

UPCISS

O-Level (M4-R5)

Internet of Things and its
Applications

Chapter-4

**Interfacing Different Types
of Sensor and Actuators**

Video Tutorial

O-Level M4-R5 Full Video

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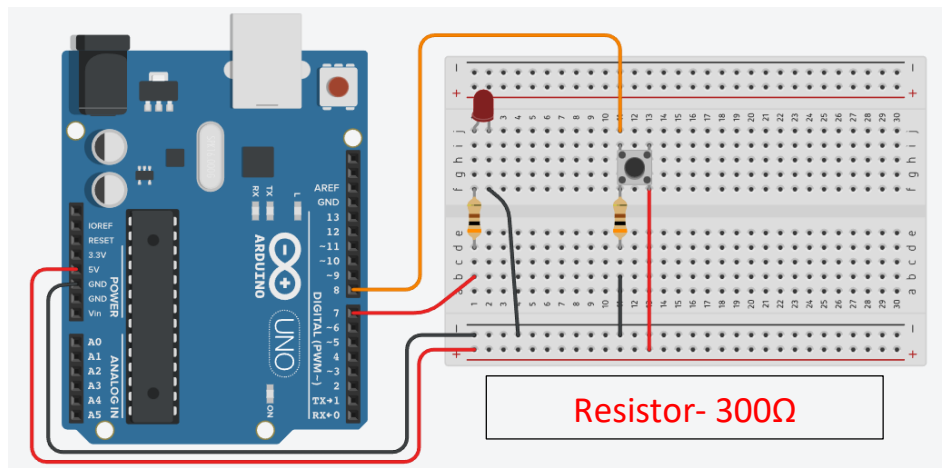
Contents

| | |
|---|----|
| Interfacing Different Types of Sensor and Actuators ----- | 2 |
| Push Button..... | 2 |
| Buzzer (Piezo)..... | 2 |
| Touch Sensor..... | 3 |
| RGB LED Light..... | 4 |
| Ultrasonic Sensor (HC-SR04) | 5 |
| LDR Sensor | 5 |
| 7 Segment LED Display | 6 |
| MQ135 Gas Sensor..... | 9 |
| PIR Motion Sensor (Passive Infrared Sensor) | 9 |
| DHT 11 Humidity and Temperature Sensor..... | 10 |
| Interfacing Keypad 4X4 | 10 |
| Interfacing LCD 16X2 | 11 |
| DHT11 Sensor Print on LCD | 12 |
| IR (Infrared) Sensor | 12 |
| HC-05 Bluetooth Module | 13 |
| Servo Motor | 13 |

Interfacing Different Types of Sensor and Actuators

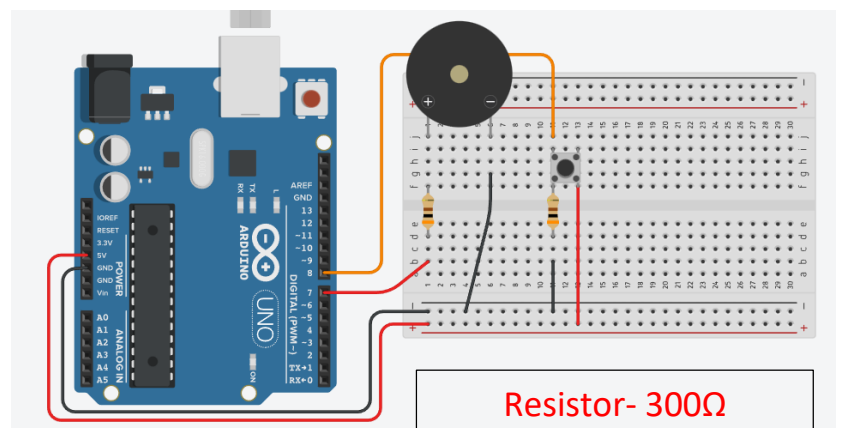
Push Button

```
int led = 7, pb = 8;
void setup() {
  Serial.begin(9600);
  pinMode(led, OUTPUT);
  pinMode(pb, INPUT);
}
void loop() {
  int signal = digitalRead(pb);
  Serial.println(signal);
  if (signal == 1) {
    digitalWrite(led, 1);
    delay(200);
  } else {
    digitalWrite(led, 0);
  }
}
```

