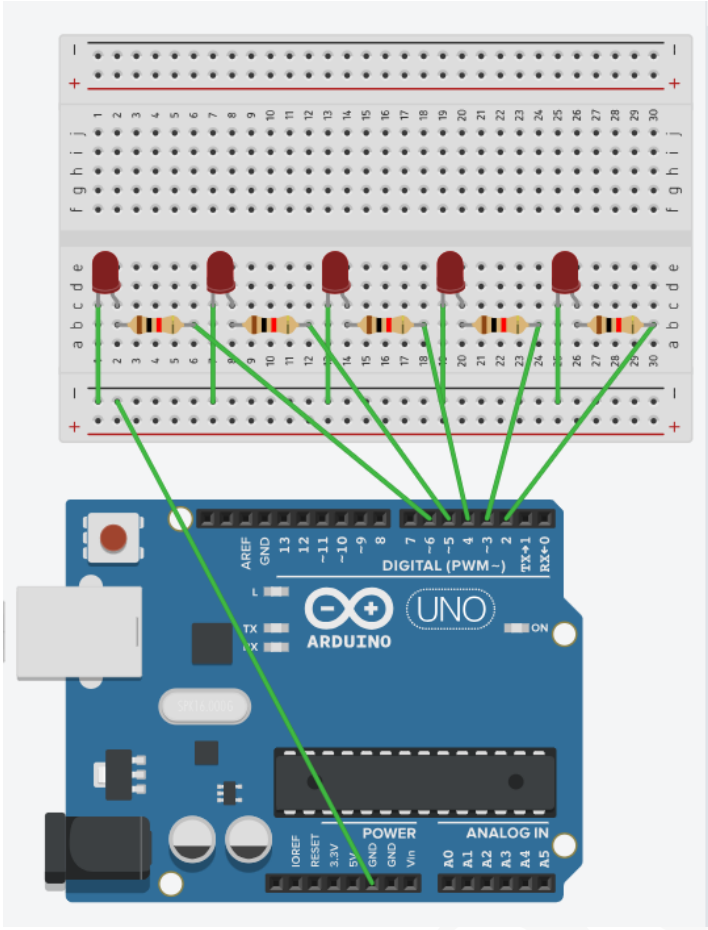
Code –

```
 void setup()
 {
   pinMode(6, OUTPUT);
   pinMode(5, OUTPUT);
   pinMode(4, OUTPUT);
   pinMode(3, OUTPUT);
   pinMode(2, OUTPUT);
 }

 void loop()
 {
   //pattern: 123543123543.....
   for(int i=6;i>3;i--){
     digitalWrite(i,HIGH);
     delay(500);
     digitalWrite(i,LOW);
     delay(500);
   }
   for(int i=2;i<=4;i++){
     digitalWrite(i,HIGH);
     delay(500);
     digitalWrite(i,LOW);
     delay(500);
   }
}
```

RESULTS:

In this experiment, we learnt how to design a pattern of sequence of multiple LED's using for loop in Arduino.

Output:




```
// C++ code
//
void setup()
{
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(2, OUTPUT);
}

void loop()
{
  //pattern: 123543123543.....
  for(int i=6;i>3;i--){
    digitalWrite(i,HIGH);
    delay(500);
    digitalWrite(i,LOW);
    delay(500);
  }
  for(int i=2;i<=4;i++){
    digitalWrite(i,HIGH);
    delay(500);
    digitalWrite(i,LOW);
    delay(500);
  }
}
```

