Introduction to Embedded System Development with Arduino
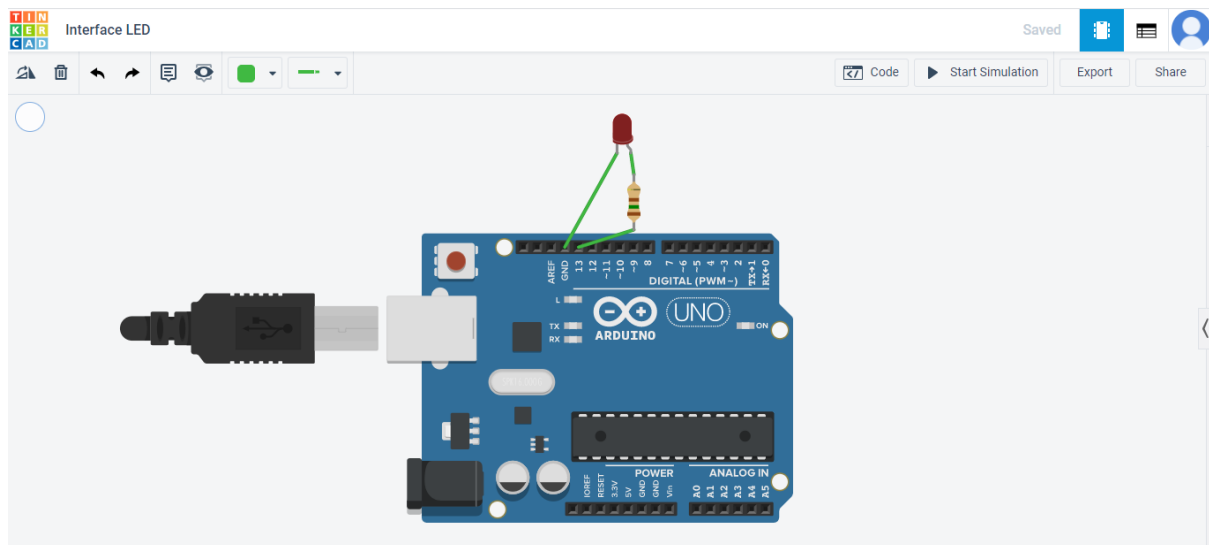
JUNE 6

Task 1:
Create Tinkercad account

Interfacing of an LED with Arduino UNO Rev 3.

The LED is connected to pin 13 and blinks for 0.5s.Resistor(150 ohm) was used.

CODE:

```
void setup()
{
  pinMode(13,OUTPUT);
}
void loop()
{
  digitalWrite(13,HIGH);
  delay(500);
  digitalWrite(13,LOW);
  delay(1000);
}
```

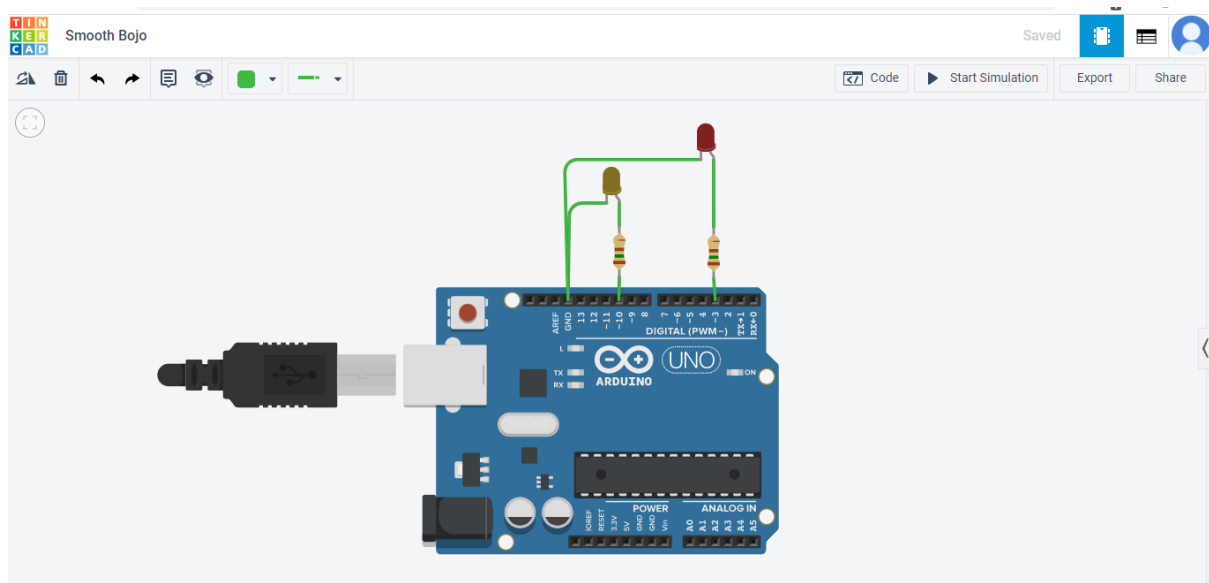# Blink the LEDs alternatively.

Connect LED to digital pin 3. Connect LED to digital pin 10. Each LED blinks for 0.5s.Use 150 ohm resistor for both LEDs.

