

Assignment - 4
ESP 32 – Ultrasonic Sensor

Assignment Date	3 NOVEMBER 2022
Student Name	NARESH KUMAR
Student Roll Number	312319106108
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 IBMAccounts-----

#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 theabove 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 simulation interface. On the left, the 'sketch.ino' file contains the following code:

```

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 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 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 {
33   digitalWrite(trigPin, LOW);
34   delayMicroseconds(2);
35   digitalWrite(trigPin, HIGH);

```

On the right, the 'Simulation' window shows an ESP32 microcontroller connected to an ultrasonic sensor. Below the hardware diagram, a list of distance measurements is displayed:

```

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

```

IoT Watson Platform:

The screenshot displays the IBM Watson IoT Platform interface. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. The main content area shows details for a device with ID '456789', which is 'Disconnected' and has '345' events. The 'Recent Events' tab is active, showing a table of events. The table has columns for 'Event', 'Value', 'Format', and 'Last Received'. Below the table, it indicates 'Items per page 50' and '1-1 of 1 item'. A status bar at the bottom right shows '1 Simulation running'. The bottom of the image shows a Windows taskbar with various application icons and system information like '27°C Rain off and on' and '03:16 PM 04-11-2022'.

Event	Value	Format	Last Received
event_1	{"randomNumber":100,"temp":17,"hum":52}	json	a few seconds ago
event_1	{"randomNumber":72,"temp":3,"hum":38}	json	a few seconds ago
event_1	{"randomNumber":70,"temp":7,"hum":84}	json	a few seconds ago
event_1	{"randomNumber":61,"temp":1,"hum":92}	json	a few seconds ago
event_1	{"randomNumber":86,"temp":22,"hum":88}	json	a few seconds ago