

Assignment - 4
ESP 32 – Ultrasonic Sensor

Assignment Date	3 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:

The screenshot displays the Wokwi web-based simulation environment. On the left, the 'sketch.ino' file is open, showing the Arduino code for an ESP32 connected to an HC-SR04 ultrasonic sensor. The code includes necessary libraries, defines the sensor's pins (trigPin = 5, echoPin = 18), and implements a callback function for the subscribed topic. The right side of the interface shows the 'Simulation' window, which contains a 3D model of the ESP32 microcontroller and the HC-SR04 sensor. The sensor is connected to the ESP32 via four colored wires: red for VCC, green for GND, blue for trigPin, and yellow for echoPin. The Wokwi interface also includes a top navigation bar with various icons and a bottom status bar.

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wokwi.com/projects/347290193940709972

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Apps

Gmail

YouTube

LinkedIn

IBM

Tinkercad

github

Rocket chat

cloud ibm

WOKWI

SAVE

SHARE

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Docs

SIGN UP

sketch.ino

diagram.json

libraries.txt

Library Manager

1 #include <WiFi.h>

2 #include <PubSubClient.h>

3 void callback(char* subscribtopic, byte* payload, unsigned int

4 payloadlength);

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

6 #define ORG "9lxobn"//IBM ORGANITION ID

7 #define DEVICE_TYPE "ESP32PROJECT"//Device type mentioned in ibm watson IOT Platform

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 subscribtopic[] = "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 {

33 digitalWrite(trigPin, LOW);

34 delayMicroseconds(2);

Simulation

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Connecting to
WiFi connected
IP address:
10.10.0.2
Reconnecting client to 9lxobn.messaging.internetofthings.ibmcloud.com
iot-2/cmd/test/fmt/String
subscribe to cmd OK

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

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IoT Watson Platform:

The screenshot displays the IoT Watson Platform interface. On the left is a dark sidebar with icons for navigation. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces', along with an 'Add Device' button. The main content area shows a table of devices. The first device, ID 567890, is 'Disconnected' and of type '908'. Below the table, a modal window titled 'Recent Events' is open, showing a list of events. The events are JSON objects containing 'randomNumber', 'temp', and 'hum' values. A status message at the bottom right indicates '1 Simulation running'.

Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
567890	Disconnected	908	Device	Nov 3, 2022 4:21 PM	

Event	Value	Format	Last Received
event_1	{"randomNumber":31,"temp":55,"hum":92}	json	a few seconds ago
event_1	{"randomNumber":84,"temp":21,"hum":78}	json	a few seconds ago
event_1	{"randomNumber":57,"temp":27,"hum":94}	json	a few seconds ago
event_1	{"randomNumber":99,"temp":3,"hum":96}	json	a few seconds ago

1 Simulation running

<https://wokwi.com/projects/347290193940709972>