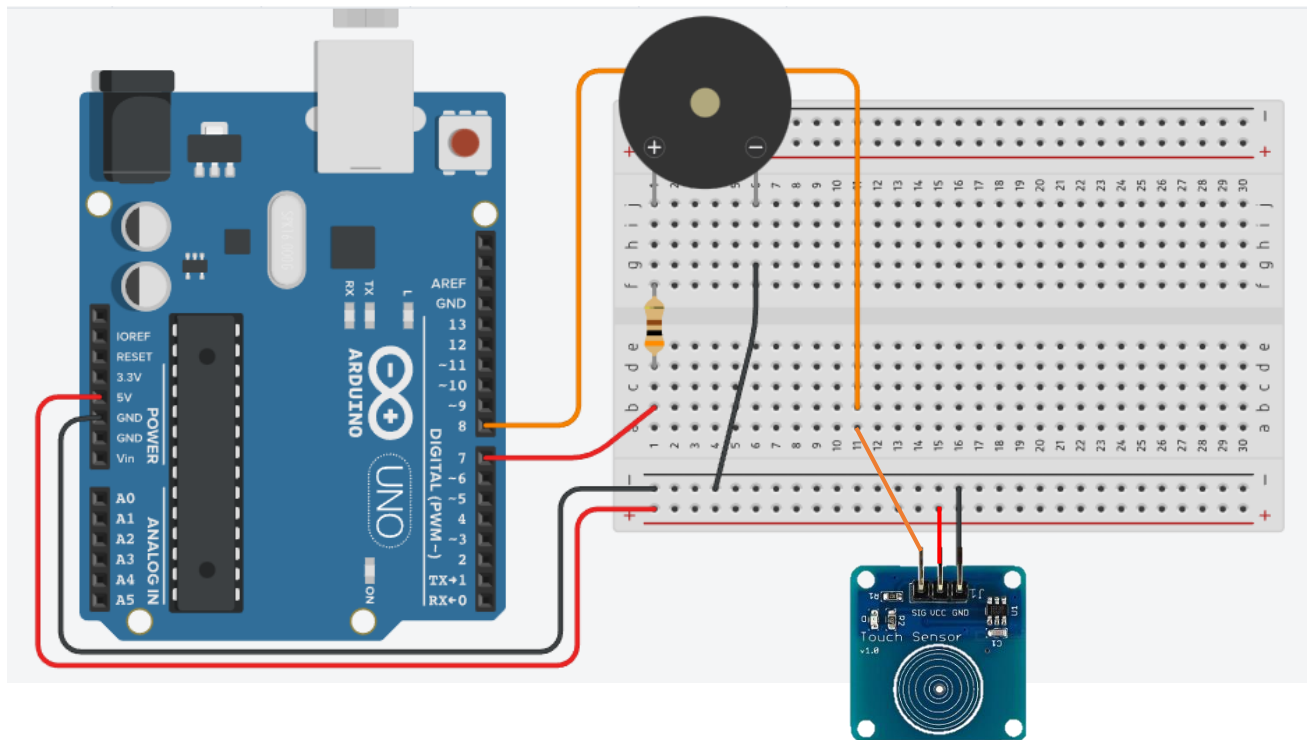


Buzzer (Piezo)

```
int buz = 7, pb = 8;
void setup() {
  Serial.begin(9600);
  pinMode(buz, OUTPUT);
  pinMode(pb, INPUT);
}
void loop() {
  int signal = digitalRead(pb);
  Serial.println(signal);
  if (signal == 1) {
    digitalWrite(buz, 1);
    delay(200);
  } else {
    digitalWrite(buz, 0);
  }
}
```



Touch Sensor

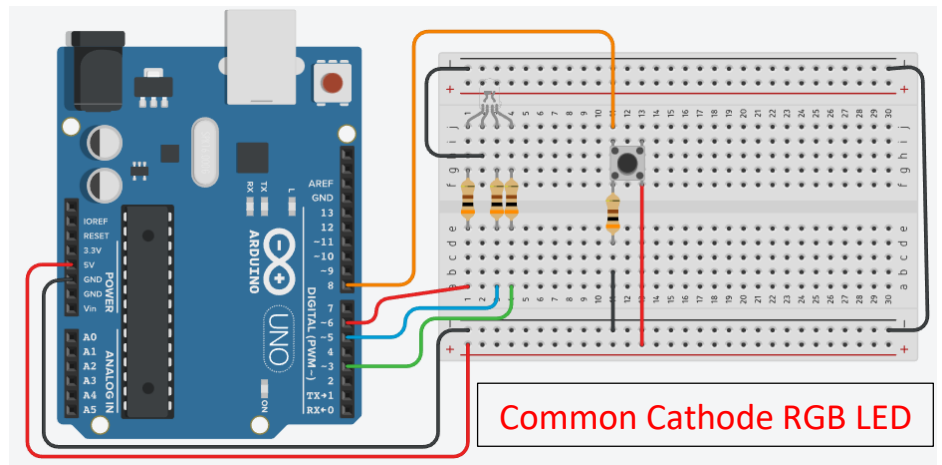


```
int buz = 7, tch = 8;
void setup() {
  Serial.begin(9600);
  pinMode(buz, OUTPUT);
  pinMode(tch, INPUT);
}
void loop() {
  int signal = digitalRead(tch);
  Serial.println(signal);
  if (signal == 1) {
    digitalWrite(buz, 1);
    delay(200);
  } else {
    digitalWrite(buz, 0);
  }
}
```