EXPERIMENT 5

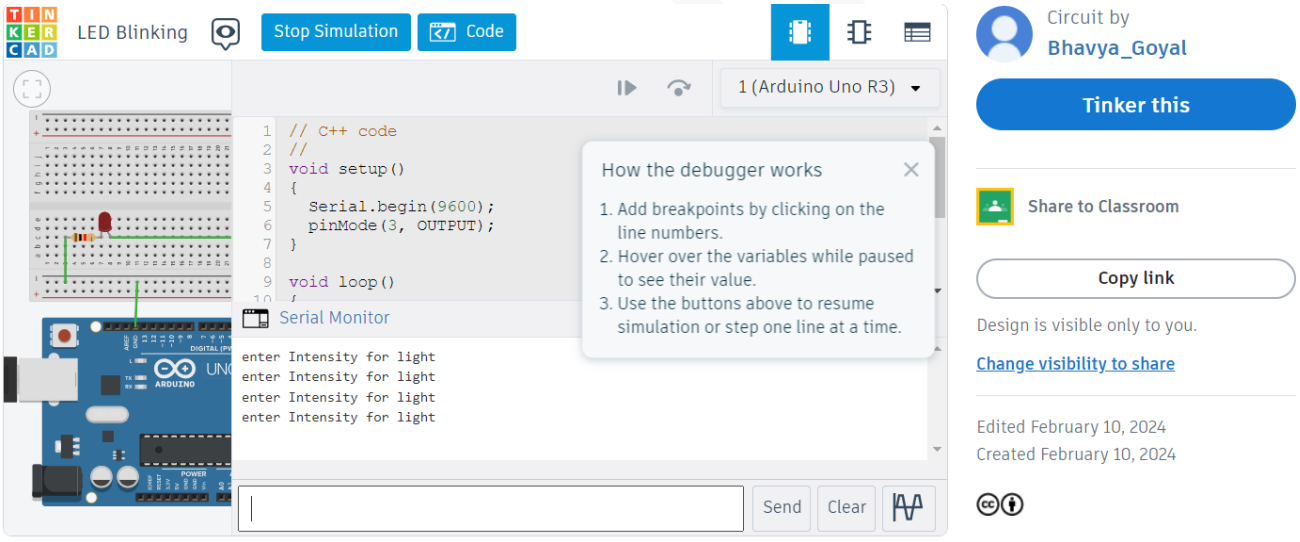
OBJECTIVE: Write a program to demonstrate sending data from the computer to the Arduino board and control brightness of LED.

SOFTWARE USED: Tinkercad Simulator.

HARDWARE USED:

Sr No.	Name of the Component	Value
1.	Arduino Uno Board	1
2.	Breadboard	1
3.	Jumper Wires	3
4.	LED	1
5.	Resistor	1000 ohm

TINKERCAD DIAGRAM:



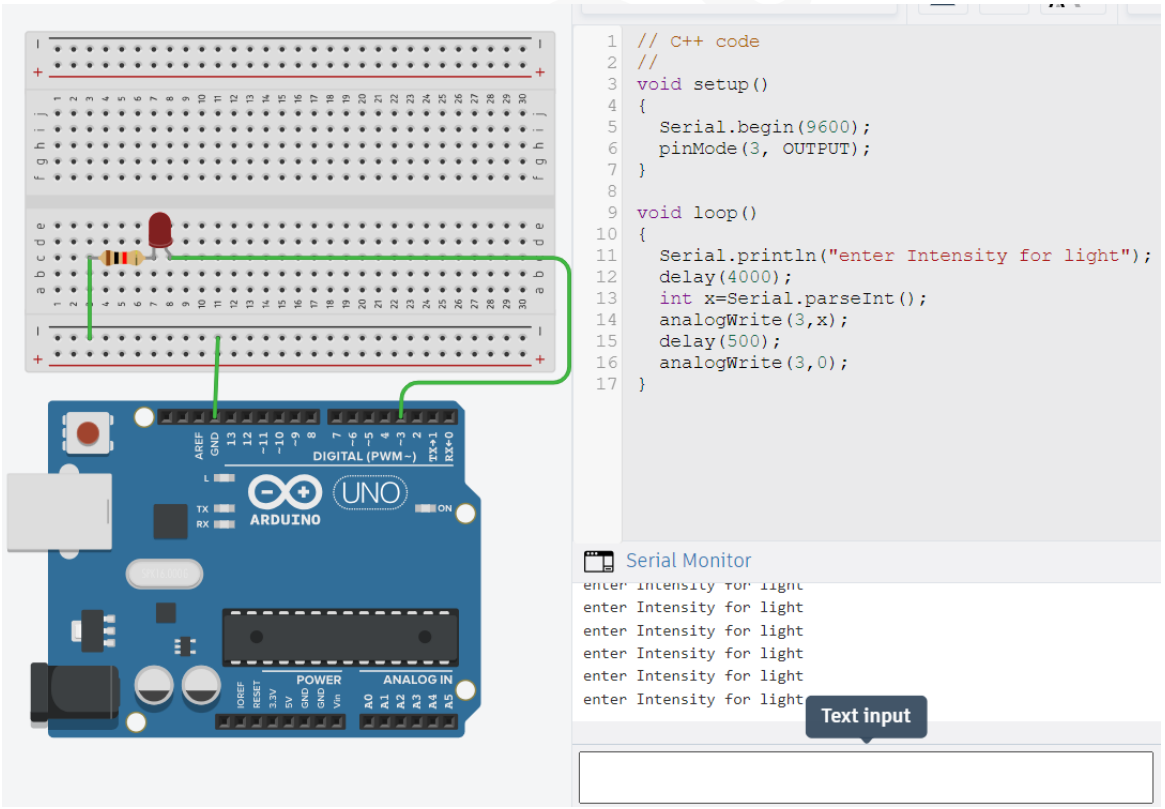
Code –

```
void setup()
 {
  Serial.begin(9600);
  pinMode(3, OUTPUT);
 }

 void loop()
 {
  Serial.println("enter Intensity for light");
  delay(4000);
  int x=Serial.parseInt();
  analogWrite(3,x);
  delay(500);
  analogWrite(3,0);
}
```