CODE:

```
void setup()
{
  pinMode(10, OUTPUT);
  pinMode(3, OUTPUT);
}

void loop()
{
  digitalWrite(10, HIGH);
  digitalWrite(3, LOW);
  delay(1000);
  digitalWrite(10, LOW);
  digitalWrite(3, HIGH);
  delay(1000);
}
```
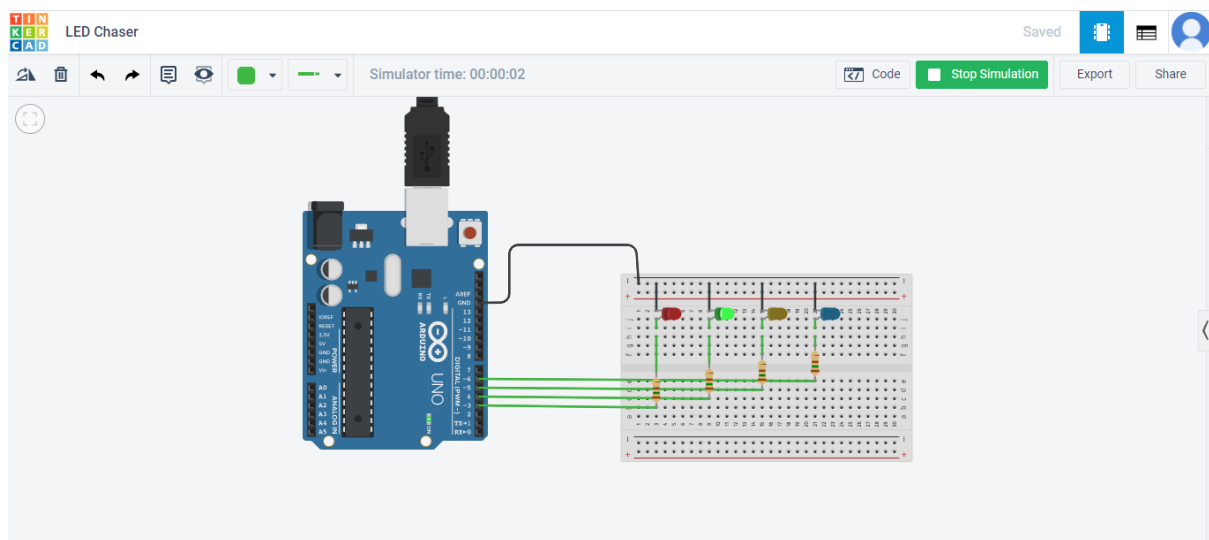
LED Chaser

Connect LEDs to digital pins 3,4,5,6. Make LED chaser with 0.5s. The four LEDs blink one after the other for 0.5s until powered off.

CODE:

```
int pin[]={3,4,5,6};
void setup()
{
  for(int i=0;i<4;i++)
  {
  pinMode(pin[i], OUTPUT);
  }
}
void loop()
{
  for(int i=0;i<4;i++)
  {
   digitalWrite(pin[i], HIGH);
  delay(500);
  digitalWrite(pin[i], LOW);
  }
}
```

LED CHASER 2

Connect LEDs to digital pins 3,4,5,6. Make LEDs chase in clockwise direction and after 10 cycles make the LEDs chase in anticlockwise direction. This is repeated until power is turned off.

CODE:

```
int pin[]={3,4,5,6};
void setup()
{
  for(int i=0;i<4;i++)
  {
      pinMode(pin[i], OUTPUT);
  }
}

void loop()
{
  for(int i=0;i<10;i++)
  {
    for(int i=0;i<4;i++)
    {
      digitalWrite(pin[i], HIGH);
        delay(500);
      digitalWrite(pin[i], LOW);
    }
  }
 delay(2000);
 for(int i=0;i<10;i++)
  {
    for(int i=3;i>=0;i--)
    {
      digitalWrite(pin[i], HIGH);
        delay(500);
      digitalWrite(pin[i], LOW);
    }
```

```
  }
  delay(2000);
}
```
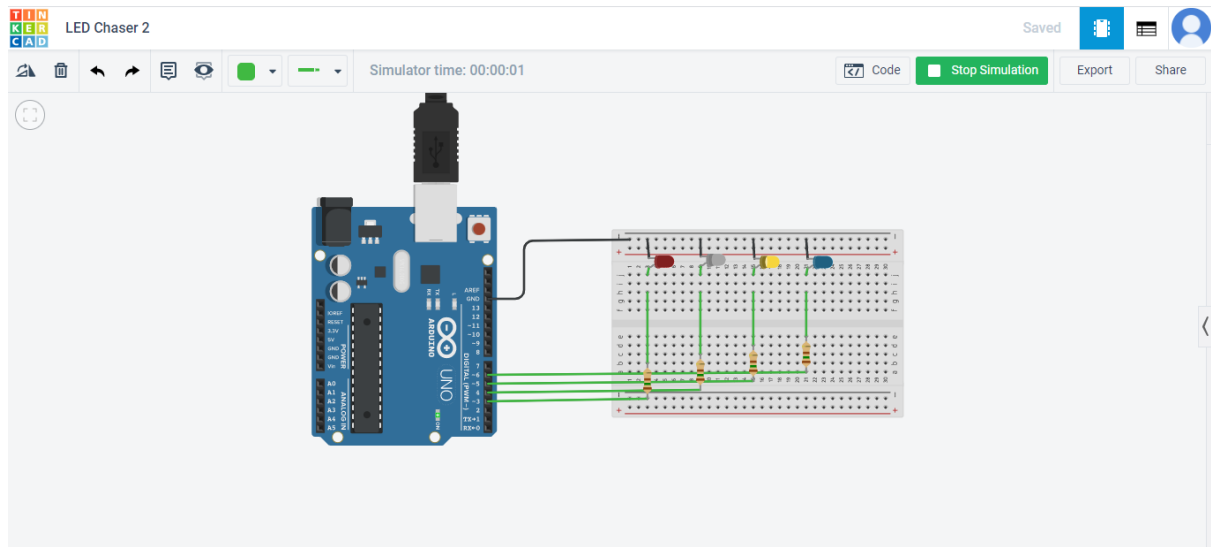

