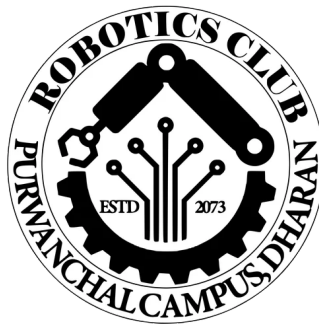SOME NOTES

ON

Day 4: Sensors and Real-World Applications

BY

Pratik Dahal
PUR081BCT050

TO

Robotics Club

TRIBHUWAN UNIVERSITY

INSTITUTE OF ENGINEERING

ROBOTICS CLUB

PURWANCHAL CAMPUS

DHARAN, NEPAL

2025-07-02

1 What I learnt today

1.1 Different types of sensors used

Today, in the session, i got to know about the different types of sensors and also got hands-on experience of using them in circuit setup. Those sensors were:

- Ultrasonic Sensors

- Colour Sensor

- IR sensor

Other contents and assignment on following pages.

Short Notes: IR Sensor and Ultrasonic Sensor with Arduino

2 IR Sensor to Light LED

Working Principle

An IR sensor detects the presence of an object based on infrared light reflection. When an object is detected, the sensor outputs a LOW signal (0), which can be used to turn ON an LED.

Circuit Description

- IR sensor OUT pin → Digital pin 2 on Arduino

- LED anode → Digital pin 13 (or any other)

- LED cathode → GND (via 220 resistor)

- IR sensor VCC and GND → Arduino 5V and GND

Arduino Code

```
const int irPin = 2;
const int ledPin = 13;

void setup() –
  pinMode(irPin, INPUT);
  pinMode(ledPin, OUTPUT);


void loop() –
  int irValue = digitalRead(irPin);
  if (irValue == LOW) – // Object detected
    digitalWrite(ledPin, HIGH);
    else –
    digitalWrite(ledPin, LOW);
```

Listing 1: IR Sensor to Control LED

3 Ultrasonic Sensor to Detect Distance

Working Principle

The ultrasonic sensor (HC-SR04) sends out ultrasonic sound waves. The time taken for the echo to return is measured to calculate the distance.

Circuit Description

- VCC → 5V on Arduino
- GND → GND on Arduino
- Trig → Digital pin 9
- Echo → Digital pin 10

Arduino Code

```
const int trigPin = 9;
const int echoPin = 10;

void setup() -
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial.begin(9600);


void loop() -
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  long duration = pulseIn(echoPin, HIGH);
  float distance = duration * 0.034 / 2;

  Serial.print("Distance: ");
  Serial.print(distance);
  Serial.println(" cm");

  delay(500);
```

Listing 2: Ultrasonic Sensor Distance Detection

4   Day-04 Assignment

Design a circuit using Arduino and ultrasonic sensor where an LED turns ON if an object is detected within 10 cm in tinkercad.
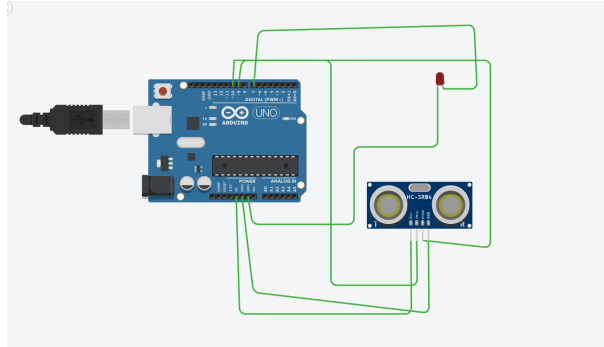

Figure 1: Circuit Setup


```
1   const int trigPin = 9;
2   const int echoPin = 10;
3   const int ledPin = 7;
4
5   void setup() {
6     pinMode(trigPin, OUTPUT);
7     pinMode(echoPin, INPUT);
8     pinMode(ledPin, OUTPUT);
9     Serial.begin(9600);
10  }
11
12  void loop() {
13    // Send ultrasonic pulse
14    digitalWrite(trigPin, LOW);
15    delayMicroseconds(2);
16    digitalWrite(trigPin, HIGH);
17    delayMicroseconds(10);
18    digitalWrite(trigPin, LOW);
19
20    // Read the echo pulse
21    long duration = pulseIn(echoPin, HIGH);
22
23    // Calculate distance (in cm)
24    float distance = duration * 0.034 / 2;
25
26    Serial.print("Distance: ");
27    Serial.print(distance);
28    Serial.println(" cm");
29
30    // Turn LED ON if object is within 10 cm
31    if (distance <= 10) {
32      digitalWrite(ledPin, HIGH);
33    } else {
34      digitalWrite(ledPin, LOW);
35    }
36
37    delay(500);
38  }
39
```

Figure 2: Code