RGB LED Light

```
int red = 6, blue = 5, green = 3, pb = 8, c = 0;
void setup() {
  pinMode(red, OUTPUT);
  pinMode(blue, OUTPUT);
  pinMode(green, OUTPUT);
  pinMode(pb, INPUT);
}
```

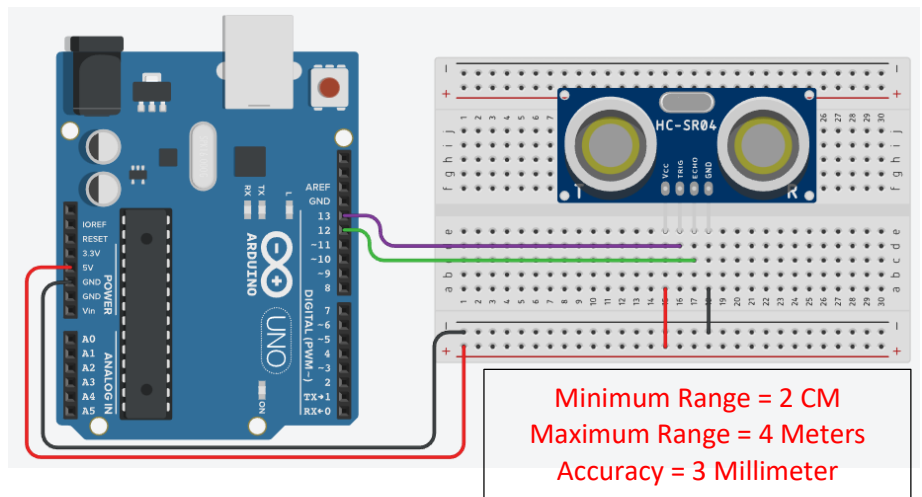
```
void loop() {
  int signal = digitalRead(pb);
  if (signal == 1) { c++; }
  if (c == 1) {
    setcolor(255, 0, 0);
    delay(100);
    setcolor(160, 110, 90);
    delay(100);
    setcolor(200, 70, 190);
    delay(100);
    setcolor(255, 170, 80);
    delay(100);
  } else if (c == 2) {
    setcolor(0, 255, 0);
    delay(100);
    setcolor(60, 210, 50);
    delay(100);
    setcolor(100, 240, 90);
    delay(100);
    setcolor(110, 255, 50);
    delay(100);
  } else {
    setcolor(0, 0, 0);
    delay(200);
    c = 0;
  }
}
```



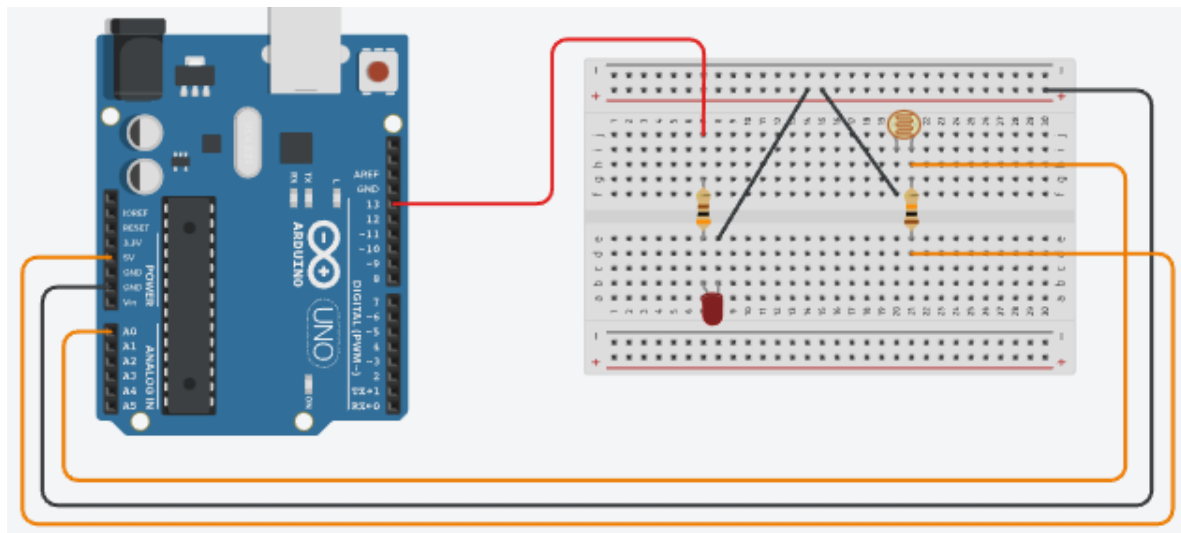
```
void setcolor(int r, int b, int g) {
  analogWrite(red, r);
  analogWrite(blue, b);
  analogWrite(green, g);
}
```