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Control LED using switch

The LED is connected to pin 5 and the switch to pin 8. The switch is pulled up using a resistor. The LED is turned on when the switch is closed and turned off when the switch is open.
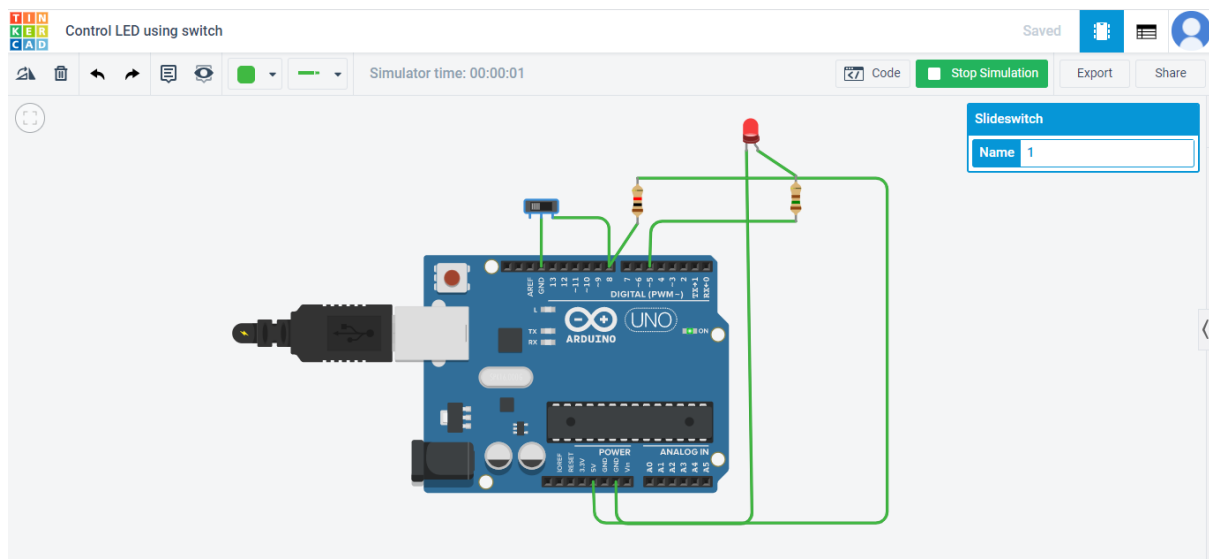
CODE:

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

```
void loop()
{
  int stat= digitalRead(8);
  if(stat==1)
    digitalWrite(5,HIGH);
  else
    digitalWrite(5,LOW);
}
```


Control two LEDs using a switch

One LED is connected to pin 10 and the other to pin 0.The switch is connected to pin 8 and pulled up using a resistor. LED at pin 10 is turned on and LED at pin 0 is off when the switch is closed and vice versa when switch is open.
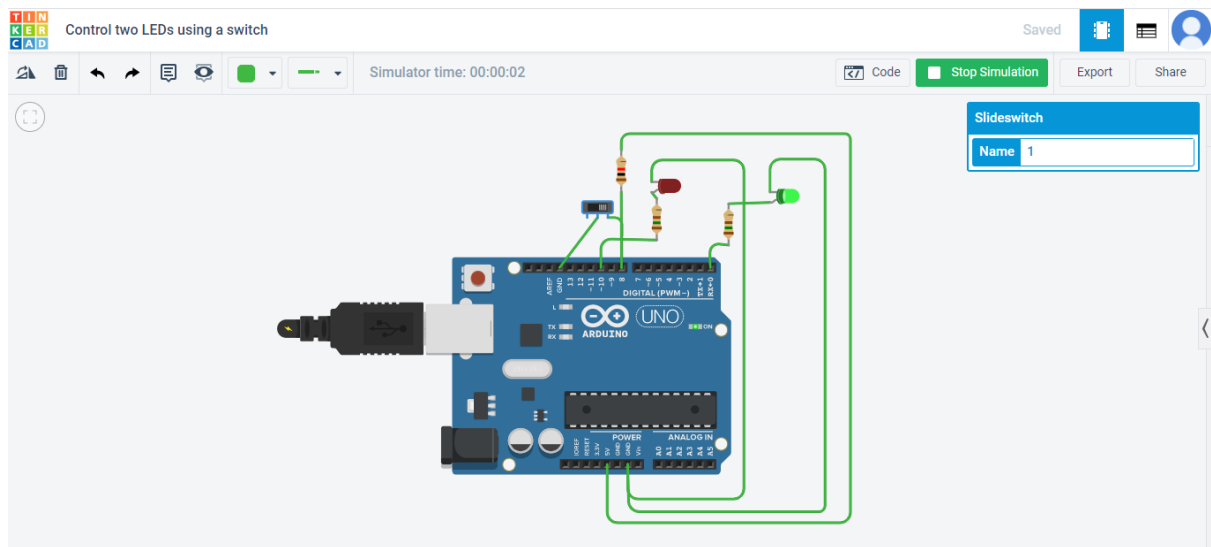
CODE:

```
void setup()
{
  pinMode(10, OUTPUT);
  pinMode(0, OUTPUT);
  pinMode(8, INPUT);
}
```

```
void loop()
{
  int stat= digitalRead(8);
  if(stat == 1)
  {
    digitalWrite(10,HIGH);
    digitalWrite(0,LOW);
  }
  else
  {
    digitalWrite(0,HIGH);
    digitalWrite(10,LOW);

  }
}
```