RESULTS:

In this experiment, we learnt how to demonstrate sending data from the computer to the Arduino board and control brightness of LED.

Output:



EXPERIMENT 6

OBJECTIVE: *Serial Communication:*

WAP to print following pattern using for loop.

****

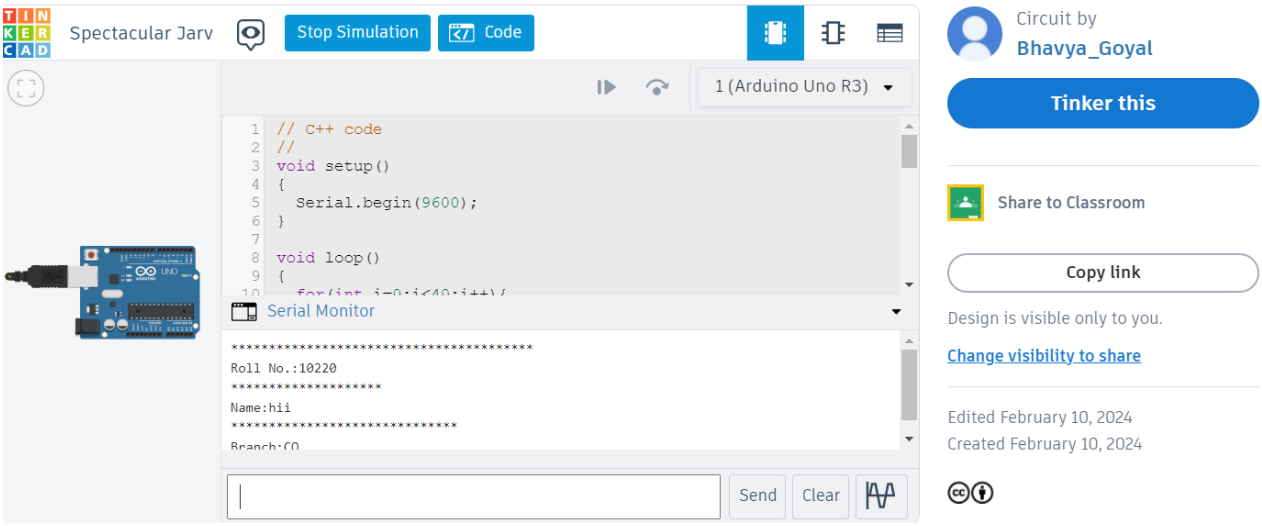
RollNo.
****
Name:
****
Branch:
****

SOFTWARE USED: Tinkercad Simulator.

HARDWARE USED:

Sr No.	Name of the Component	Value
1.	Arduino Uno Board	1
2.	Breadboard	1
3.	Jumper Wires	11
4.	LED	5
5.	Resistor	1000 ohm

TINKERCAD DIAGRAM:



Code –

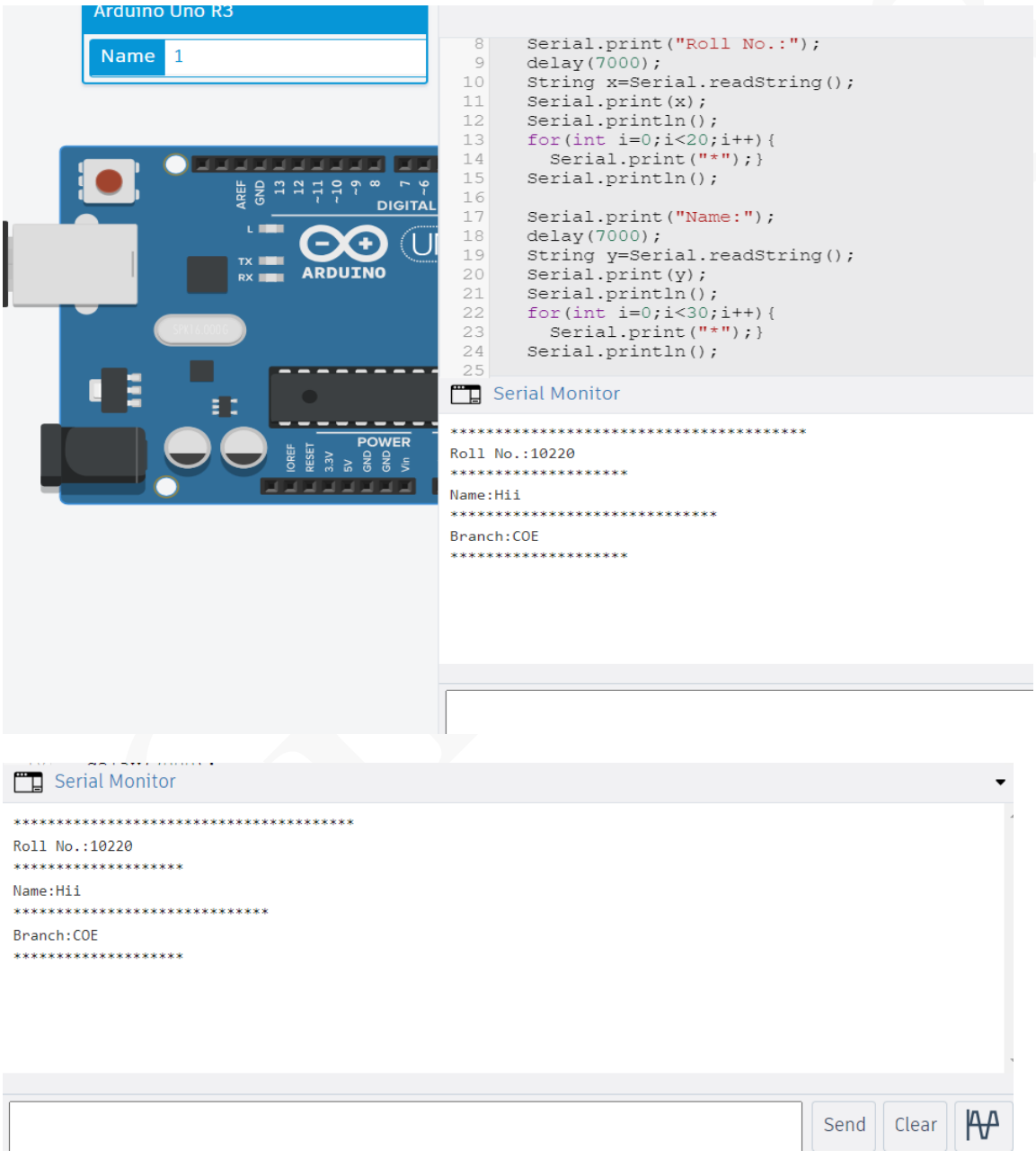
```
void setup()
{
  Serial.begin(9600);
  for(int i=0;i<40;i++){
    Serial.print("*");}
  Serial.println();

  Serial.print("Roll No.:");
  delay(7000);
  String x=Serial.readString();
  Serial.print(x);
  Serial.println();
  for(int i=0;i<20;i++){
    Serial.print("*");}
  Serial.println();

  Serial.print("Name:");
  delay(7000);
  String y=Serial.readString();
  Serial.print(y);
  Serial.println();
  for(int i=0;i<30;i++){
    Serial.print("*");}
  Serial.println();

  Serial.print("Branch:");
  delay(7000);
  String z=Serial.readString();
  Serial.print(z);
  Serial.println();
  for(int i=0;i<20;i++){
    Serial.print("*");}
  Serial.println();
}
```

```
 void loop()
  {
}
```

RESULTS:

In this experiment, we learnt how to do Serial Communication.