Ultrasonic Sensor (HC-SR04)

```
int trig = 13;
int echo = 12;
int duration;
int distance;
void setup() {
  Serial.begin(9600);
  pinMode(trig, OUTPUT);
  pinMode(echo, INPUT);
}
void loop() {
  digitalWrite(trig, 0);
  delayMicroseconds(2);
  digitalWrite(trig, 1);
  delayMicroseconds(10);
  digitalWrite(trig, 0);
  duration = pulseIn(echo, 1); // in Microseconds
  distance = duration * 0.034 / 2;
  Serial.print("Distance in CM: ");
  Serial.println(distance);
}
```

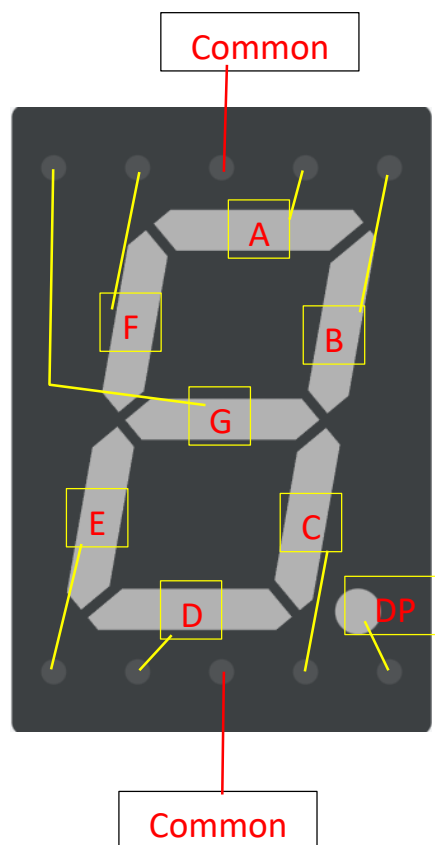
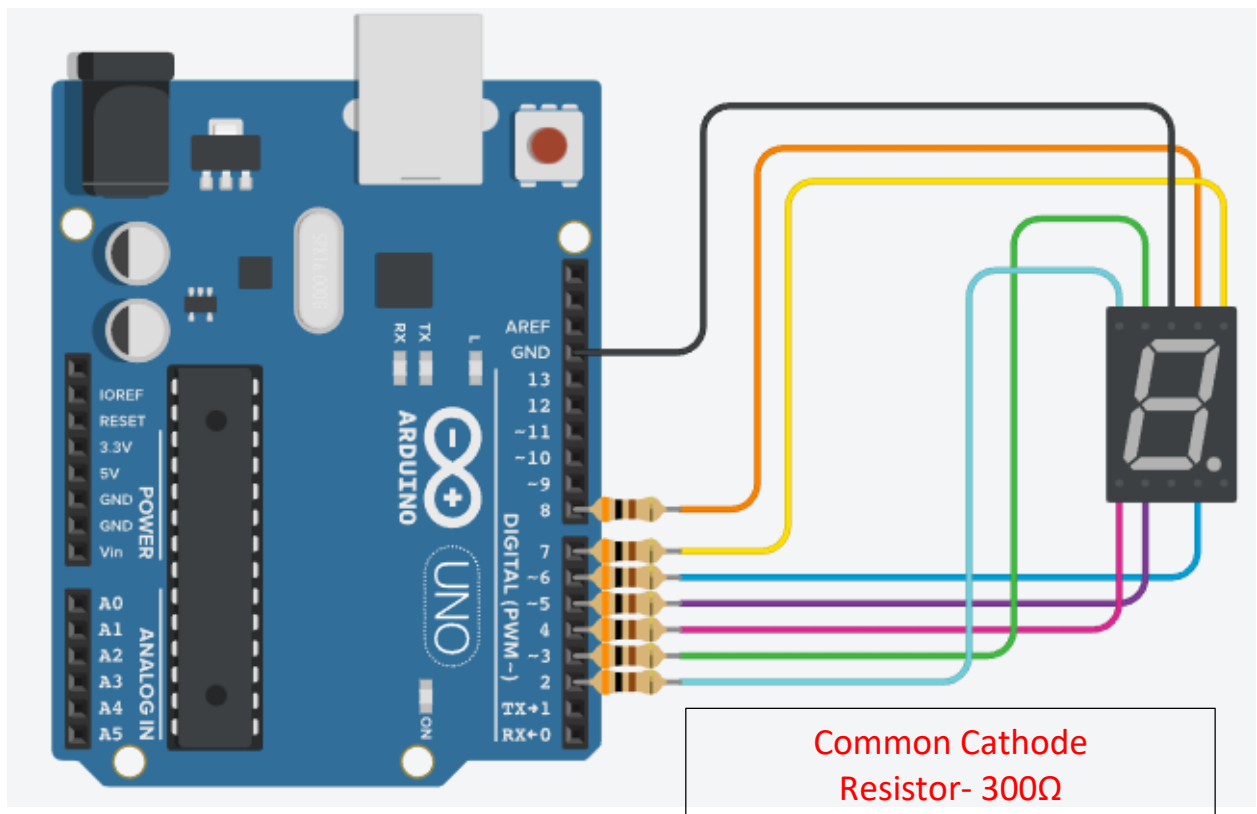