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Write a program to print Hello continuously.

CODE:
```
void setup()
{
  Serial.begin(9600);
}
void loop()
{
  Serial.println("Hello");
}
```

Control LED using switch 2

The switch is connected to pin 3 and switch to pin 5. The switch is pulled up using a resistor. The LED is turned on when the switch is closed and turned off when the switch is open. The code also prints the status of the switch
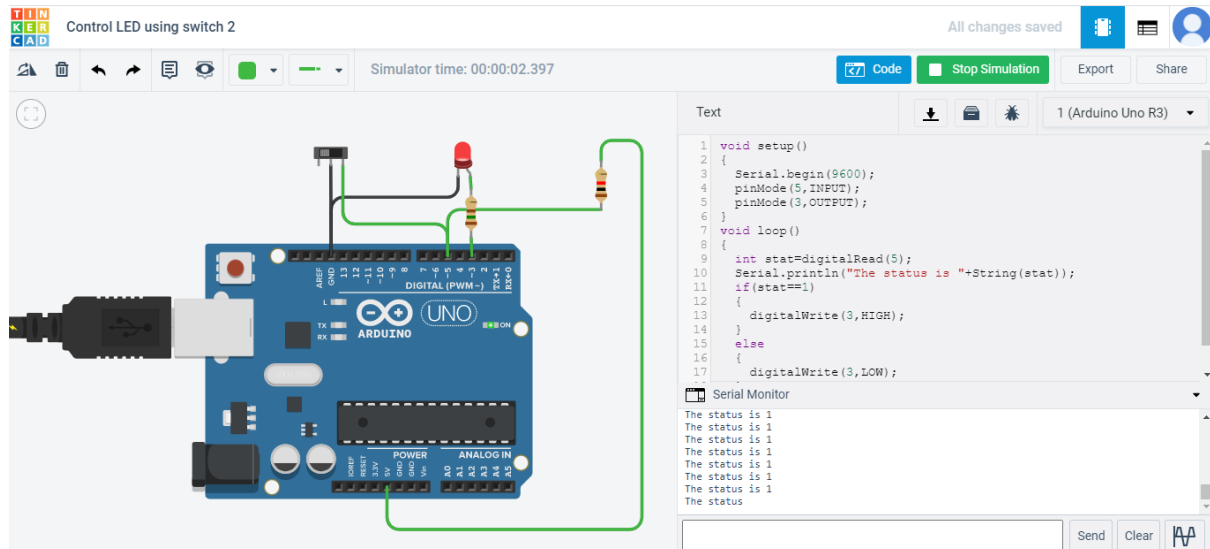
CODE:

```
void setup()
{
  Serial.begin(9600);
  pinMode(5,INPUT);
  pinMode(3,OUTPUT);
}
void loop()
{
  int stat=digitalRead(5);
  Serial.println("The status is "+String(stat));
  if(stat==1)
  {
    digitalWrite(3,HIGH);
  }
```

```
  else
  {
    digitalWrite(3,LOW);
  }
}
```


Interface a PIR Sensor

The sensor is connected to pin 8.When motion is detected the program prints "motion detected" and prints "No motion detected" when no motion is detected.

