

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

Assignment Date	19 October 2022
Student Name	Mr. Mani Kandan
Student Roll Number	MECR19IT028
Maximum Marks	2 Marks

**Question-1:**

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

WOKWI LINK : <https://wokwi.com/projects/345964118720643668>

**CODE:**

```
#include <WiFi.h> //library for wifi
#include <PubSubClient.h> //library for MQTT

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

//-----credentials of IBM Accounts-----

#define ORG "f59trs" //IBM ORGANITION ID
#define DEVICE_TYPE "ultrasonicsensor" //Device type mentioned in
ibm watson IOT Platform
#define DEVICE_ID "distancedetection" //Device ID mentioned in ibm
watson IOT Platform
#define TOKEN "AlGMGaaF01nawa1QA3" //Token
String data3;
float dist;

//----- Customise the above values -----
char server[] = ORG ".messaging.internetofthings.ibmcloud.com"; //
Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json"; // topic name and
type of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/test/fmt/String"; //
cmd REPRESENT command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth"; // authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID; //client
id

//
WiFiClient wifiClient; // creating the instance for wificlient
```

```

PubSubClient client(server, 1883, callback ,wifiClient);
//calling the predefined client id by passing parameter like
server id,portand wificredential

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()// Recursive Function
{

  digitalWrite(trig,LOW);
  digitalWrite(trig,HIGH);
  delayMicroseconds(10);
  digitalWrite(trig,LOW);
  float dur = pulseIn(echo,HIGH);
  float dist = (dur * 0.0343)/2;
  Serial.print ("Distancein cm");
  Serial.println(dist);

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

/*.....retrieving to
Cloud. .... */

void PublishData(float dist) {
  mqttconnect();//function call for connecting to ibm
  /*
    creating the String in in form JSon to update the data to
    ibm cloud
  */
  String object;

```

```

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");// if it sucessfully upload data
on the cloud then it will print publish ok in Serial monitor or
else it will print publish failed
} 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() //function defination for wificonnect
{
    Serial.println();
    Serial.print("Connecting to ");

    WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials
to establish the connection
    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");
    }
}

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++) {
        //Serial.print((char)payload[i]);
        data3 += (char)payload[i];
    }

    // Serial.println("data: "+ data3);
    // if(data3=="Near")
    // {
    // Serial.println(data3);
    // digitalWrite(LED,HIGH);

    // }

    // else
    // {
    // Serial.println(data3);

```

```

// digitalWrite(LED,LOW);

//    }
data3="";

}

```

**OUTPUT :**

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

The screenshot displays the Wokwi IoT simulator interface. On the left, the 'sketch.ino' file contains the following code:

```

1 #include <WiFi.h> //library for wifi
2 #include <PubSubClient.h> //library for MQTT
3
4
5 void callback(char* topic, byte* payload, unsigned int payloadLength);
6
7 //-----credentials of IOT Accounts-----
8
9 #define ORG "f99tr" //IOT ORGANIZATION ID
10 #define DEVICE_TYPE "ultrasonicsensor" //Device type mentioned in IOT Watson IOT Platform
11 #define DEVICE_ID "distancedetection" //Device ID mentioned in IOT Watson IOT Platform
12 #define TOKEN "AlGMSaF0Inwa1Q4J" //Token
13 String data3;
14 float dist;
15
16
17 //----- Customize the above values -----
18 char server[] = ORG ".messaging.internetofthings.ibmcloud.com"; // Server Name
19 char publishTopic[] = "iot-2/evt/data/evt/json"; // topic name and type of event perform and
20 char subscribeTopic[] = "iot-2/cmd/test/evt/String"; // cmd. REPRESENT command type AND COMMAND
21 char authMethod[] = "use-token-auth"; // authentication method
22 char token[] = TOKEN;
23 char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID //client id
24
25
26 //-----
27 WiFiClient wifiClient; // creating the instance for wifiClient
28 PubSubClient client(server, 1883, callback, wifiClient); //calling the predefined client id
29
30 int LED = 4;
31 int trig = 5;
32 int echo = 18;
33 void setup()