Output:



EXPERIMENT 7

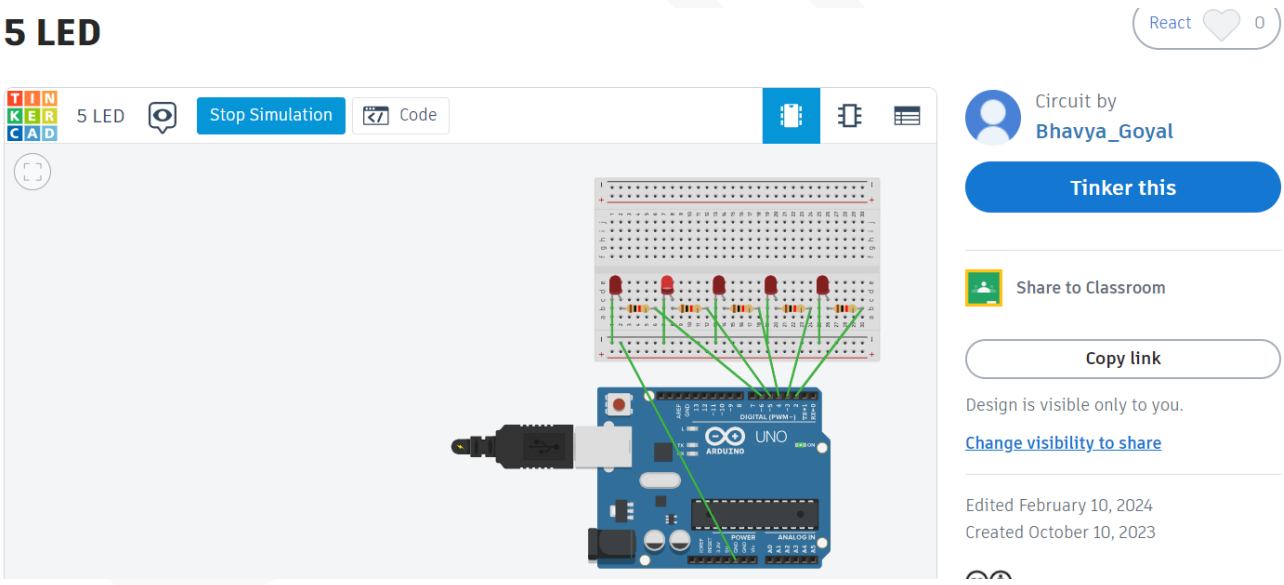
OBJECTIVE: Write a program to change the intensity of the given LED'sfor the sequence 35214 in for both forward and reverse order.

SOFTWARE USED: Tinkercad Simulator.

HARDWARE USED:

Sr No.	Name of the Component	Value
1.	Arduino Uno Board	1
2.	Breadboard	1
3.	Jumper Wires	11
4.	LED	5
5.	Resistor	1000 ohm

TINKERCAD DIAGRAM:



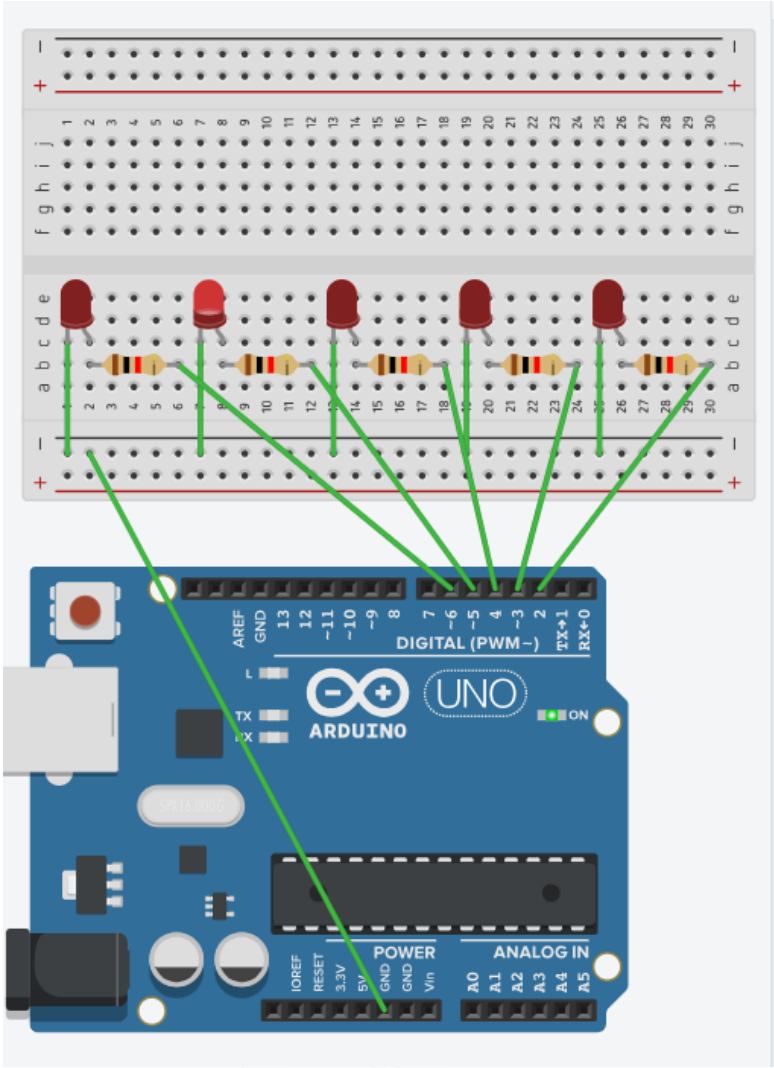
Code –

```
 void setup()
 {
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(2, OUTPUT);
 }

 void loop()
 {
  int array[]={4,2,5,6,3};
  //forward 35214
  for(int i=0;i<5;i++){
   analogWrite(array[i],255);
   delay(1000);
   analogWrite(array[i],10);
  }
  delay(1000);
  //backward 41253
  for(int i=4;i>=0;i--){
   analogWrite(array[i],255);
   delay(500);
   analogWrite(array[i],10);
  }
}
```

