

**Assignment-4**  
Distance Detection Using Ultrasonic Sensor

Assignment Date	02 November2022
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Maximum Marks	2 Marks

**Question-1:**

Write code and connections in wokwi for ultrasonic sensor. Whenever distance is less than 100cms send "alert" to ibm cloud and display in device recent events.

WOKWI LINK : <https://wokwi.com/projects/347179934021583442>

**CODE:**

```
#include <WiFi.h>
#include <PubSubClient.h>

void callback(char* subscribtopic, byte* payload, unsigned int payloadLength);

#define ORG "f59trs"
#define DEVICE_TYPE "ultrasonicsensor"
#define DEVICE_ID "distancedetection"
#define TOKEN "AlGMGaaF01nawa1QA3"
String data3;
float dist;

char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
char publishTopic[] = "iot-2/evt/Data/fmt/json";
char subscribtopic[] = "iot-2/cmd/test/fmt/String";
char authMethod[] = "use-token-auth";
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;

WiFiClient wifiClient;
PubSubClient client(server, 1883, callback ,wifiClient);

int LED = 4;
int trig = 5;
int echo = 18;
void setup()
{
  Serial.begin(115200);
  pinMode(trig,OUTPUT);
```

```

pinMode(echo, INPUT);
pinMode(LED, OUTPUT);
delay(10);
wificonnect();
mqttconnect();
}
void loop()
{
    digitalWrite(trig, LOW);
    digitalWrite(trig, HIGH);
    delayMicroseconds(10);
    digitalWrite(trig, LOW);
    float dur = pulseIn(echo, HIGH);
    float dist = (dur * 0.0343)/2;
    Serial.print ("Distance in cm :");
    Serial.println(dist);

    PublishData(dist);
    delay(1000);
    if (!client.loop()) {
        mqttconnect();
    }
}

void PublishData(float dist) {
    mqttconnect();
    String object;
    if (dist < 100)

```

```

if (dist < 100)
{
    digitalWrite(LED, HIGH);
    Serial.println("object is near");
    object = "Near";
}
else
{
    digitalWrite(LED, LOW);
    Serial.println("no object found");
    object = "No";
}

String payload = "{\"distance\": ";
payload += dist;
payload += ", \"object\": \"";
payload += object;
payload += "\"}";

    Serial.print("Sending payload: ");
    Serial.println(payload);

    if (client.publish(publishTopic, (char*) payload.c_str())) {
        Serial.println("Publish ok");
    } else {
        Serial.println("Publish failed");
    }
}

void mqttconnect() {
    if (!client.connected()) {

```

```

        Serial.print("Reconnecting client to ");
        Serial.println(server);
        while (!!!client.connect(clientId, authMethod, token)) {
            Serial.print(".");
            delay(500);
        }
        initManagedDevice();
        Serial.println();
    }
}

void wificonnect()
{
    Serial.println();
    Serial.print("Connecting to ");
    WiFi.begin("Wokwi-GUEST", "", 6);
    while (WiFi.status() != WL_CONNECTED) {
        delay(500);
        Serial.print(".");
    }
    Serial.println("");
    Serial.println("WiFi connected");
    Serial.println("IP address: ");
    Serial.println(WiFi.localIP());
}

void initManagedDevice() {
    if (client.subscribe(subscribetopic)) {
        Serial.println((subscribetopic));
        Serial.println("subscribe to cmd OK");
    } else {
        Serial.println("subscribe to cmd FAILED");
    }
}