CODE:

```
void setup()
{
  pinMode(8,INPUT);
  Serial.begin(9600);
}

void loop()
{
  int stat= digitalRead(8);
```

```
  if(stat==1)
  {
    Serial.println("Motion detected");
  }
  else
  {
    Serial.println("No motion detected");
  }

}
```
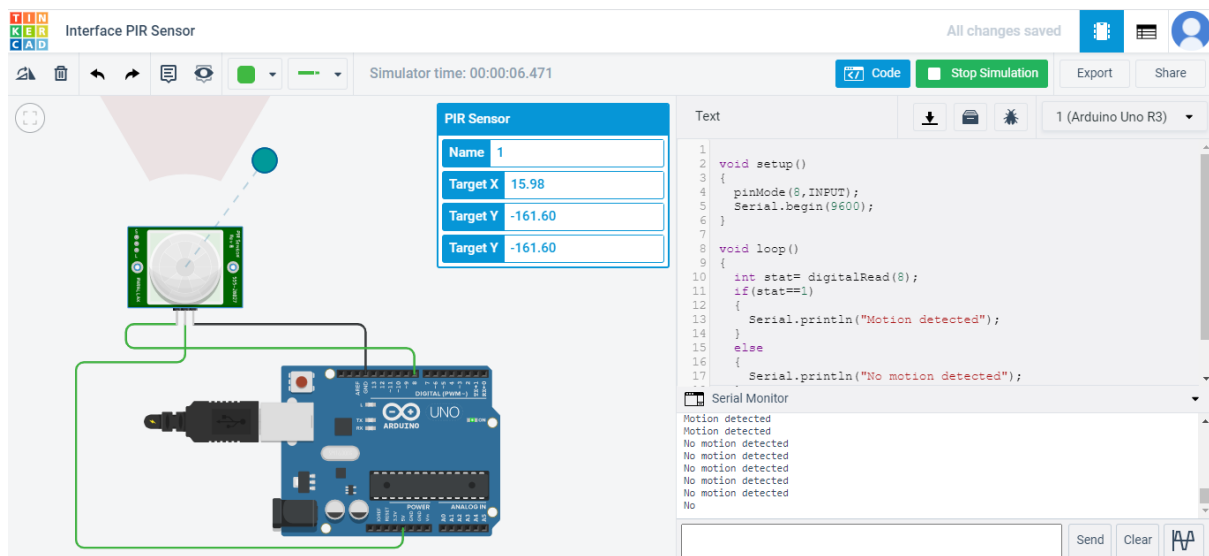

Control LED using character Input

The LED is connected to pin 11 and when the character 'A' is typed the LED is turned on and when the character 'a' is typed the LED is turned off.

CODE:

```
char c;
void setup()
{
  Serial.begin(9600);
  pinMode(11, OUTPUT);
```

```
}

void loop()
{
  Serial.println("Type a character");
  if(Serial.available()>0)
  {
  c= Serial.read();

  if(c=='A')
    {
      digitalWrite(11,HIGH);
}
  if(c=='a')
  {
    digitalWrite(11,LOW);
  }
  }
}
```

Saved

Simulator time: 00:00:02.104   Code   Stop Simulation   Export   Share

Text   1 (Arduino Uno R3)

```
1  char c;
2  void setup()
3  {
4    Serial.begin(9600);
5    pinMode(11, OUTPUT);
6  }
7
8  void loop()
9  {
10   Serial.println("Type a character");
11   if(Serial.available()>0)
12   {
13   c= Serial.read();
14
15   if(c=='A')
16     {
17       digitalWrite(11,HIGH);
```

Serial Monitor

```
Type a character
Type a character
Type a character
Type a character
Type a character
Type a character
Type a character
Type a
```

Send   Clear

JUNE 10

Interface Ultrasonic sensor HC-SR04 with Arduino

The trigger pin is connected to pin 6 and echo pin is connected to pin 3. The distance between the sensor and the object is calculated and printed.

A pulse is sent from Arduino to the trigger pin hence that pin is an output pin and the echo pin sends a signal to the Arduino hence it is an input pin.

CODE:

```
float hightime=0;
float distance=0;
void setup()
{
  Serial.begin(9600);
  pinMode(6,OUTPUT); //triggerpin
  pinMode(3,INPUT); //echopin

}

void loop()
{
  digitalWrite(6, LOW);
  delayMicroseconds(2);
  digitalWrite(6,HIGH);
  delayMicroseconds(10);
  digitalWrite(6,LOW);
  hightime= pulseIn(3 , HIGH);
  distance= (hightime*0.034)/2;
  Serial.println("Distance is " + String(distance));
  delay(1000);
 }
```
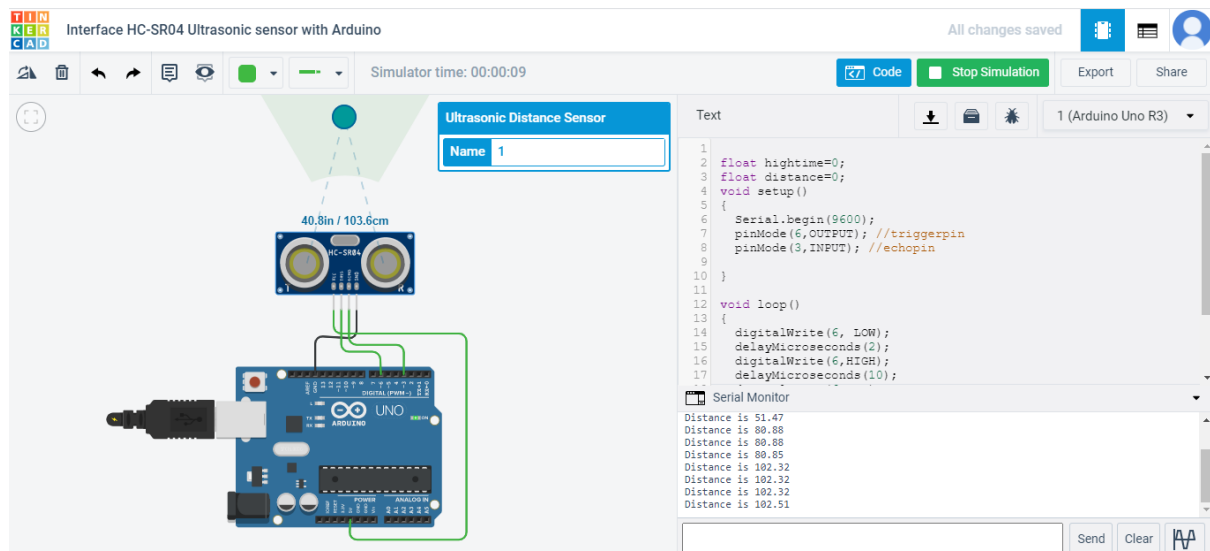
Interface DC Motor using L293D