LDR Sensor



```
void setup() {
  pinMode(13, OUTPUT);
  Serial.begin(9600);
}
void loop() {
  int ldr = analogRead(A0);
  Serial.println(ldr);
  delay(100);
  if (ldr > 900) { digitalWrite(13, 1);}
  else {digitalWrite(13, 0);}
}
```

7 Segment LED Display

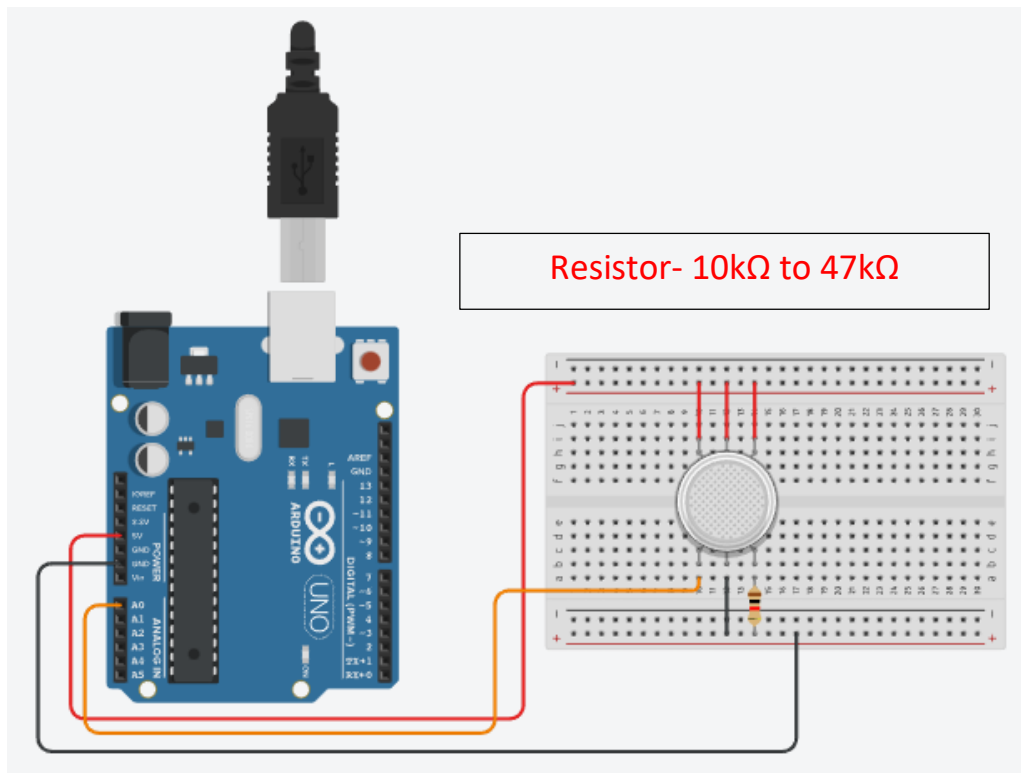


```
int a = 8, b = 7, c = 6, d = 5, e = 4, f = 3, g = 2;
int dt = 1000;
void setup() {
    pinMode(a, OUTPUT);
    pinMode(b, OUTPUT);
    pinMode(c, OUTPUT);
    pinMode(d, OUTPUT);
    pinMode(e, OUTPUT);
    pinMode(f, OUTPUT);
    pinMode(g, OUTPUT);
}
void loop() {
    // Write 0
    digitalWrite(a, 1);
    digitalWrite(b, 1);
    digitalWrite(c, 1);
    digitalWrite(d, 1);
    digitalWrite(e, 1);
    digitalWrite(f, 1);
    digitalWrite(g, 0);
    delay(dt);
    // Write 1
    digitalWrite(a, 0);
    digitalWrite(b, 1);
    digitalWrite(c, 1);
    digitalWrite(d, 0);
    digitalWrite(e, 0);
    digitalWrite(f, 0);
    digitalWrite(g, 0);
    delay(dt);
    // Write 2
    digitalWrite(a, 1);
    digitalWrite(b, 1);
    digitalWrite(c, 0);
    digitalWrite(d, 1);
    digitalWrite(e, 1);
    digitalWrite(f, 0);
    digitalWrite(g, 1);
    delay(dt);
    // Write 3
    digitalWrite(a, 1);
    digitalWrite(b, 1);
    digitalWrite(c, 1);
    digitalWrite(d, 1);
    digitalWrite(e, 0);
    digitalWrite(f, 0);
    digitalWrite(g, 1);
    delay(dt);
    // Write 4
    digitalWrite(a, 0);
    digitalWrite(b, 1);
    digitalWrite(c, 1);
```



```
digitalWrite(d, 0);
digitalWrite(e, 0);
digitalWrite(f, 1);
digitalWrite(g, 1);
delay(dt);
// Write 5
digitalWrite(a, 1);
digitalWrite(b, 0);
digitalWrite(c, 1);
digitalWrite(d, 1);
digitalWrite(e, 0);
digitalWrite(f, 1);
digitalWrite(g, 1);
delay(dt);
// Write 6
digitalWrite(a, 1);
digitalWrite(b, 1);
digitalWrite(c, 1);
digitalWrite(d, 1);
digitalWrite(e, 1);
digitalWrite(f, 0);
digitalWrite(g, 1);
delay(dt);
// Write 7
digitalWrite(a, 1);
digitalWrite(b, 1);
digitalWrite(c, 1);
digitalWrite(d, 0);
digitalWrite(e, 0);
digitalWrite(f, 0);
digitalWrite(g, 0);
delay(dt);
// Write 8
digitalWrite(a, 1);
digitalWrite(b, 1);
digitalWrite(c, 1);
digitalWrite(d, 1);
digitalWrite(e, 1);
digitalWrite(f, 1);
digitalWrite(g, 1);
delay(dt);
// Write 9
digitalWrite(a, 1);
digitalWrite(b, 1);
digitalWrite(c, 1);
digitalWrite(d, 1);
digitalWrite(e, 0);
digitalWrite(f, 1);
digitalWrite(g, 1);
delay(dt);
}
```

