

Name of the Students:	Roll No.	Date:
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## Experiment No. – 6

**Title:** Introduction to MQTT/ CoAP and sending sensor data to cloud using Raspberry-Pi/Beagle board/Arduino.

**Aim:** Interfacing of DHT11 (Humidity, Temperature) sensor and MQ3 Smoke Sensor with Raspberry Pi board and store the information on thingspeak cloud.

**Hardware Requirements:** Raspberry Pi 3 B<sup>+</sup>, DHT11 Sensor, MQ3 Smoke Sensor

**Software Requirements:** Python 3 IDE

**Theory:**

**DHT11 Sensor:**

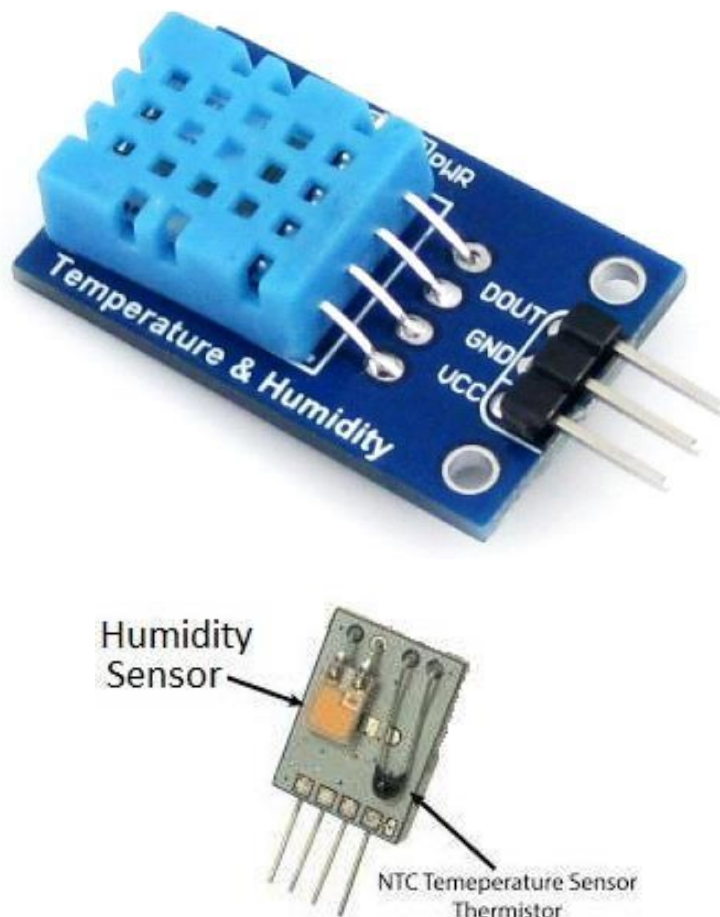


Fig: 1 DHT11 Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a

digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using library, sensor readings can be up to 2 seconds old.

### Specifications

- Low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings  $\pm 2^{\circ}\text{C}$  accuracy
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1" spacing

### Pin Configuration

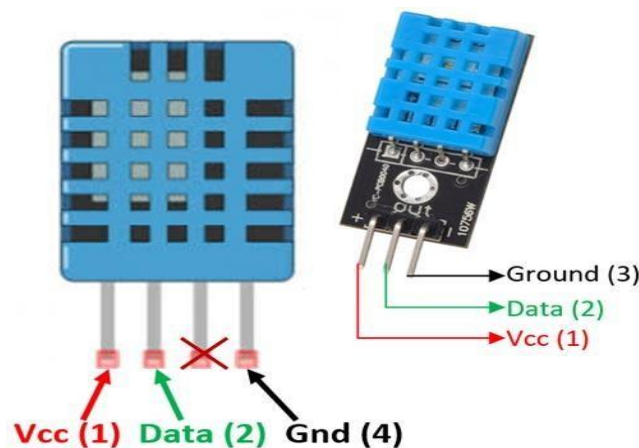


Fig: 2 Pin description of DHT11

No:	Pin Name	Description
<b>For Sensor</b>		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	NC	No Connection and hence not used
4	Ground	Connected to the ground of the circuit
<b>For module</b>		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	Ground	Connected to the ground of the circuit