RESULTS:

In this experiment, we learnt how to change the intensity of the given LED'sfor the sequence 35214 in for both forward and reverse order.

Output:




```
// C++ code
//
void setup()
{
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(2, OUTPUT);
}

void loop()
{
  int array[]={4,2,5,6,3};
  //forward 35214
  for(int i=0;i<5;i++){
    analogWrite(array[i],255);
    delay(1000);
    analogWrite(array[i],10);
  }
  delay(1000);
  //backward 41253
  for(int i=4;i>=0;i--){
    analogWrite(array[i],255);
    delay(500);
    analogWrite(array[i],10);
  }
}
```

EXPERIMENT 8

OBJECTIVE: Write a program to demonstrate control of DC Motor using forward, backward, left, right turn motion and clock-wise/anti clock- wise rotation.

SOFTWARE USED: Arduino

HARDWARE USED:

Sr No.	Name of the Component	Value
1.	Buggy	1

ARDUINO PROGRAM CODE:

```
void setup() {
  pinMode(5,OUTPUT);
  pinMode(6,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(8,OUTPUT);
}

void forward(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void backward(){
  digitalWrite(5,LOW);
  digitalWrite(6,HIGH);
  digitalWrite(7,HIGH);
  digitalWrite(8,LOW);
}
void right(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,LOW);
}
void left(){
```

```
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
 }
 void anticlockwise(){
  digitalWrite(5,LOW);
  digitalWrite(6,HIGH);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
 }
 void clockwise(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,HIGH);
  digitalWrite(8,LOW);
 }
 void loop() {
  //square
  forward();
  delay(3000);
  right();
  delay(2150);
  forward();
  delay(3000);
  right();
  delay(2150);
  forward();
  delay(3000);
  right();
  delay(2150);
  forward();
  delay(3000);

  exit(1);
}
```

RESULTS:

In this experiment, we learnt how to demonstrate control of DC Motor using forward, backward, left, right turn motion and clock-wise/anti clock- wise rotation.

Output:

square_co29.ino

```
void setup() {
  pinMode(5,OUTPUT);
  pinMode(6,OUTPUT);
  pinMode(7,OUTPUT);
  pinMode(8,OUTPUT);
}

void forward(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void backward(){
  digitalWrite(5,LOW);
  digitalWrite(6,HIGH);
  digitalWrite(7,HIGH);
  digitalWrite(8,LOW);
}
void right(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,LOW);
}
void left(){
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void anticlockwise(){
  digitalWrite(5,LOW);
  digitalWrite(6,HIGH);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void clockwise(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,HIGH);
  digitalWrite(8,LOW);
}
void loop() {
  //square
  forward();
  delay(3000);
  right();
  delay(2150);
  forward();
  delay(3000);
  right();
  delay(2150);
  forward();
  delay(3000);
  right();
  delay(2150);
  forward();
  delay(3000);

  exit(1);
}