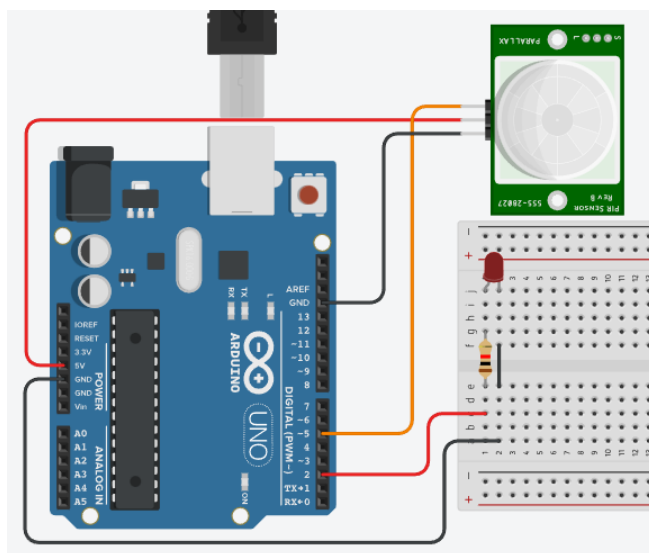
MQ135 Gas Sensor



```
void setup() {  
  Serial.begin(9600);  
}  
void loop() {  
  int val = analogRead(A0);  
  int air = map(val, 0, 1023, 0, 255);  
  Serial.print("Air Quality ");  
  Serial.println(air);  
  delay(1000);  
}
```

PIR Motion Sensor (Passive Infrared Sensor)

```
void setup() {  
  pinMode(2, OUTPUT);  
  pinMode(5, INPUT);  
  Serial.begin(9600);  
}  
void loop() {  
  int value = digitalRead(5);  
  Serial.println(value);  
  if (value == 1) {  
    digitalWrite(2, 1);  
  } else {  
    digitalWrite(2, 0);  
  }  
}
```