### **MQ3 Smoke Sensor:**

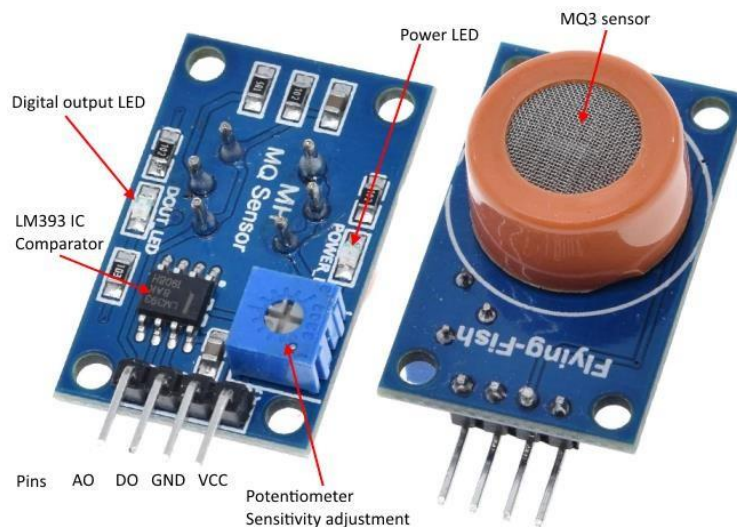


Fig: 3 Pin description of MQ3 Sensor

The MQ3 Gas Sensor module detects gas leakage in home and industry. The MQ3 Gas Sensor can detect Alcohol, Benzine, Methane, Hexane, LPG, CO. It can detect the presence of alcohol gases at concentrations from 0.05 mg/L to 10 mg/L

The sensitive material used for this sensor is SnO<sub>2</sub>, whose conductivity is lower in clean air. Its conductivity increases as the concentration of alcohol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline.

This module provides both digital and analog outputs. MQ3 gas sensor module can be easily interfaced with Microcontrollers, Arduino Boards, Raspberry Pi etc. The MQ series of gas sensors use a small heater inside with an electrochemical sensor. They are sensitive to a range of gasses and are used indoors at room temperature.

Due to its fast response time and high sensitivity, measurements can be taken as soon as possible. The sensor sensitivity can be adjusted by using the potentiometer.

#### **Features:**

- High sensitivity and fast response
- Wide detecting scope
- stable and Long life
- Simple drive circuit
- Analog and Digital Outputs

#### **Pinout:**

- Vcc – Power Supply (5V)
- GND – Ground
- AO – Analog Output, DO – Digital Output

### ***Raspberry pi 3:***

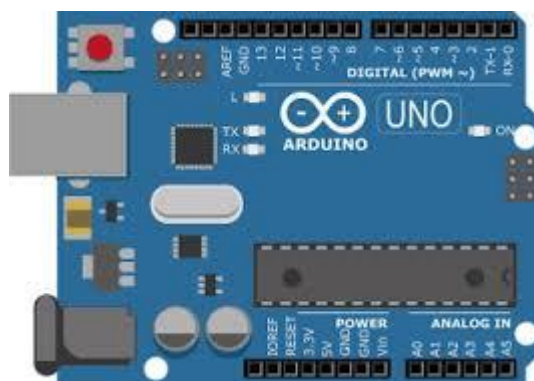
The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games.

Raspberry Pi 3 Model B was released in February 2016 with a 64bit quad core processor, on-board Wi-Fi, Bluetooth and USB boot capabilities. On Pi Day 2018 model 3B+ appeared with a faster 1.4 GHz processor and a three times faster network based on gigabit Ethernet (300 Mbit / s) or 2.4 / 5 GHz dual-band Wi-Fi (100 Mbit / s). Other options are: Power over Ethernet (PoE), USB boot and network boot (an SD card is no longer required). This allows the use of the Pi in hard-to-reach places (possibly without electricity).

Fig.4 Raspberry Pi 3 Model B+



Arduino UNO:





Arduino UNO is a microcontroller board based on the **ATmega328P**. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started