```

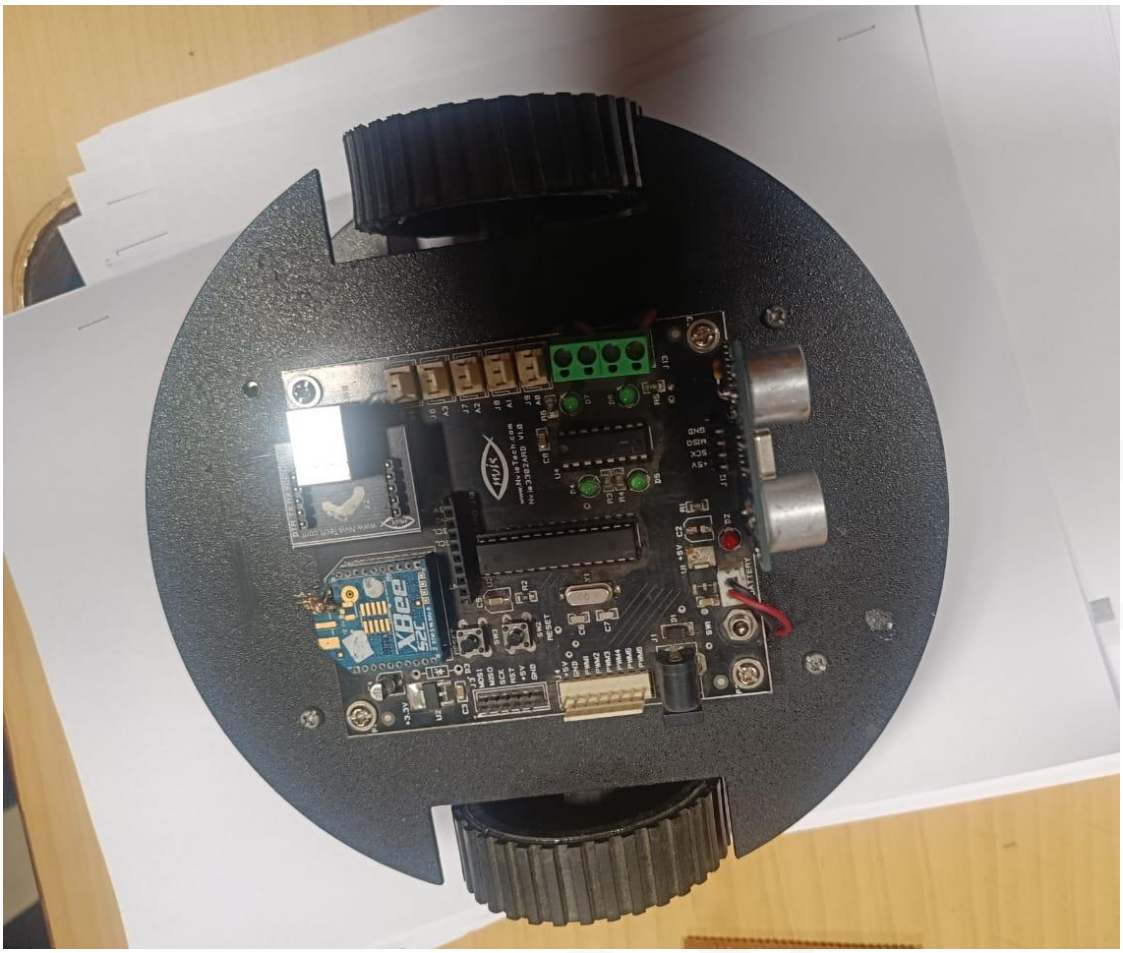


Fig:
Buggy performing forward, backward, left, right turn motion and clock-wise/anti clock- wise rotation.

EXPERIMENT 9

OBJECTIVE: Write a program to read values of IR Sensor using analogand digital read and convert buggy into normal line follower robocar

SOFTWARE USED: Arduino

HARDWARE USED:

Sr No.	Name of the Component	Value
1.	Buggy	1
2.	IR Sensor	1

ARDUINO PROGRAM CODE:

```
int count=0;
void setup() {
  pinMode(A0,INPUT);
  pinMode(A1,INPUT);
  for(int i=5;i<=8;i++){
    pinMode(i,OUTPUT);
  }
}
void forward(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void right(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,LOW);
}
void left(){
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
```

```
  digitalWrite(8,HIGH);
 }
 void stopf(){
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,LOW);
 }
 void loop() {
  int l,r;
  l=digitalRead(A1);
  r=digitalRead(A0);
  if(l && r){
   forward();
  }
  else if(l && !r){
   right();
  }
  else if(!l && r){
   left();
  }
  else{
   count++;
   if(count<=3){
    forward();
   }
   else{
    stopf();
    delay(5000);
   }
  }
}
```