The motor is connected to output 1 and 2 of the IC. Pins 4,5,12,13 of the IC are connected to ground. Pins 16,1,7 are connected to 5V of Arduino. Input 1 and Input 2 of the IC are connected to pins 2 and 3 of Arduino respectively. The program rotates the motor in clockwise direction if 'C' is input and rotates in the anticlockwise direction if 'A' is input.

CODE:
```
char c;
void setup()
{
  Serial.begin(9600);
  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
}

void loop()
{
  Serial.println("Enter a either A or C");
  if(Serial.available()>0)
  {
      c= Serial.read();
```
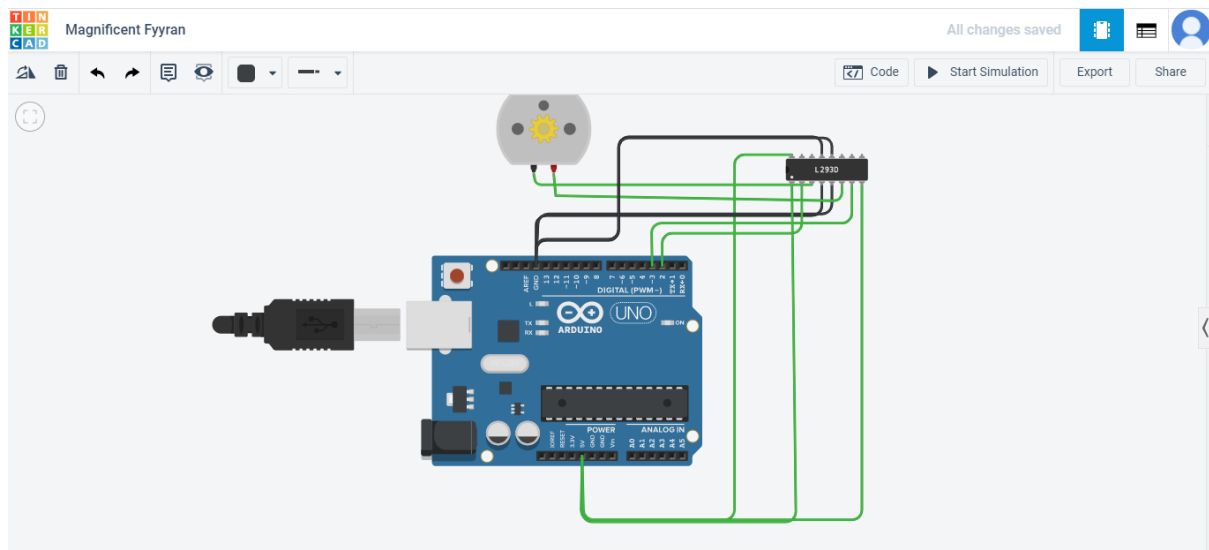
```
    if(c=='A')
    {
    digitalWrite(2,HIGH);
    digitalWrite(3,LOW);


    }
    if(c=='C')
    {
    digitalWrite(3,HIGH);
    digitalWrite(2,LOW);


    }
  }
}
```


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Interface DC Motor with L293D Speed Control

The motor is connected to output 1 and 2 of the IC. Pins 4,5,12,13 of the IC are connected to ground. Pins 16 and 7 are connected to 5V of Arduino. Input 1 and Input 2 of the IC are connected to pins 2 and 3 of Arduino respectively. Pin 1 of the IC is connected to pin 5 of Arduino.

The program rotates the motor in clockwise direction if 'C' is input and rotates in the anticlockwise direction if 'A' is input. In both cases the motor starts at 0 speed and gradually increases its speed to the maximum value.

