

# IOT Technology based Air Quality Monitoring System

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**Abstract**— The paper deals with measuring the air quality using the Arduino Atmel 8-bit AVR microcontroller. This system was designed to monitor and analyze air quality in real-time and generate the analyzed report for the users.

**Keywords:** Arduino Uno, DTH11, ESP8266, IOT, MQ-135, MQ2

## I. INTRODUCTION

The rapid increase of different toxic components (CO, SO<sub>2</sub>, NO, NO<sub>2</sub>, etc.) comes from vehicle exhaust, industries, wildfires, and many more.

This will leads to many harmful diseases that affect lung development increased the risk of cancer, premature deaths, memory problems, increased asthma symptoms.

For any developing nation, poor quality of air is a challenge. Detection of harmful components from the air is the first step to improve the quality of air.

This project will work on sensors, which will give the composition of different components, measures the temperature, humidity and shows the real-time output and generates an analytical report.

## II. LITERATURE SURVEY

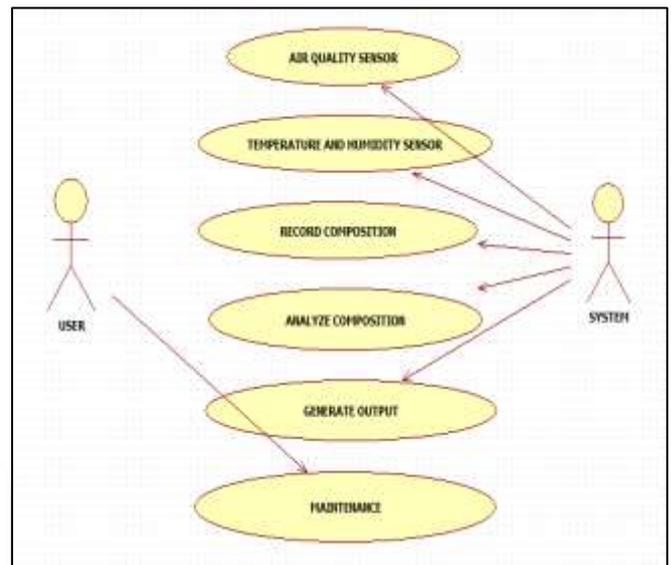
Air is the most essential element of the environment which is polluted by different toxic pollutants. Being aware of the quality of air is very important. This proposed system is a wireless sensor network that monitors the composition of pollutants in the air. It is a low-budget efficient and accurate monitoring system. There are some existing systems, (i) Smart environment monitoring system on vehicles was introduced in 2015. It figured out the rate of poisonous pollutants which are responsible for poor air quality. (ii) Industrial air pollution monitoring system for safety and health enhancement was introduced to know the hazardous pollutants in the air and their effects. (iii) Low cost air quality system was introduced in 2008. Based on mobile GPRS system because sensors are quite expensive. (iv) Wireless sensor network based pollution monitoring system in metropolitan cities was introduced to know the air quality. (v) Pollution Dynamic Monitoring System was another system which is introduced to improve air quality.

It's clear from the above researches that air pollution should be controlled. Increased air pollution will affect the climate conditions. The number of toxic elements as waste from industries and other human activities contaminates introduced in nature, which will affect nature. But the air is a very essential component and can easily get polluted and solutions for improvement in air quality is a must. According to World Health Organization (WHO), from smog hanging over cities to smoke inside the home, air pollution poses a major threat to health and climate. The combined effects of ambient (outdoor) and household air pollution cause premature deaths, increased mortality from stroke, heart

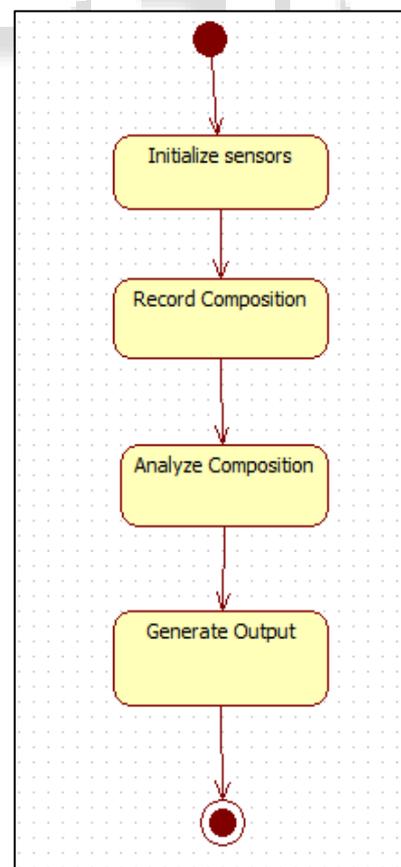
disease, chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections.