```

```

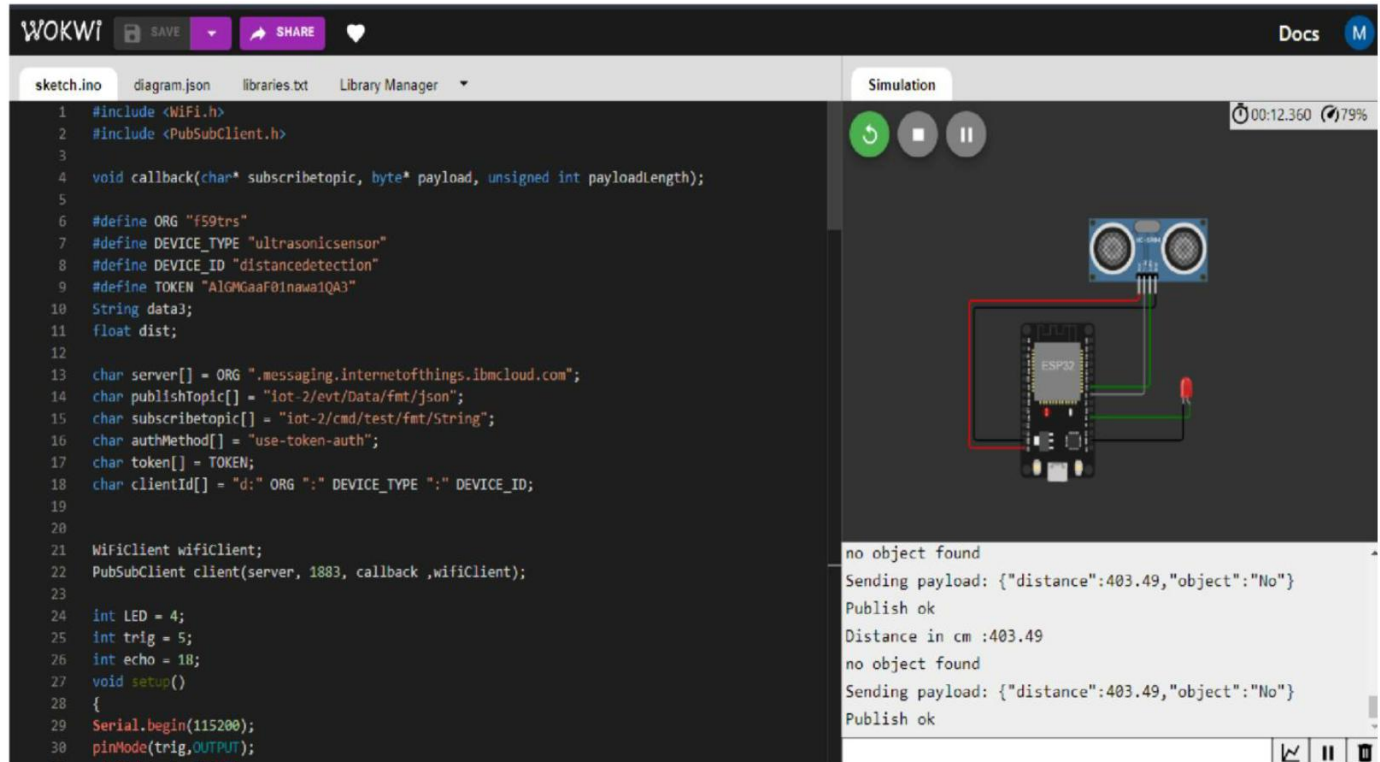
        Serial.println("subscribe to cmd FAILED");
    }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{
    Serial.print("callback invoked for topic: ");
    Serial.println(subscribetopic);
    for (int i = 0; i < payloadLength; i++) {
        data3 += (char)payload[i];
    }
    data3="";
}