```

On the right, the 'Simulation' window shows a 3D model of the ESP32 microcontroller and the HC-SR04 ultrasonic sensor connected by wires. Below the simulation, the console output shows the following sequence of events:

```

no object found
Sending payload: {"distance":403.45,"object":"No"}
Publish ok
Distance in cm 233.00
no object found
Sending payload: {"distance":233.00,"object":"No"}
Publish ok

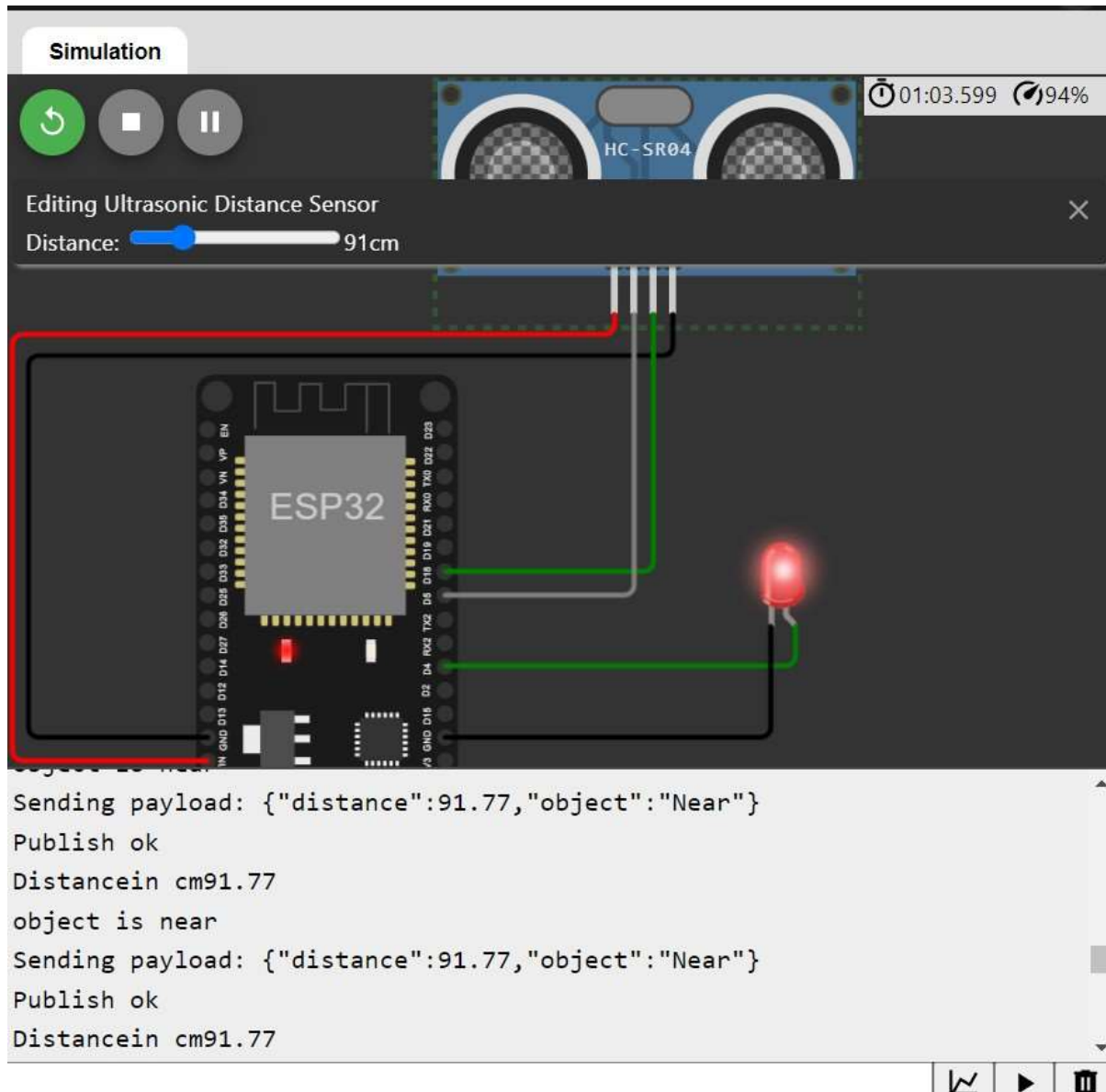
```

