

# An IoT Based Automated Noise and Air Pollution Monitoring System

**Palaghat Yaswanth Sai**

Department of Computer Science and Engineering, Narayana Engineering College Gudur, India

**Abstract:** In the present era, air and noise pollution is the growing hazardous issue. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all. Here we propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in a particular areas through IOT. System uses air sensors to sense presence of harmful gases/compounds in the air and constantly transmit this data to microcontroller. Also system keeps measuring sound level and reports it to the online server over IOT. The sensors interact with microcontroller which processes this data and transmits it over internet. This allows authorities to monitor air pollution in different areas and take action against it. Also authorities can keep a watch on the noise pollution near schools, hospitals and no honking areas, and if system detects air quality and noise issues it alerts authorities so they can take measures to control the issue.

**Keywords:** IoT, Air Pollution, Noise Pollution, Microcontroller, Monitoring System.

## I. PROPOSED MODEL



In this project we are going to make an **IOT Based Air Pollution Monitoring System** in which we will **monitor the Air Quality over a webservice using internet** and will trigger a alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases are present in the air like CO<sub>2</sub>, smoke, alcohol, benzene and NH<sub>3</sub>. It will show the air quality in PPM on the LCD and as well as on webpage so that we can monitor it very easily.

We have used MQ135 sensor which is the best choice for monitoring Air Quality as it can detects most harmful gases and can measure their amount accurately. In this IOT project, you can monitor the pollution level from anywhere using your computer or mobile. We can install

this system anywhere and can also trigger some device when pollution goes beyond some level, like we can switch on the Exhaust fan or can send alert SMS/mail to the user.

## II.PREVIOUS WORK AND LITERATURE SURVEY

Some of the research works carried out for monitoring the pollution parameters in a particular area of interest for making the environment smart in that area, different techniques and methods which were used in the past discussed in this section.

Smart Environment Monitoring using Wireless Sensor networks [1] -In this work they are mainly focus on the

making the city environment smart, by deploying wireless sensor networks in all over the city and moving public transportation system buses and cars.

By accessing all the sensor networks, environmental behaviors are collected as a streaming data base to identify the environmental conditions. This methodology gives the monitoring data from stationary nodes deployed in city to the mobile nodes on public transportation buses and cars.

Toward a Green Campus with the Internet of Things -the Application of Lab Management this research work adopts the concept of "Internet of Things" and implements an idea of energy-saving by proper management of computers and air conditioners. The architecture and the prototype of the system is explained in [6]. Here the objects of Internet of Things are computers and air conditioners.

WSN and IOT-Based Smart Homes and Their Extension to Smart Buildings [8] –This work mainly aims to design and develop reliable, efficient, flexible, economical, real-time and realistic wellness sensor networks for smart home systems. The sensor and actuator nodes based on wireless networking technologies are deployed into the home environment. These nodes generate real-time data related to the object usage and movement inside the home. Further extends the smart home system to smart buildings and models the design issues related to the smart building Environment.

### III.COMPONENTS USED:

#### MQ135 GAS SENSOR:



MQ-135 Module sensor has lower conductivity in clean air. When the target combustible gas exist, the sensors conductivity is more higher along with the gas concentration rising. Convert change of conductivity to correspond output signal of gas concentration. MQ135 gas sensor has high sensitivity to Ammonia, Sulphide and Benzene steam, also sensitive to smoke and other harmful gases. It is with low cost and suitable for different applications such as harmful gases/smoke detection.

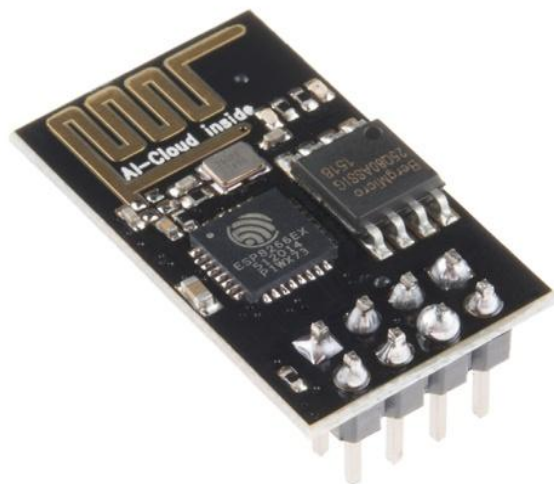
#### SOUND SENSOR:

This module allows you to detect when sound has exceeded a set point you select. Sound is detected via a microphone and fed into an LM393 op amp.