```

## OUTPUT:

### When object is not near to the ultrasonic sensor



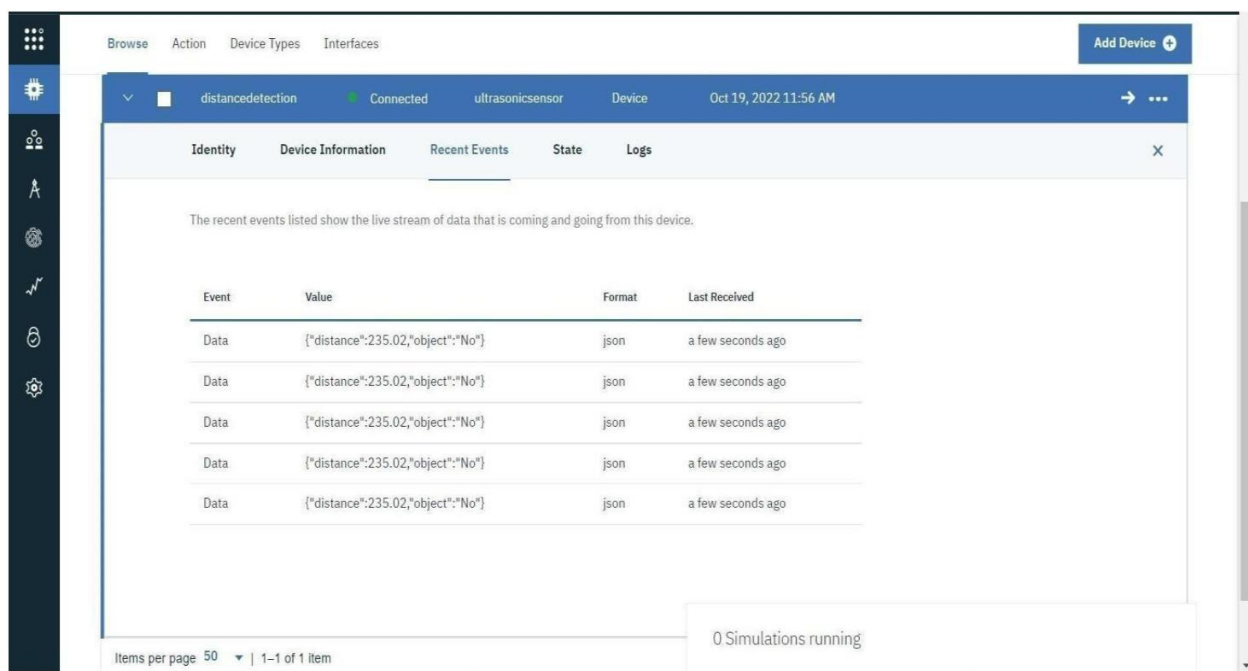
The screenshot shows the Wokwi IDE interface. On the left, the sketch.ino file contains the following code:

```
1 #include <WiFi.h>
2 #include <PubSubClient.h>
3
4 void callback(char* subscribetopic, byte* payload, unsigned int payloadlength);
5
6 #define ORG "f59trs"
7 #define DEVICE_TYPE "ultrasonicsensor"
8 #define DEVICE_ID "distancedetection"
9 #define TOKEN "AIGMGaaF01nawaiQA3"
10 String data3;
11 float dist;
12
13 char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
14 char publishTopic[] = "iot-2/evt/Data/fmt/json";
15 char subscribetopic[] = "iot-2/cmd/test/fmt/String";
16 char authMethod[] = "use-token-auth";
17 char token[] = TOKEN;
18 char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
19
20
21 WiFiClient wifiClient;
22 PubSubClient client(server, 1883, callback, wifiClient);
23
24 int LED = 4;
25 int trig = 5;
26 int echo = 18;
27 void setup()
28 {
29   Serial.begin(115200);
30   pinMode(trig, OUTPUT);
```

The simulation window on the right shows a diagram of an ESP32 board connected to an ultrasonic sensor. Below the diagram, the serial output is displayed:

```
no object found
Sending payload: {"distance":403.49,"object":"No"}
Publish ok
Distance in cm :403.49
no object found
Sending payload: {"distance":403.49,"object":"No"}
Publish ok
```