## III. SYSTEM DESIGN DIAGRAMS

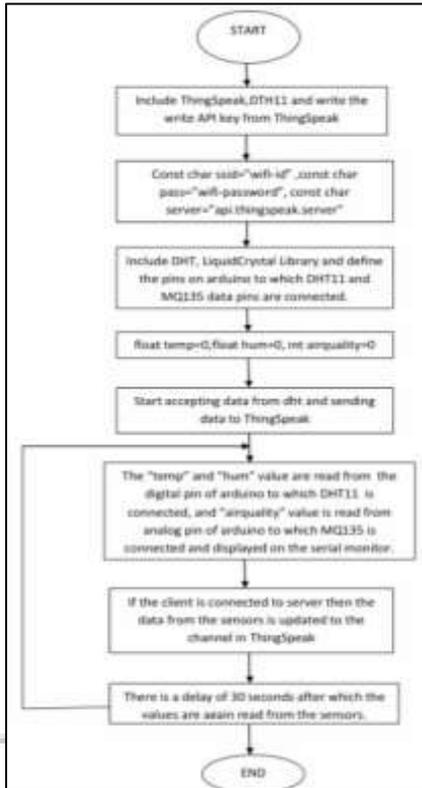
### A. Use Case Diagram



### B. State Diagram



C. Flow Chart Model

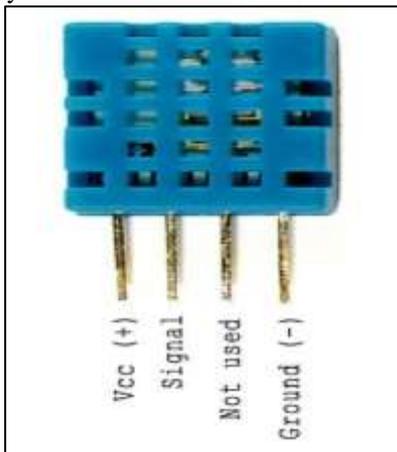


IV. COMPONENT DESCRIPTION

TEMPERATURE AND HUMIDITY SENSOR (DHT11)

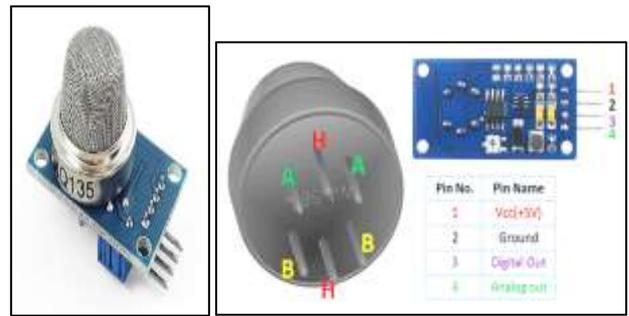
DHT11 digital temperature and humidity sensor is a 4-pin package out of which 3 pins will be used: Vcc-3.5V to 5.5V, Signal-Output of both temperature and humidity (serial data), Not used- No connection, Ground- connected to the ground.

The sensor can measure temperature: 0 C to 50 C and humidity: 20% to 90%.



A. Air Quality Sensor (mq135)

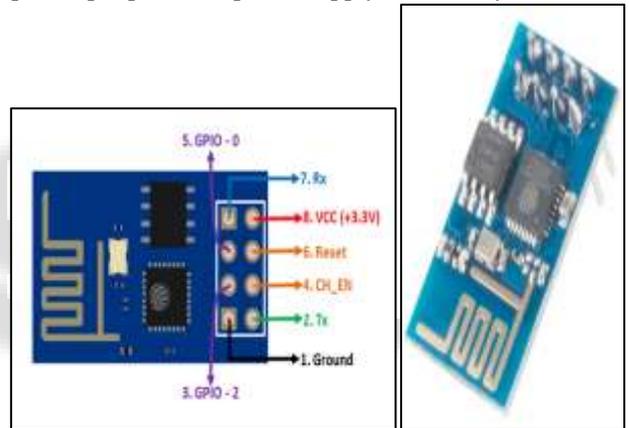
MQ135 Air quality sensor is used for detecting ammonia, nitrogen oxides, benzene series, smoke, Carbon-di-oxide and other toxic gases that reduce the air quality. H-Pins: one pin is connected to supply and other to ground, A-Pins: for supply voltage, B-Pins: one pin will act as output and other to ground. A- Pins and B-Pins are interchangeable.



B. Wi-Fi Module (esp8266)

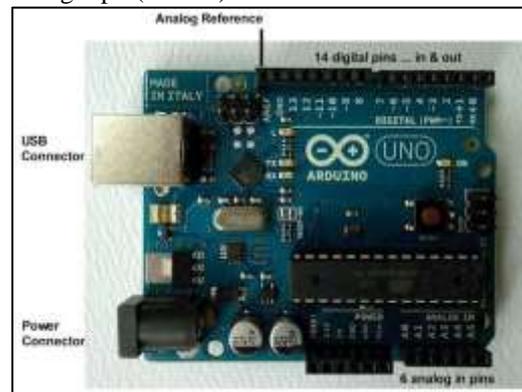
ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

Ground: connected to ground, Tx(GPIO-1): upload program or act as input/output pin, GPIO-2: input/output pin, CH\_EN: Chip Enable- Active high, GPIO-0(Flash): input/output pin, Reset: reset the module, Rx(GPIO-3): input/output pin, Vcc: power supply +3.3V only.



C. Arduino Uno

Arduino is a device that acts as an intermediate between hardware and software. It can sense and control objects in the physical world. Power: Vin(3.3V) and Ground(5 V), Analog Pins: analog input(A0-A5).



V. CONCLUSION

The system is introduced to monitor the air quality using IOT Technology. As mentioned above the problems due to poor

air quality this system will help in improving that. For the detection of quality different components in the air, the MQ135 gas sensor is used. Arduino is the heart of this project which controls the entire process and communicates with hardware and software. For internet connectivity, a Wi-Fi module is used. DHT11 sensor is used for the measurement of temperature and humidity. The monitor is used to display the Output. Pollution is increasing at an alarming rate, this system is a step to contribute a solution. This system is efficient and maintenance is cheap, so it can easily be installed in highly polluted areas. It is beneficial in all climatic conditions.

#### VI. FUTURE ENHANCEMENTS

For enhancement in the project machine learning would be introduced so that system would learn the change in climate and work accordingly. It will predict impurities in the atmosphere that would be possible in the future and it will give a warning.

#### ACKNOWLEDGEMENTS

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