The sound level set point is adjusted via an on board potentiometer. When the sound level exceeds the set point, it automatically sends the message to the server through wifi connectivity



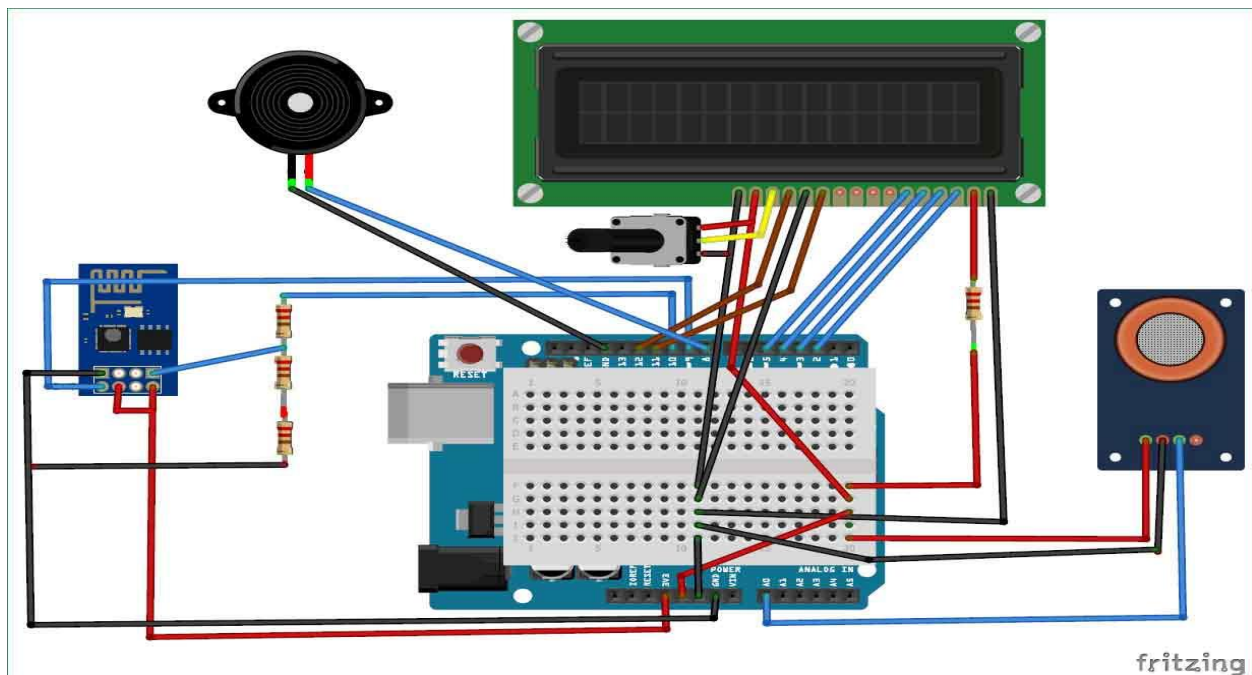
#### ESP8266 WIFI MODULE:



It is the leading IOT devices in the world in which it is very cheap and effective to use. The hardware connections required to connect to the ESP8266 module are fairly straight-forward but there are a couple of important items to note related to power:

- The ESP8266 requires 3.3V power–do not power it with 5 volts!
- The ESP8266 needs to communicate via serial at 3.3V and does not have 5V tolerant inputs.so you need level conversion to communicate with a 5V microcontroller like most Arduinos use.

## IV. CIRCUIT DIAGRAM AND EXPLANATION



First of all we will connect the **ESP8266 with the Arduino**. ESP8266 runs on 3.3V and if you will give it 5V from the Arduino then it won't work properly and it may get damage. Connect the VCC and the CH\_PD to the 3.3V pin of Arduino. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Arduino when we will connect it directly to the Arduino. So, we will have to make a voltage divider for it which will convert the 5V into 3.3V. This can be done by connecting three resistors in series like we did in the circuit. Connect the TX pin of the ESP8266 to the pin 10 of the Arduino and the RX pin of the esp8266 to the pin 9 of Arduino through the resistors.

ESP8266 Wi-Fi module gives your projects **access to Wi-Fi or internet**. It is a very cheap device and make your projects very powerful. It can communicate with any microcontroller and it is the most leading devices in the IOT platform. Learn more about using ESP8266 with Arduino here.