### Data sent to the IBM cloud device when the object is far



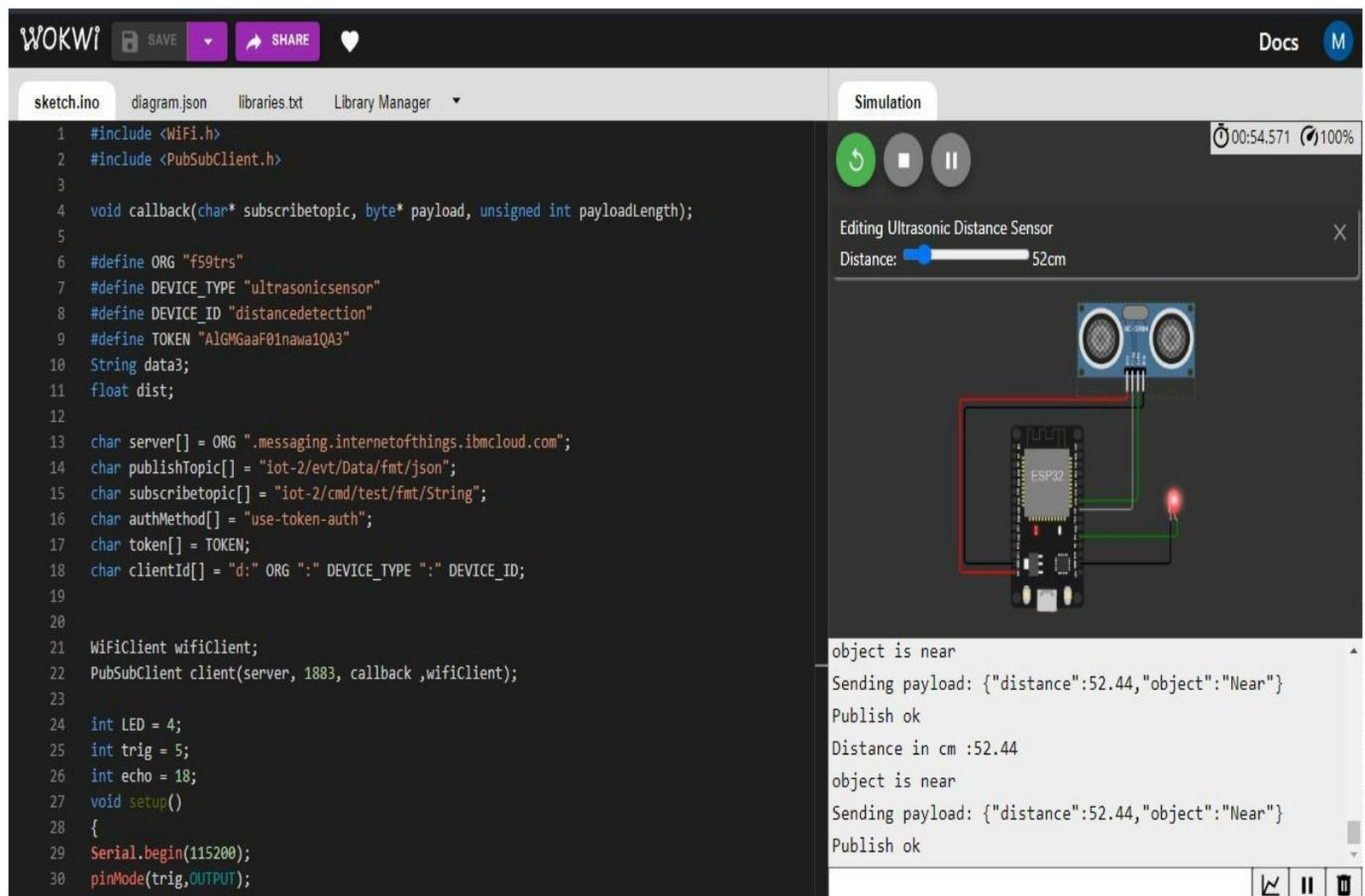
The screenshot shows the IBM Cloud IoT Platform interface. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. A sidebar on the left contains various icons. The main content area shows a device named 'distancedetection' connected to an 'ultrasonicsensor' device. The 'Recent Events' tab is selected, displaying a table of recent events.

Event	Value	Format	Last Received
Data	{"distance":235.02,"object":"No"}	json	a few seconds ago
Data	{"distance":235.02,"object":"No"}	json	a few seconds ago
Data	{"distance":235.02,"object":"No"}	json	a few seconds ago
Data	{"distance":235.02,"object":"No"}	json	a few seconds ago
Data	{"distance":235.02,"object":"No"}	json	a few seconds ago

At the bottom of the interface, it shows '0 Simulations running'.