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

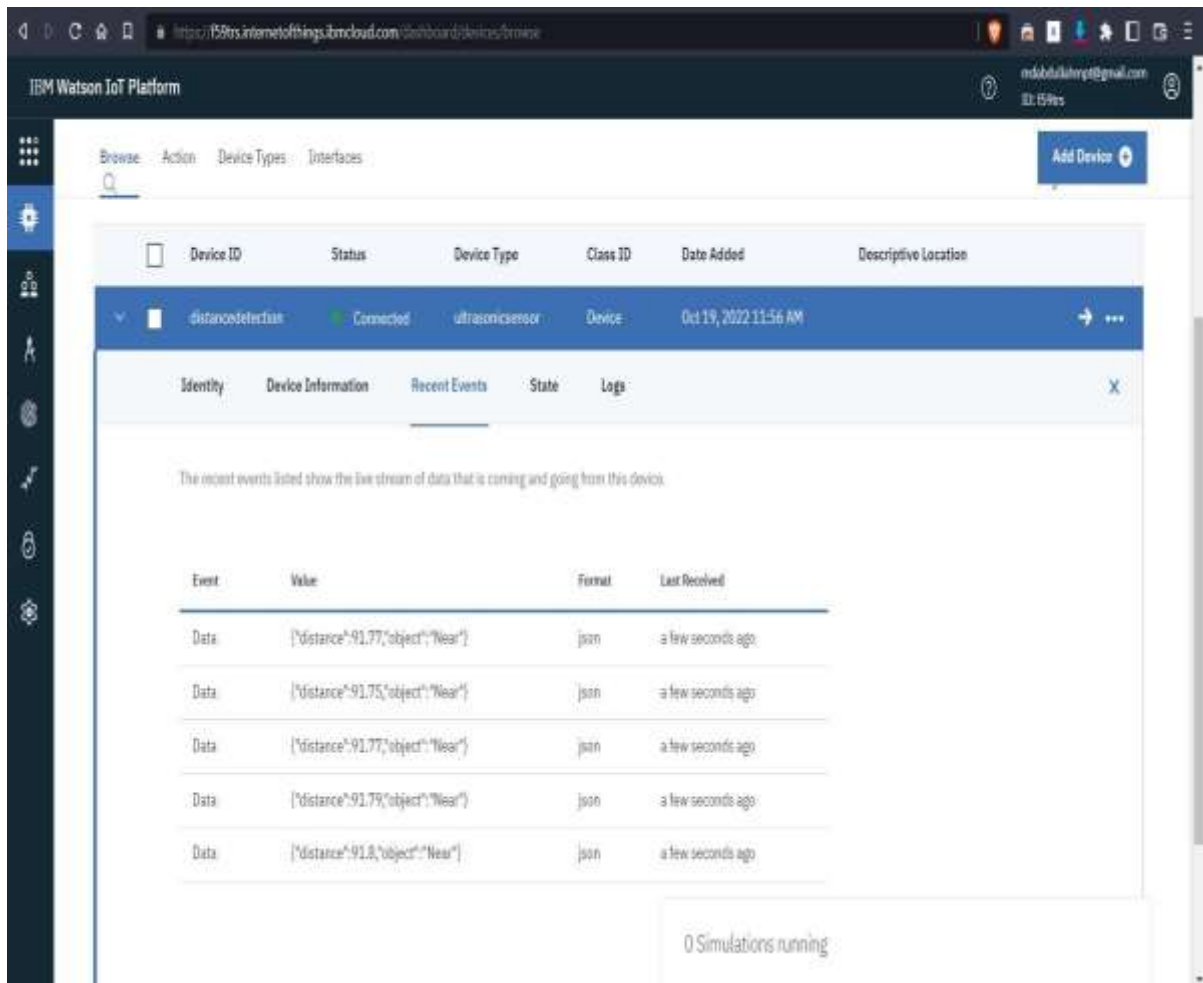
The screenshot displays the IBM Watson IoT Platform interface. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. A sidebar on the left contains various icons for navigation. The main content area shows a device named 'distance-detection' with a status of 'Connected' and a device type of 'ultrasonicsensor'. The device is located at 'Device' and was last updated on 'Oct 19, 2022 11:56 AM'. Below this, a tabbed interface shows 'Identity', 'Device Information', 'Recent Events', 'State', and 'Logs'. The 'Recent Events' tab is active, displaying a table of recent data events. The table has four columns: 'Event', 'Value', 'Format', and 'Last Received'. It lists five 'Data' events, each with a value of '["distance":235.02,"object":"","No"]' in 'json' format, received 'a few seconds ago'. At the bottom, it indicates '0 Simulations running' and 'Items per page 50 | 1-1 of 1 item'.

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

When object is nearer to the ultrasonic sensor



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



The screenshot displays the IBM Watson IoT Platform interface. At the top, the navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. A search bar is present, and an 'Add Device' button is in the top right. The main content area shows a list of devices. The selected device is 'distanceDetector', which is 'Connected' and has a 'Device Type' of 'ultrasonicsensor'. The 'Date Added' is 'Oct 19, 2022 11:56 AM'. Below the device list, the 'Recent Events' tab is active, showing a table of events. The table has columns for 'Event', 'Value', 'Format', and 'Last Received'. The events are JSON objects representing distance measurements, all received 'a few seconds ago'. At the bottom right, a status box indicates '0 Simulations running'.

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

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