CODE:

```
char c;
void setup()
{
  Serial.begin(9600);
  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(5, OUTPUT);
}

void loop()
{
   Serial.println("Enter a either A or C");
  if(Serial.available()>0)
  {
      c= Serial.read();

      if(c=='A')
      {
      digitalWrite(2,HIGH);
      digitalWrite(3,LOW);
    for (int i=0;i<=255;i++)
    {
      analogWrite(5,i);
      delay(10);
    }


      }
      if(c=='C')
      {
```
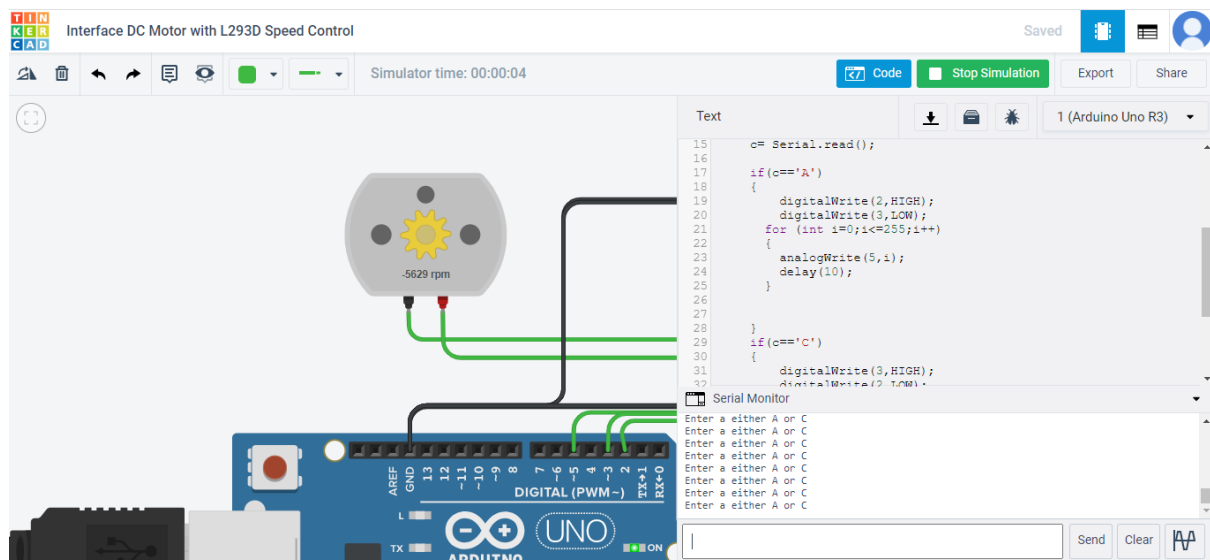
```
    digitalWrite(3,HIGH);
    digitalWrite(2,LOW);
  for (int i=0;i<=255;i++)
  {
    analogWrite(5,i);
    delay(10);
  }



      }
    }
}
```


INTERFACE 2x16 LCD

Print "Hello World!" and "This is *your name* " on the Liquid Crystal Display screen. The Register Select(RS) pin is connected to pin 7, the Enable pin of LCD is connected to pin 6. Pins D4,D5,D6,D7 are connected to pins 2,3,4,5 of Arduino respectively. VSS (1), LED Negative(16), Read/Write (RW) pin of LCD are grounded. VDD(2) is given 5V and LED Positive is given 5V through a 220 ohm resistor. The contrast pin (3) of LCD is connected to a potentiometer.
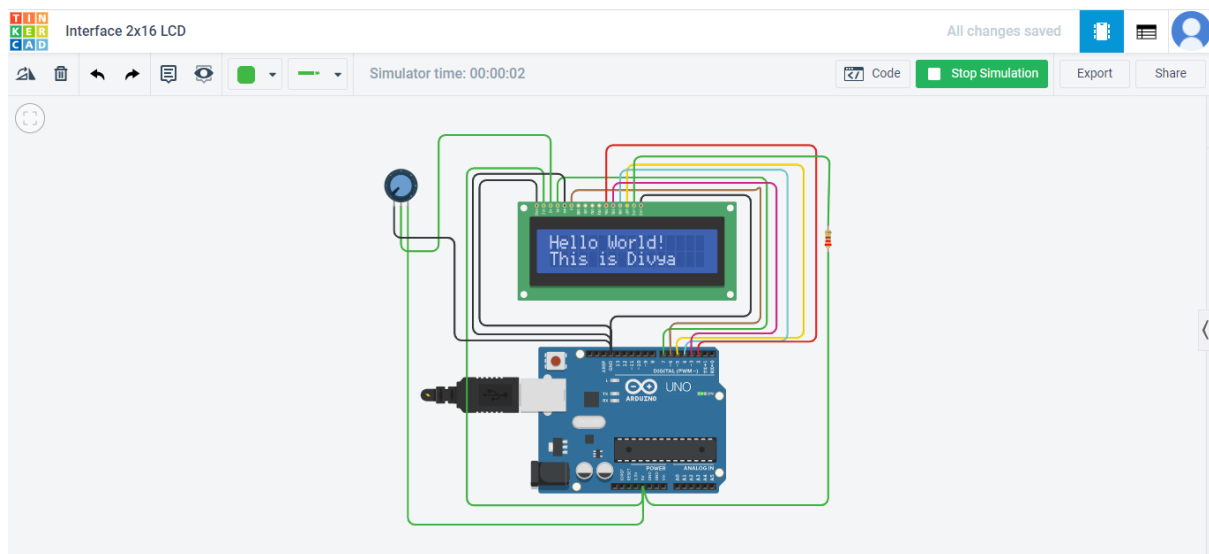
CODE:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(7,6,2,3,4,5);
void setup()
{

  lcd.begin(16,2);
  lcd.setCursor(0,0);
  lcd.print("Hello World!");
  delay(2000);