## When object is nearer to the ultrasonic sensor



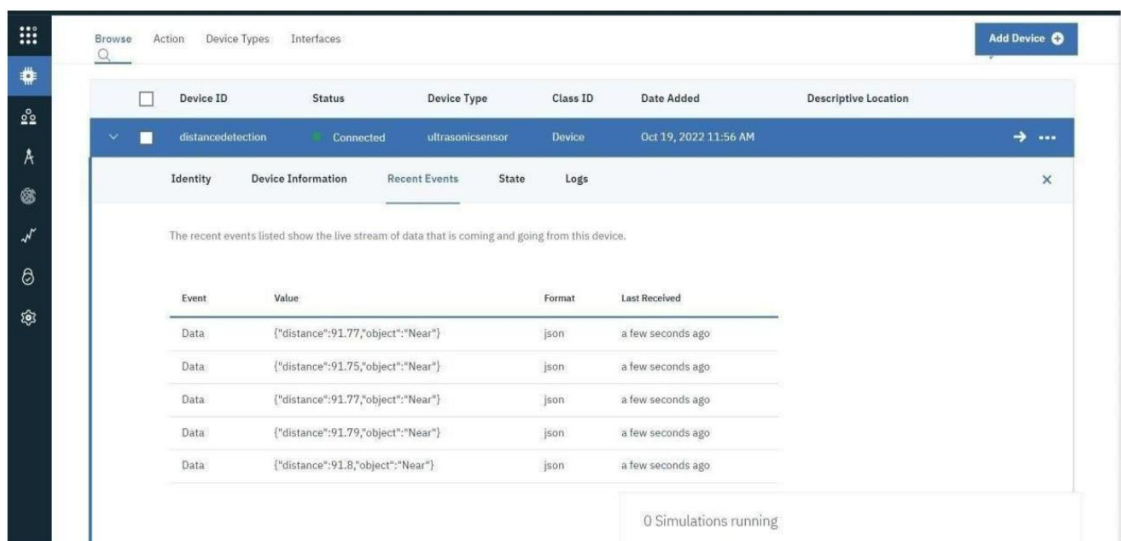
The screenshot shows the Wokwi IDE interface. On the left, the 'sketch.ino' file is open, displaying the following code:

```
1 #include <WiFi.h>
2 #include <PubSubClient.h>
3
4 void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
5
6 #define ORG "f59trs"
7 #define DEVICE_TYPE "ultrasonicsensor"
8 #define DEVICE_ID "distancedetection"
9 #define TOKEN "AlGMGaaF0Inawa1QA3"
10 String data3;
11 float dist;
12
13 char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
14 char publishTopic[] = "iot-2/evt/Data/fmt/json";
15 char subscribetopic[] = "iot-2/cmd/test/fmt/String";
16 char authMethod[] = "use-token-auth";
17 char token[] = TOKEN;
18 char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
19
20
21 WiFiClient wifiClient;
22 PubSubClient client(server, 1883, callback, wifiClient);
23
24 int LED = 4;
25 int trig = 5;
26 int echo = 18;
27 void setup()
28 {
29   Serial.begin(115200);
30   pinMode(trig, OUTPUT);
```

On the right, the 'Simulation' window is active. It shows a visual representation of the ESP32 board connected to an ultrasonic sensor and an LED. A slider control for the ultrasonic sensor is set to 52cm. Below the simulation, the console output shows the following messages:

```
object is near
Sending payload: {"distance":52.44,"object":"Near"}
Publish ok
Distance in cm :52.44
object is near
Sending payload: {"distance":52.44,"object":"Near"}
Publish ok
```

## Data sent to the IBM cloud device when the object is near



The screenshot shows the IBM IoT Platform dashboard. The 'Device ID' column is selected, and the device 'distancedetection' is highlighted. The 'Recent Events' tab is active, showing a list of events:

Event	Value	Format	Last Received
Data	{"distance":91.77,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.75,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.77,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.79,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.8,"object":"Near"}	json	a few seconds ago

At the bottom of the dashboard, it indicates '0 Simulations running'.