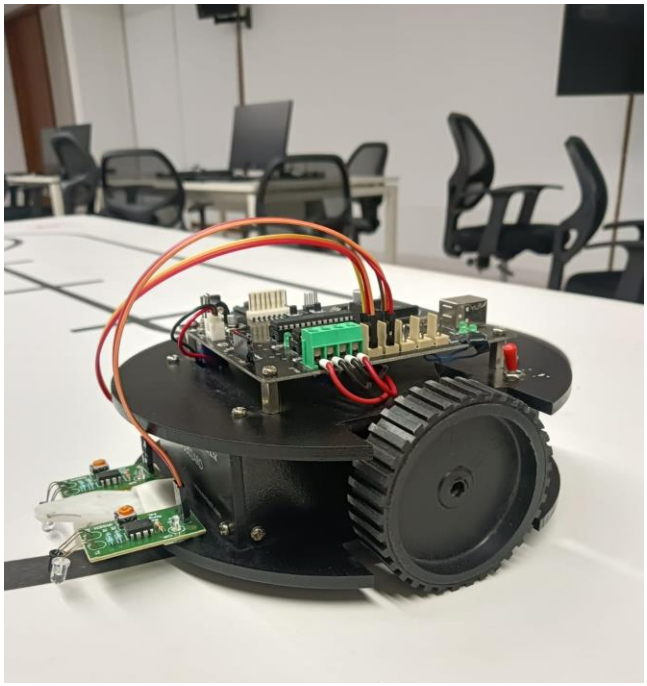
RESULTS:

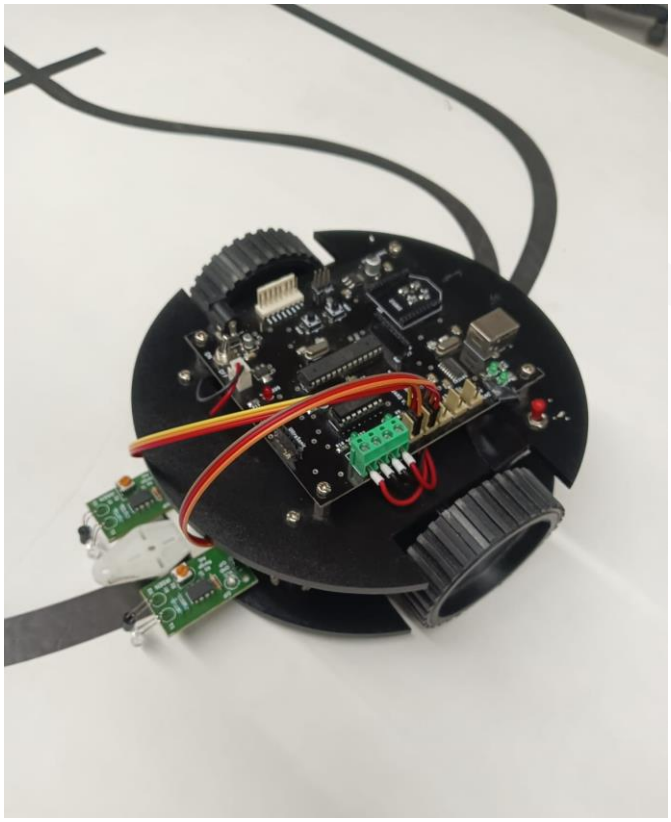
In this experiment, we learnt how to read values of IR Sensor using analogand digital read and convert buggy into normal line follower robocar

Output:

ir_sensor.ino

```
int count=0;
void setup() {
  pinMode(A0,INPUT);
  pinMode(A1,INPUT);
  for(int i=5;i<=8;i++){
    pinMode(i,OUTPUT);
  }
}
void forward(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void right(){
  digitalWrite(5,HIGH);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,LOW);
}
void left(){
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,HIGH);
}
void stopf(){
  digitalWrite(5,LOW);
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
  digitalWrite(8,LOW);
}
void loop() {
  int l,r;
  l=digitalRead(A1);
  r=digitalRead(A0);
  if(l && r){
    forward();
  }
  else if(l && !r){
    right();
  }
  else if(!l && r){
    left();
  }
  else{
    count++;
    if(count<=3){
      forward();
    }
    else{
      stopf();
      delay(5000);
    }
  }
}
```





----------THANK YOU----------