

**Assignment - 4**  
ESP 32 – Ultrasonic Sensor

Assignment Date	4 NOVEMBER 2022
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Maximum Marks	2 Marks

**Question-1:**

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

**Solution:**

**Program:**

```
#include <WiFi.h>
#include <WiFiClient.h>
#include <PubSubClient.h>
const int trigPin = 5;
const int echoPin = 18;
//define sound speed in cm/uS
#define SOUND_SPEED 0.034
#define CM_TO_INCH 0.393701
long duration;
float distanceCm;
float distanceInch;

void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);
//-----credentials of IBM Accounts-----

#define ORG "b31tni"//IBM ORGANITION ID
#define DEVICE_TYPE "Assignment4"//Device type mentioned in ibm watson IOT
Platform
#define DEVICE_ID "assignment"//Device ID mentioned in ibm watson IOT
Platform#define TOKEN "6r?TKCIuy+okJ?9B+7" //Token
String data3;

//----- 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);

void setup() {
    Serial.begin(115200); // Starts the serial communication
    pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
    pinMode(echoPin, INPUT); // Sets the echoPin as an Input
    Serial.println();
    wificonnect();
    mqttconnect();
}

void loop() {
    // Clears the trigPin
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    // Sets the trigPin on HIGH state for 10 micro seconds
    digitalWrite(trigPin, HIGH);
    delayMicroseconds(10);
    digitalWrite(trigPin, LOW);

    // Reads the echoPin, returns the sound wave travel time in microseconds
    duration = pulseIn(echoPin, HIGH);

    // Calculate the distance
    distanceCm = duration * SOUND_SPEED/2;

    // Convert to inches
    distanceInch = distanceCm * CM_TO_INCH;

    // Prints the distance in the Serial Monitor
    Serial.print("Distance (cm): ");
    Serial.println(distanceCm);
    Serial.print("Distance (inch): ");
    Serial.println(distanceInch);

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

void PublishData(float Cm) {

```

```

mqttconnect();//function call for connecting to ibm
/*
    creating the String in in form JSon to update the data to ibm cloud
*/
String payload = "{\"Distance (cm)\":";
payload += Cm;
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];
    }
}

```

## Wokwi Simulation:

Wokwi Simulation interface showing the code and the simulated hardware setup.

**Code (sketch.ino):**

```

1  #include <WiFi.h>
2  #include <PubSubClient.h>
3  void callback(char* subscribetopic, byte* payload, unsigned int
4  payloadLength);
5  //-----credentials of IBM Accounts-----
6  #define ORG "91xobn"//IBM ORGANITION ID
7  #define DEVICE_TYPE "ESP32PROJECT"//Device type mentioned in ibm watson IOT Pl
8  #define DEVICE_ID "ESP32"//Device ID mentioned in ibm watson IOT Platform
9  #define TOKEN "ESP32PROJECT" //Token
10 String data3;
11 char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
12 char publishTopic[] = "iot-2/evt/Data/fmt/json";
13 char subscribetopic[] = "iot-2/cmd/test/fmt/String";
14 char authMethod[] = "use-token-auth";
15 char token[] = TOKEN;
16 char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
17 WiFiClient wifiClient;
18 PubSubClient client(server, 1883, callback ,wifiClient);
19 const int trigPin = 5;
20 const int echoPin = 18;
21 #define SOUND_SPEED 0.034
22 long duration;
23 float distance;
24 void setup() {
25   Serial.begin(115200);
26   pinMode(trigPin, OUTPUT);
27   pinMode(echoPin, INPUT);
28   wifiConnect();
29   mqttConnect();
30 }
31 void loop()
32 {

```

**Simulation:**

The simulation shows an ESP32 microcontroller connected to an HC-SR04 ultrasonic sensor. The sensor is connected to the ESP32 via a breadboard. The simulation output shows the distance measured by the sensor:

```

Distance (cm): 399.96
Distance (cm): 399.92
Distance (cm): 399.96
Distance (cm): 399.94
Distance (cm): 399.94
Distance (cm): 399.94
Distance (cm): 399.94

```

IoT Watson Platform:

Your Platform temporary passwo x IBM IBM Watson IoT Platform x +

iuvc9f.internetofthings.ibmcloud.com/dashboard/devices/drilldown/345:123456?returnTo=/devices/browse

IBM Watson IoT Platform kowsikap16@gmail.com ID: iuvc9f

Back

Device Drilldown - 123456

Device Credentials

Connection Information

Recent Events

State

Device Information

Metadata

Diagnostics

Connection Logs

Device Actions

Recent Events

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
event_1	{"randomNumber":1,"temp":93,"hump":50}	json	a few seconds ago
event_1	{"randomNumber":15,"temp":77,"hump":74}	json	a few seconds ago
event_1	{"randomNumber":40,"temp":40,"hump":69}	json	a few seconds ago

State

This table shows a list of data points that are reported

Showing Raw Data | No Interfaces Available

1 Simulation running

<https://wokwi.com/projects/347378598996345428>