}

void loop()
{
  lcd.setCursor(0,1);
  lcd.print("This is Divya");
  delay(2000);
  lcd.clear();

}
```

Display Distance

The code measures distance between object and ultrasonic sensor HC-SR04 and displays it on the LCD. The Register Select(RS) pin is connected to pin 2, the Enable pin of LCD is connected to pin 3. Pins D4,D5,D6,D7 are connected to pins 4,5,6,7 of Arduino respectively. VSS (1), LED Negative(16), Read/Write (RW) pin of LCD are grounded. VDD(2) is given 5V and LED Positive is given 5V through a 220 ohm resistor. The contrast pin (3) of LCD is connected to a potentiometer.The trigger pin is connected to pin 9 and echo pin is connected to pin 11.

CODE:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(2,3,4,5,6,7);
float hightime=0.0;
float distance=0.0;
void setup()
{
  lcd.begin(16,2);
  lcd.setCursor(0,0);
  lcd.print("Hello!");
  delay(2000);
  pinMode(9,OUTPUT); //triggerpin
  pinMode(11,INPUT); //echopin
}
void loop()
{
  lcd.setCursor(0,1);
  digitalWrite(9, LOW);
  delayMicroseconds(2);
  digitalWrite(9,HIGH);
  delayMicroseconds(10);
  digitalWrite(9,LOW);
  hightime= pulseIn(11, HIGH);
  distance= (hightime*0.034)/2;
  lcd.print("Distance : "+String(distance));
```

```
  delay(2000);
  lcd.clear();
  }
```
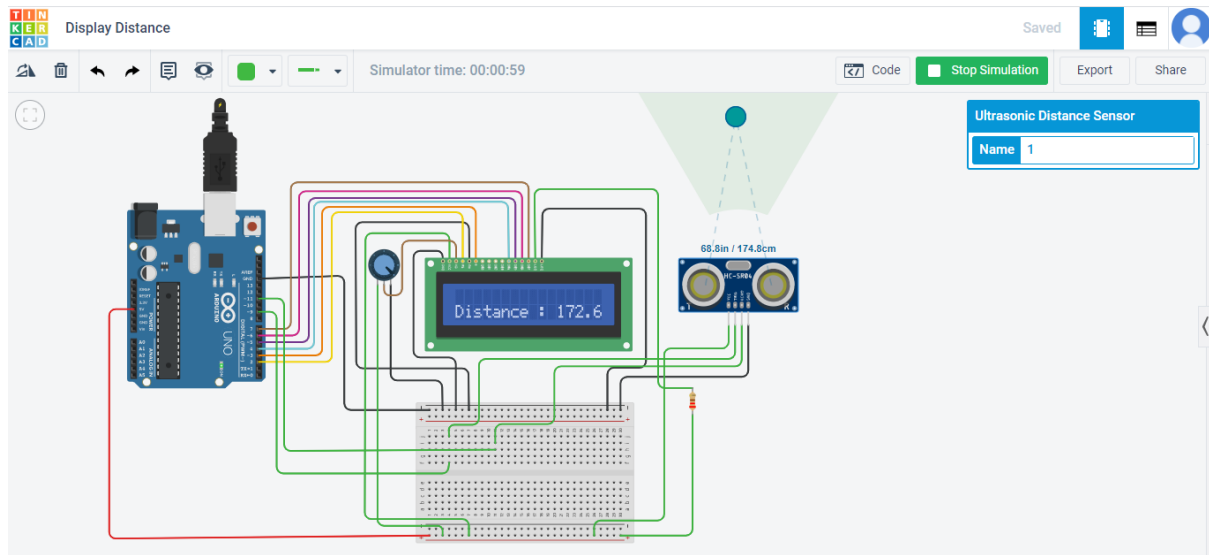

Available Light

This program calculates the intensity of light using an LDR and displays
it on the LCD. It also prints *Dark* if intensity is less than 400 and *Bright* if
intensity is greater than 400. One leg of the photoresistor is connected to
pin A0 of Arduino and grounded using a 1K resistor and the other end is
connected to 5V.The Register Select(RS) pin is connected to pin 7, the
Enable pin of LCD is connected to pin 6. Pins D4,D5,D6,D7 are
connected to pins 5,4,3,2 of Arduino respectively. VSS (1), LED
Negative(16), Read/Write (RW) pin of LCD are grounded. VDD(2) is
given 5V and LED Positive is given 5V through a 220 ohm resistor. The
contrast pin (3) of LCD is connected to a potentiometer.

 CODE:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(7,6,5,4,3,2);
int light_intensity=0;
void setup()
{
```

```
  lcd.begin(16,2);
  lcd.setCursor(0,0);
  lcd.print("Hello!");
  delay(2000);
}

void loop()
{
  lcd.clear();
  light_intensity = analogRead(A0);
  lcd.setCursor(0,0);
  lcd.print("Intensity:" + String(light_intensity));
  lcd.setCursor(0,1);
  if(light_intensity<400)
  {
    lcd.print( "Dark");
  }
  else
  {
    lcd.print("Bright");
  }
  delay(1000);
}
```

Available Light

Saved

Simulator time: 00:00:13

Code   Stop Simulation   Export   Share

Intensity:599
Bright

Photoresistor

Name   1

ARDUINO UNO