

Assignment-4

Distance Detection Using Ultrasonic Sensor

Date	25 October 2022
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Team ID	PNT2022TMID17224
Project Name	Industry-Specific Intelligent Fire Management System

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/346515191471538772>

CODE:

```

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

void callback(char* subscribetopic, 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 subscribetopic[] = "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");
    }
}

```

```

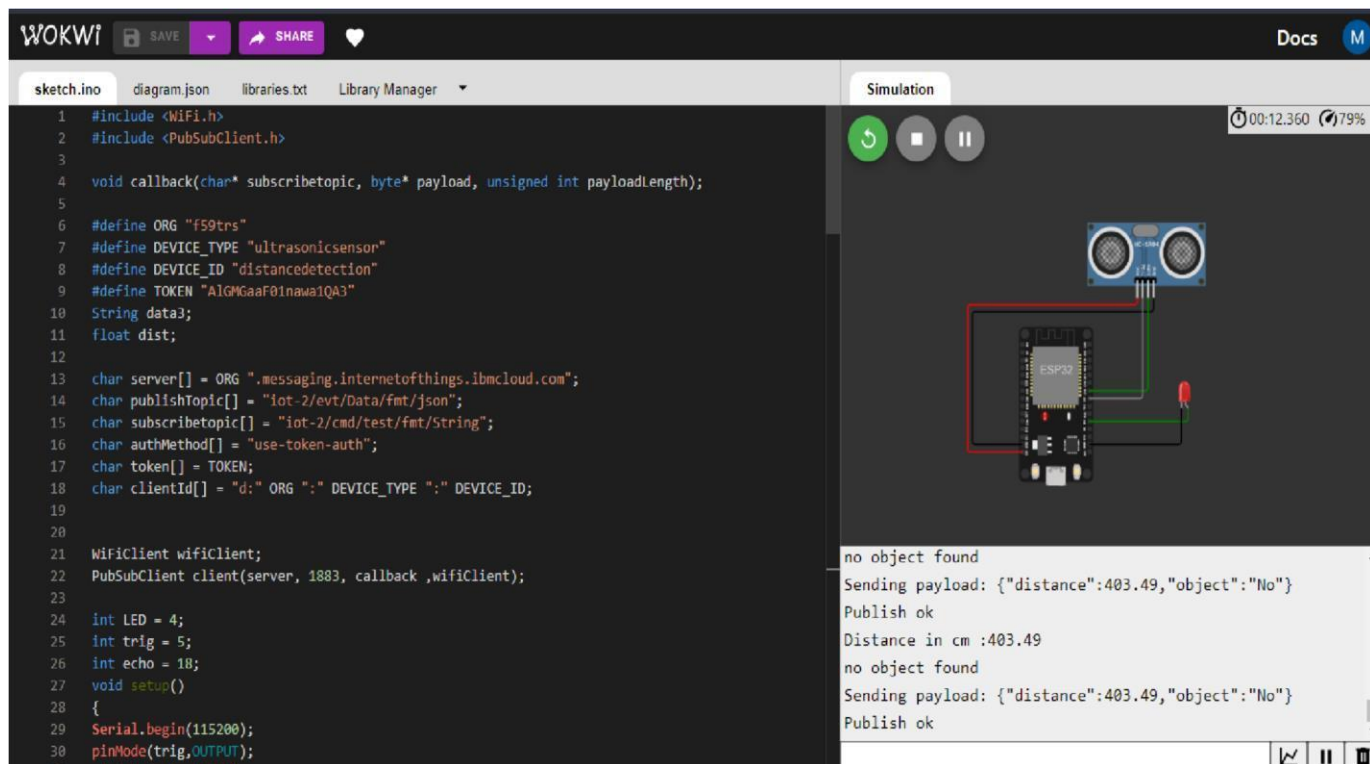
        Serial.println("subscribe to cmd FAILED");
    }
}

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



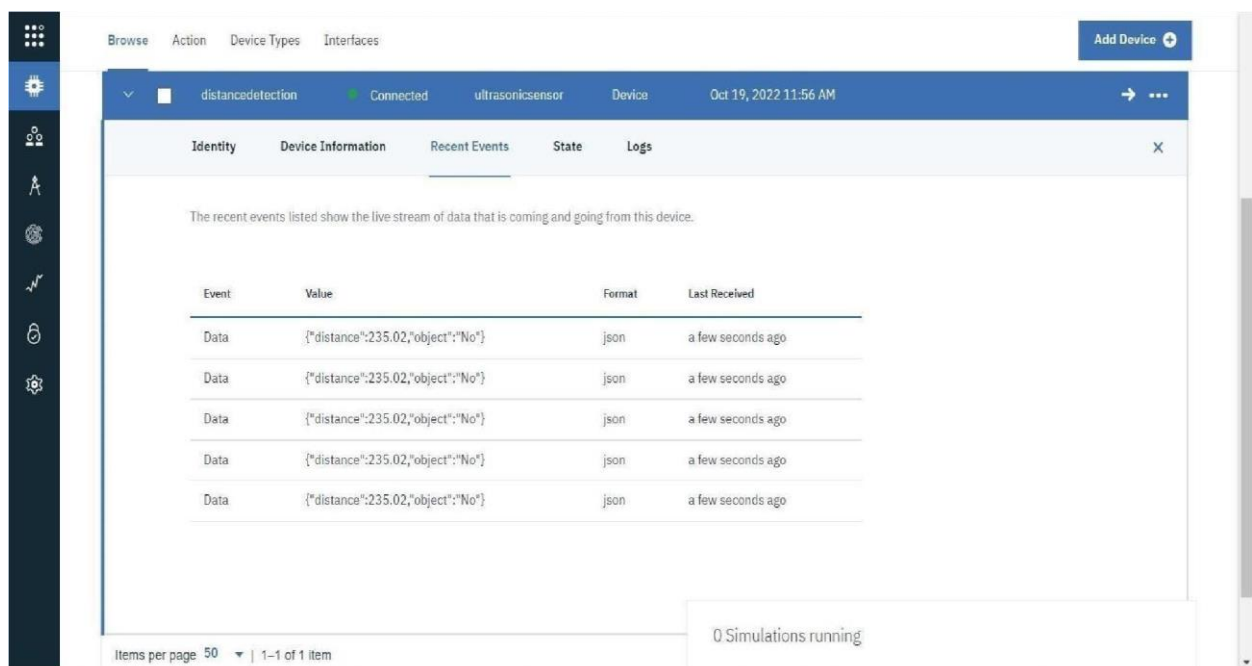
The screenshot displays the Wokwi IDE interface. On the left, the 'sketch.ino' file is open, showing the following code:

```
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' tab shows a visual representation of the ESP32 and the ultrasonic sensor. Below the simulation, the console output displays the following messages:

```
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

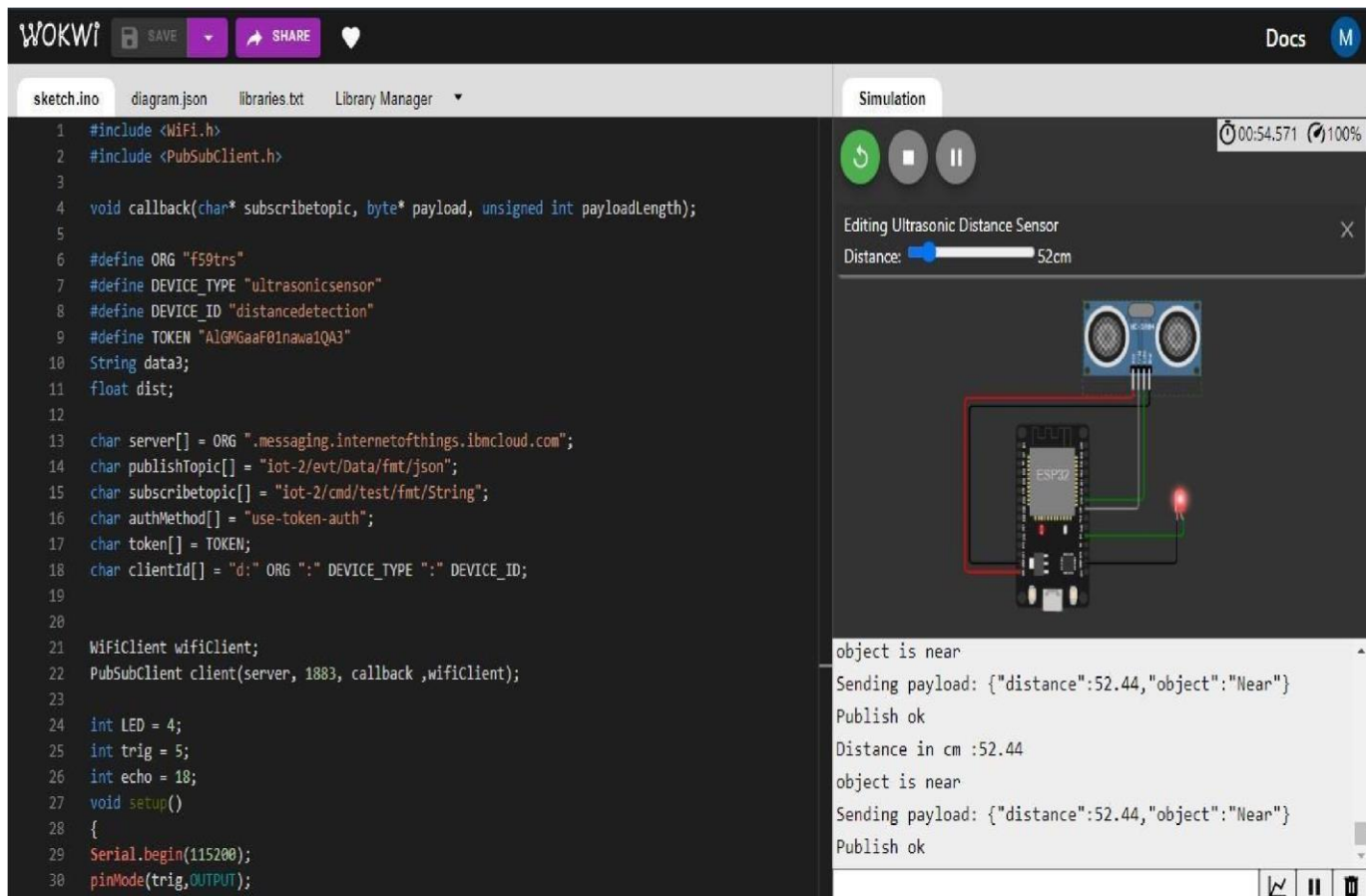


The screenshot shows the IBM IoT Cloud dashboard. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. A sidebar on the left contains various icons for device management. The main content area displays the details for a device named 'distancedetection', which is 'Connected' and of type 'ultrasonicsensor'. The 'Recent Events' tab is selected, showing a list of 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 dashboard, it indicates '0 Simulations running'.

When object is nearer to the ultrasonic sensor



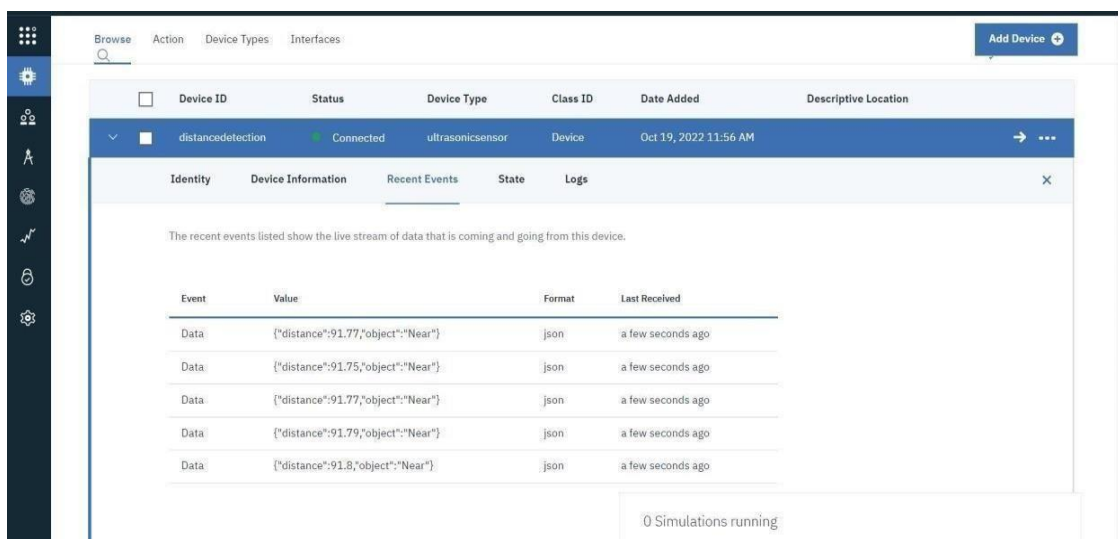
The screenshot shows the Wokwi IDE interface. On the left, the 'sketch.ino' file is open, displaying C++ code for an ESP32 connected to an ultrasonic sensor and an LED. The code includes libraries for WiFi and PubSubClient, and it sets up a MQTT client to publish distance data to the IBM Cloud IoT Platform. On the right, the 'Simulation' window shows a 3D model of the hardware. A slider for the ultrasonic sensor distance is set to 52cm. Below the simulation, a console window shows the output of the program, indicating that the object is near and a JSON payload is being sent to the cloud.

```
1 #include <WiFi.h>
2 #include <PubSubClient.h>
3
4 void callback(char* subscribtopic, byte* payload, unsigned int payloadLength);
5
6 #define ORG "f59trs"
7 #define DEVICE_TYPE "ultrasonicsensor"
8 #define DEVICE_ID "distancedetection"
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10 String data3;
11 float dist;
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13 char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
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15 char subscribtopic[] = "iot-2/cmd/test/fmt/String";
16 char authMethod[] = "use-token-auth";
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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);
```

Simulation window output:

```
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 Cloud IoT Platform console. The 'Device ID' is 'distancedetection', and its status is 'Connected'. The 'Recent Events' tab is selected, showing a list of events. Each event contains a JSON payload with distance and object information.

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

0 Simulations running