DHT 11 Humidity and Temperature Sensor

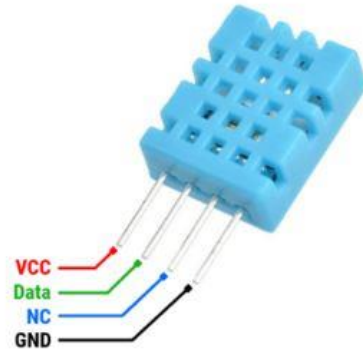
```
#include <DHT.h>
#include <DHT_U.h>

DHT dht(2, DHT11);

void setup() {
  Serial.begin(9600);
  dht.begin();
}

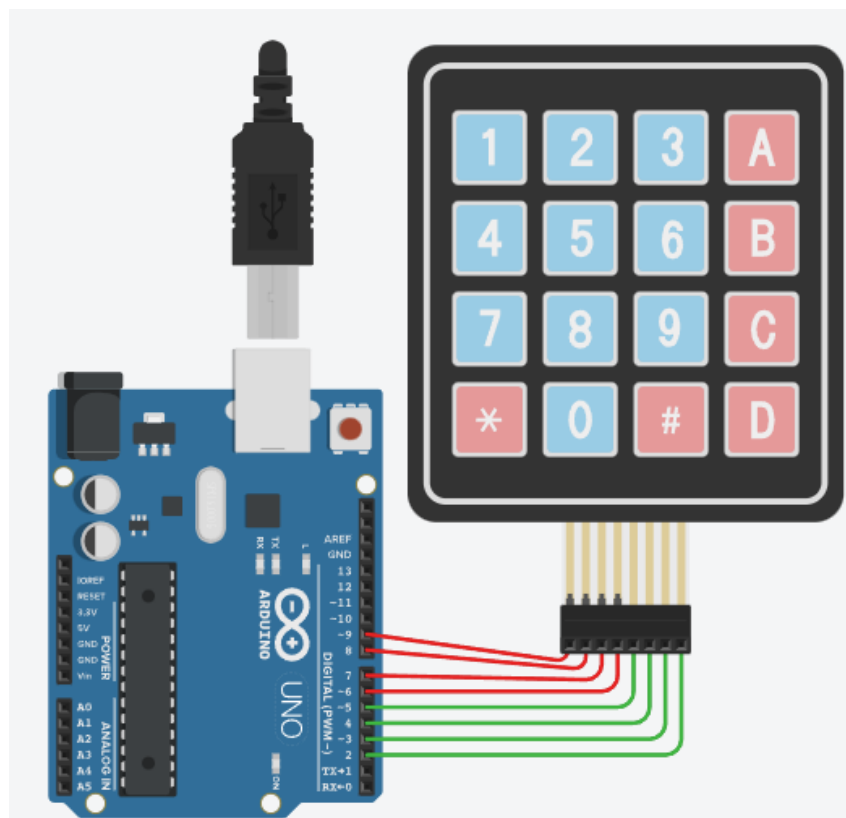
void loop() {
  delay(2000);
  float h = dht.readHumidity();
  float tc = dht.readTemperature();
  float tf = dht.readTemperature(true);

  Serial.print(h);
  Serial.print(" % Humidity \t");
  Serial.print(tc);
  Serial.print(" °C Temperature \t");
  Serial.print(tf);
  Serial.print(" °F Temperature \t");
  Serial.println("");
}
```



- Humidity Range: 20-90% RH
- Humidity Accuracy: $\pm 5\%$ RH
- Temperature Range: 0-50 °C
- Temperature Accuracy: $\pm 2\%$ °C
- Operating Voltage: 3V to 5.5V

Interfacing Keypad 4X4

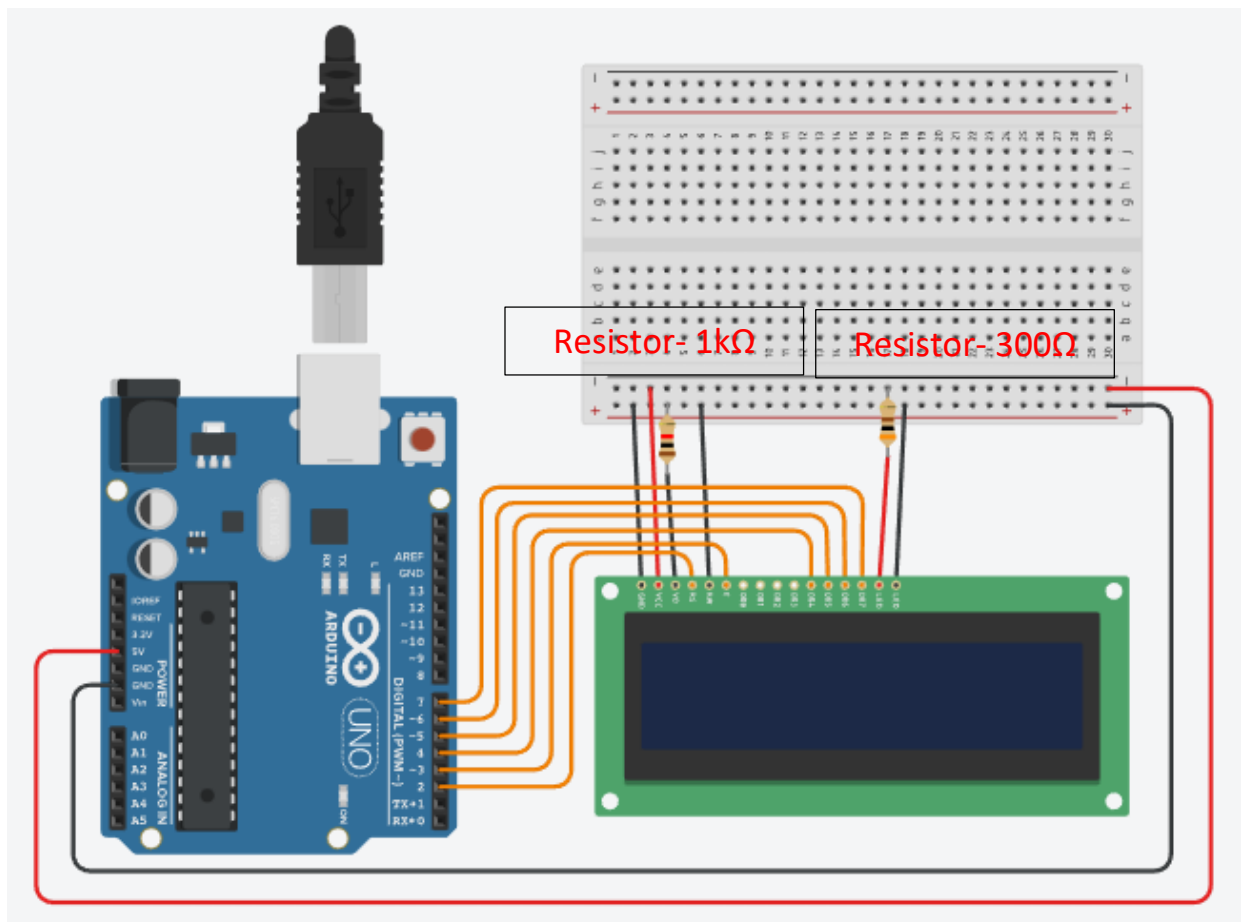


```

#include <Keypad.h>
byte row = 4;
byte col = 4;
char keys[4][4] = {
  { '1', '2', '3', 'A' },
  { '4', '5', '6', 'B' },
  { '7', '8', '9', 'C' },
  { '*', '0', '#', 'D' }
};
byte rowpin[4] = { 9, 8, 7, 6 };
byte colpin[4] = { 5, 4, 3, 2 };
Keypad mykeypad = Keypad(makeKeymap(keys), rowpin, colpin, row, col);
void setup() {
  Serial.begin(9600);
}
void loop() {
  char presskey = mykeypad.getKey();
  if (presskey) {
    Serial.println(presskey);
  }
}

