

Assignment - 4
ESP 32 – Ultrasonic Sensor

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| 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 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 Arduino IDE editor shows 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. The sensor's output is displayed as a list of distance readings in centimeters:

```

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

```

The simulation status bar at the bottom indicates a runtime of 00:22.296 and 99% battery level.

IoT Watson Platform:

The screenshot shows the IBM Watson IoT Platform interface. The top navigation bar includes the IBM logo and the text 'IBM Watson IoT Platform'. The main header area displays 'Device Drilldown - 152807' and a 'Back' button. A sidebar on the left contains various icons and a list of menu items: Device Credentials, Connection Information, Recent Events (highlighted), State, Device Information, Metadata, Diagnostics, Connection Logs, and Device Actions.

The main content area is divided into two sections. The top section, titled 'Recent Events', contains a table with the following data:

| Event | Value | Format | Last Received |
|---------|---|--------|-------------------|
| event_1 | {"randomNumber":91,"temp":12,"hump":59} | json | a few seconds ago |
| event_1 | {"randomNumber":55,"temp":26,"hump":96} | json | a few seconds ago |
| event_1 | {"randomNumber":7,"temp":17,"hump":73} | json | a few seconds ago |
| event_1 | {"randomNumber":86,"temp":6,"hump":59} | json | a few seconds ago |

The bottom section, titled 'State', contains a text box with the message '2 Simulations running'.