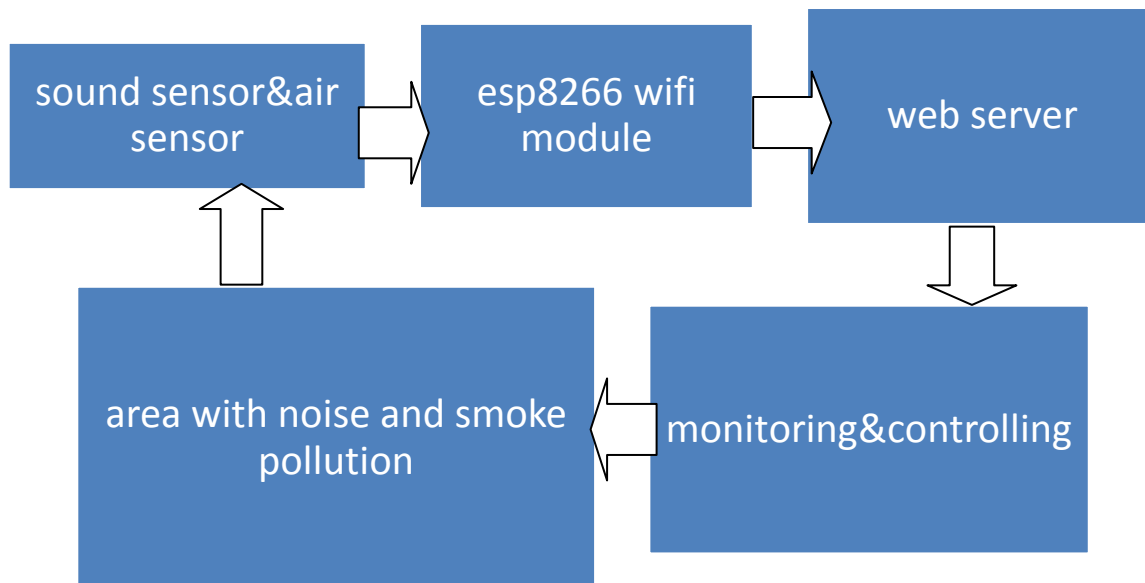
Then we will connect the **MQ135 sensor with the Arduino**. Connect the VCC and the ground pin of the sensor to the 5V and ground of the Arduino and the Analog pin of sensor to the A0 of the Arduino.

Connect a buzzer to the pin 8 of the Arduino which will start to beep when the condition becomes true.

In last, we will connect LCD with the Arduino. The connections of the LCD are as follows

- Connect pin 1 (VEE) to the ground.
- Connect pin 2 (VDD or VCC) to the 5V.
- Connect pin 3 (V0) to the middle pin of the 10K potentiometer and connect the other two ends of the potentiometer to the VCC and the GND. The potentiometer is used to control the screen contrast of the LCD. Potentiometer of values other than 10K will work too.
- Connect pin 4 (RS) to the pin 12 of the Arduino.
- Connect pin 5 (Read/Write) to the ground of Arduino. This pin is not often used so we will connect it to the ground.
- Connect pin 6 (E) to the pin 11 of the Arduino. The RS and E pin are the control pins which are used to send data and characters.
- The following four pins are data pins which are used to communicate with the Arduino.
  - Connect pin 11 (D4) to pin 5 of Arduino.
  - Connect pin 12 (D5) to pin 4 of Arduino.
  - Connect pin 13 (D6) to pin 3 of Arduino.
  - Connect pin 14 (D7) to pin 2 of Arduino.
- Connect pin 15 to the VCC through the 220 ohm resistor. The resistor will be used to set the back light brightness. Larger values will make the back light much more darker.
- Connect pin 16 to the Ground.

## V. WORKING EXPLANATION



The MQ135 sensor can sense NH<sub>3</sub>, NO<sub>x</sub>, alcohol, Benzene, smoke, CO<sub>2</sub> and some other gases, so it is perfect gas sensor for our **Air Quality Monitoring Project**. When we will connect it to Arduino then it will sense the gases, and we will get the Pollution level in PPM (parts per million). MQ135 gas sensor gives the output in form of voltage levels and we need to convert it into PPM. So for converting the output in PPM, here we have used a library for MQ135 sensor, it is explained in detail in “Code Explanation” section below.

Sensor was giving us value of 90 when there was no gas near it and the safe level of air quality is 350 PPM and it should not exceed 1000 PPM. When it exceeds the limit of 1000 PPM, then it starts cause Headaches, sleepiness and stagnant, stale, stuffy air and if exceeds beyond 2000 PPM then it can cause increased heart rate and many other diseases. When the value will be less than 1000 PPM, then the LCD and webpage will display “Fresh Air”. Whenever the value will increase 1000 PPM, then the buzzer will start beeping and the LCD and webpage will display “Poor Air, Open Windows”. If it will increase 2000 then the buzzer will keep beeping and the LCD and webpage will display “Danger! Move to fresh Air”.

## VI. CONCLUSION

By keeping the embedded devices in the environment for monitoring enables self protection (i.e., smart environment) to the environment. To implement this need to deploy the sensor devices in the environment for collecting the data and analysis. By deploying sensor devices in the environment, we can bring the environment into real life i.e. it can interact with other objects through

the network. Then the collected data and analysis results will be available to the end user through the Wi-Fi.

The smart way to monitor environment and an efficient, low cost embedded system is presented with different models in this paper. In the proposed architecture functions of different modules were discussed.

The noise and air pollution monitoring system with Internet of Things (IoT) concept experimentally tested for monitoring two parameters. It also sent the sensor parameters to the cloud (Google Spread Sheets). This data will be helpful for future analysis and it can be easily shared to other end users.

This model can be further expanded to monitor the developing cities and industrial zones for pollution monitoring. To protect the public health from pollution, this model provides an efficient and low cost solution for continuous monitoring of environment.

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## BIOGRAPHY



**Yaswanth Sai Palaghat** is a student studying computer science and engineering at naryanana engineering college gudur. I am the sole author of this paper. I am very much interested in internet of things since from its evolution. I have presented many

papers in many symposiums. To obtain the level of my best, I am interested to publish it here.