```

Interfacing LCD 16X2



```

#include <LiquidCrystal.h>
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
void setup() {
  lcd.begin(16, 2);
  lcd.print("Hello UPCISS");
}
void loop() {
  lcd.setCursor(0, 1);
  lcd.print(millis() / 1000);
}

```

DHT11 Sensor Print on LCD

```

#include <DHT.h>
#include <DHT_U.h>
#include <LiquidCrystal.h>
DHT dht(8, DHT11);
LiquidCrystal lcd(2, 3, 4, 5, 6, 7);
void setup() {
  Serial.begin(9600);
  dht.begin();
  lcd.begin(16, 2);
}
void loop() {
  float h = dht.readHumidity();
  float tc = dht.readTemperature();
  lcd.print(h);
  lcd.print(" % Humidity");
  lcd.setCursor(0, 1);
  lcd.print(tc);
  lcd.print(" °C Temperature");
  delay(2000);
  lcd.clear();
}

```

IR (Infrared) Sensor

```

#include <IRremote.h>
int irs = 5;
int c = 1;
void setup() {
  Serial.begin(9600);
  pinMode(2, OUTPUT);
  IrReceiver.begin(irs, ENABLE_LED_FEEDBACK);
}
void loop() {
  if (IrReceiver.decode()) {
    String ircode = String(IrReceiver.decodedIRData.command, HEX);
    delay(300);
    Serial.println(ircode);
    IrReceiver.resume();
  }
}

```



```

if ((ircode == "f") && (c % 2 == 1)) {
    digitalWrite(2, 1);
    c++;
} else if ((ircode == "f") && (c % 2 == 0)) {
    digitalWrite(2, 0);
    c++;
}
}
}
}

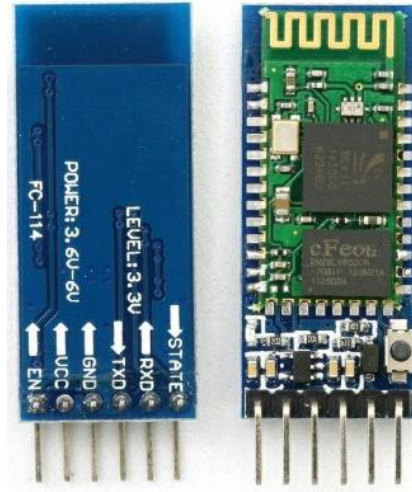
```

HC-05 Bluetooth Module

```

char val;
void setup() {
    Serial.begin(9600);
    pinMode(2, OUTPUT);
}
void loop() {
    if (Serial.available()) {
        val = Serial.read();
        if (val == 'A') {
            digitalWrite(2, 1);
        } else if (val == 'a') {
            digitalWrite(2, 0);
        }
    }
}
}

```



Servo Motor

```

#include <Servo.h>
Servo myservo;
void setup() {
    myservo.attach(7);
}
void loop() {
    for (int i = 0; i <= 180; i++) {
        myservo.write(i);
        delay(10);
    }
    for (int i = 180; i > 0; i--) {
        myservo.write(i);
        delay(10);
    }
}
}

```



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