### Circuit Diagram:

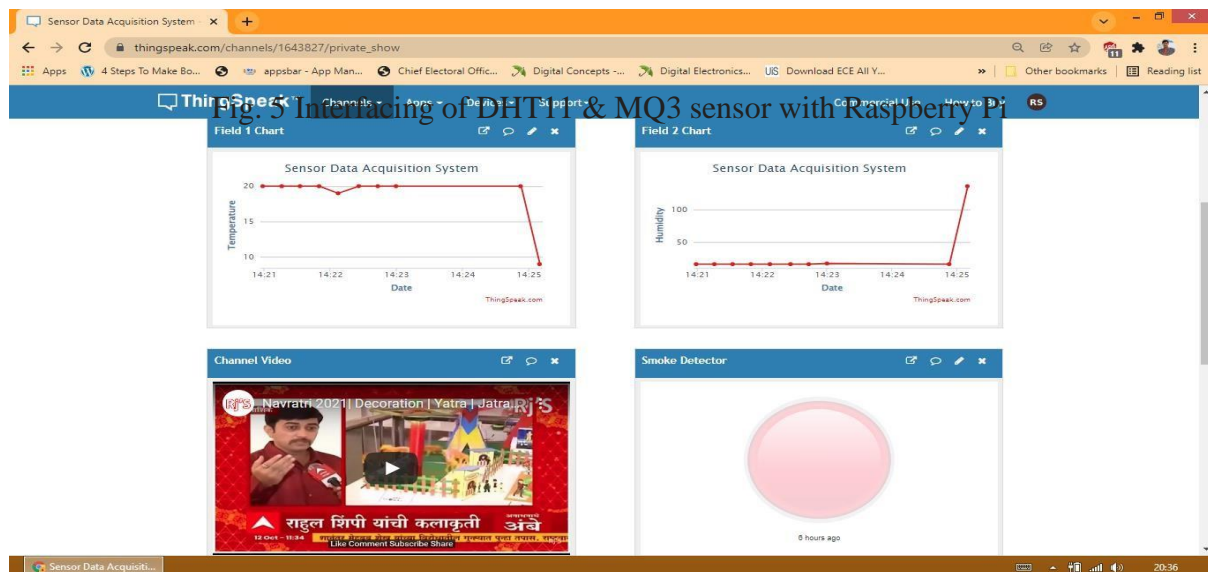
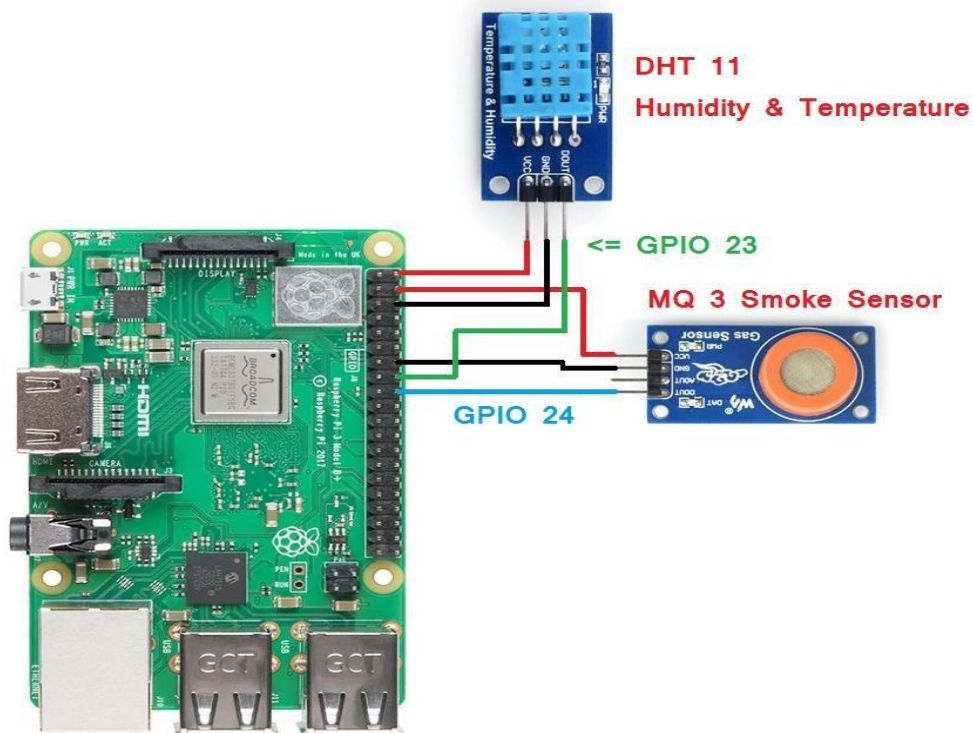


Fig. 6 Data uploaded on Thingspeak Cloud

- Create a channel on the cloud (Thingspeak)
- Make the connection as per circuit diagram
- Open Python IDE
- Write code in Editor window and save file
- Compile the code
- Open thingspeak channel
- Observe the result

**Conclusion:**

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**Code:**

```
import sys
import Adafruit_DHT as dht
from time import sleep
import urllib
import RPi.GPIO as GPIO
GPIO.setmode(GPIO.BCM)
GPIO.setup(24, GPIO.IN)          #Smoke Sensor Digital output

GPIO.setwarnings(False)

def DHT11_data():
    # Reading from DHT11 and storing the temperature and humidity
    humi, temp = dht.read_retry(11, 23)
    return humi, temp

# Enter Your API key here
myAPI = "ZQN4Z08XZ9HLOZY0"

# URL where we will send the data, Don't change it
baseURL = "https://api.thingspeak.com/update?api_key=%s" % myAPI

while True:

    humidity, temperature = DHT11_data()
    print ('Temp: {0:0.1f} C Humidity: {1:0.1f} %'.
format(temperature,humidity))

    input_state = GPIO.input(24)

    if input_state == False:
        smoke = 1
        print('Smoke Detected')
        print(smoke)
    else:
        smoke = 0
        print('Smoke is not Detected')
        print(smoke)

    from urllib.request import urlopen
    content = urlopen(baseURL + "&field1=%s&field2=%s&field3=%s" %
(temperature,humidity,smoke))

    sleep(15)
```