IOT Based Air Pollution Monitoring Handheld Device Using Micro-controller.

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***Abstract*—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 web server 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 CO2, smoke, alcohol, benzene and NH3. 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.**

By using IOT, this system can reduce the hardware cost into 1/10 as before. The system can be laid out in a large number in monitoring area to form monitoring sensor network. Targeted emergency disposal measures can be taken to minimize losses in practical application.

***Index Terms*—Alcohol, gas, smoke,IOT based monitoring system**

I. Introduction

An odor is composed of molecules, each of which has a specific size and shape. Each of these molecules has a correspondingly sized and shaped receptor in the human nose.When a specific receptor receives a molecule, it sends a signal to the brain and the brain identifies the smell associated with that particular molecule.The chemical that causes the smell can harm you. In general, we have evolved so that harmful substances smell bad, to warn us. Now, does the work of recognizing it. this odor maybe either safe or harmful and for us, our brain. The electronic nose is a device that detects the odor detected by a sensor and analyses it. Depending upon the application, the most common harmful gases are predefined and stored, such that they are identified. Thereby, they send the gas which has been identified to the operator take further action. Electronic noses have been around for several years but have typically been large and expensive hazardous gases out of the specific components of an who is working in or for that area to be alert and hence, Electronic noses were originally used for quality control applications in the food beverage and cosmetics industries. Current applications include detection of odor specific to diseases for medical diagnosis, and detection of pollutants and gas leaks for environmental protection. The electronic nose is an intelligent sensing device that uses an array of gas sensors with an open source electronic based platform, Arduino. Nowadays, the electronic noses have provided external benefits to a variety of commercial industries, agriculture, biomedical, cosmetics, environmental, food, water and various scientific research fields. The electronic nose detects the hazardous or poisonous gas which is not possible to human sniffers to identify whether the gas is dangerous or no. In all industries, odor assessment is usually performed by human sensory analysis, by chemosensory, or by gas chromatography Mainly, in industries there are exhaust gases, which are emitted during combustion process. The exhaust gas is actually a combination of many different gases: N2, CO2, H2O and 02 Though some are harmless, there are few that are harmful and are considered major pollutants. One of the most dangerous of these is CO, carbon monoxide. This gas has the potential to kill people and animals if concentrations are high enough Hydrocarbons come from unburned fuel. Nitrogen oxides are released through the internal combustion process and have been linked to acid rain and ozone Exhaust gases can be visible or invisible to the naked eye. We inhale airborne particles that enter our respiratory system and fasten in our lungs This can affect human health in both the short and the long term. Consequences for our health are alarming.

II. Required Components

- MQ135 Gas sensor
- DHT11 temperature and humidity sensor
- Microcontroller
- Wi-Fi module ESP8266
- 16X2 LCD
- 10K potentiometer
- 1K ohm resistors
- 220 ohm resistor
- Buzzer

III. BLOCK DIAGRAM AND EXPLANATION

First of all we will connect the ESP8266 with the Microcontroller. ESP8266 runs on 3.3V and if you will give it 5V from the microcontroller then it won't work properly and it may get damage. Connect the VCC and the CH-PD to the 3.3V. The RX pin of ESP8266 works on 3.3V and it will not communicate with the Microcontroller when we will connect it directly to the Microcontroller. 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 microcontroller and the RX pin of the esp8266 to the microcntroller 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 Microcontroller here. Then we will connect the MQ135 sensor with the Microcontroller. Connect the VCC and the ground pin of the sensor to the 5V and ground of the Microcontroller and the analog pin of sensor to the port of the Microcontroller. With the above gas sensor we are going to merge DHT11 temperature sensor to monitor the parameters and then analysing the two we will be getting the desired output on the LCD.

IV. WORKING EXPLANATION

The MQ135 sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2 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”.”THE ABOVE PROCEDURE WILL BE REPEATED AGAIN FOR THE TEMPERATURE SENSOR”.By Comparing these two outcomes the LCD will state the pollution of the area.

V. HARDWARE DESIGN

In this project we have used MQ(series) sensors to monitor the rate of various types of gases present near the product. These sensors are already assembled as modules. We just need to connect them to our PCB i.e. just an interface board to connect the sensors to wifimodule ESP8266 and Arduino Nano. The hardware is designed on two side copper clad sheet.

A. CIRCUIT DIAGRAM DESCRIPTION

The above figure is the circuit diagram of the product, and the circuit mainly consists of three parts namely: i. Arduino Nano ii. Sensors iii. LCD Display. Sensors like MQ3, MQ6, MQ7, MQ9 are applied as inputs to the analog pins of the Arduino. Arduino requires +5v for it’s operation and hence IC 7805 is used.

B. HARDWARE ASSEMBLY

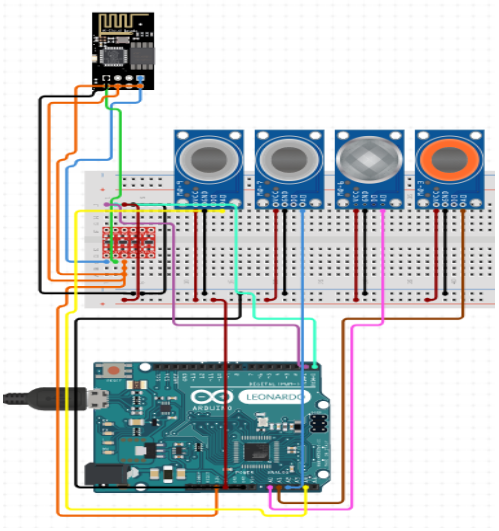

Fig. 1. HARDWARE ASSEMBLY DESIGN

C. CIRCUIT DIAGRAM

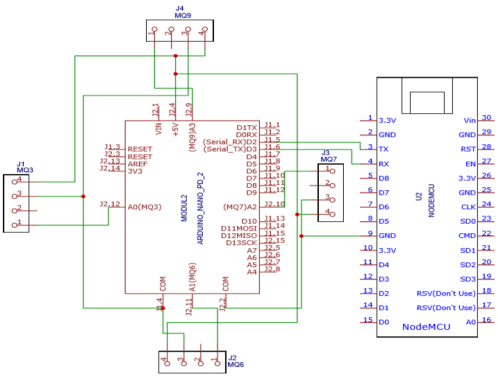

Fig. 2. SCHEMATIC LAYOUT DESIGN

VI. SOFTWARE DESIGN

The software used to design the complete PCB layout is Altium. We designed the board as two layered PCB .
The software used to code ATMEGA328P is Arduino IDE , we had code the program as sensors as inputs to the board and ESP8266 as the output from the board.
We also used Blynk application for monitoring the values which are sensed by the sensors. The processed value by ATMEGA328P is given to ESP8266 which is connected by a link in code to the application. This application continuously takes in the values of sensors and auto updates itself. This is basically done for IOT.

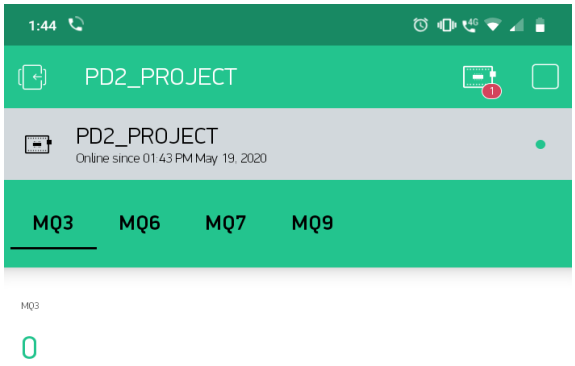

Fig. 3. SOFTWARE DESIGN FOR ANDROID

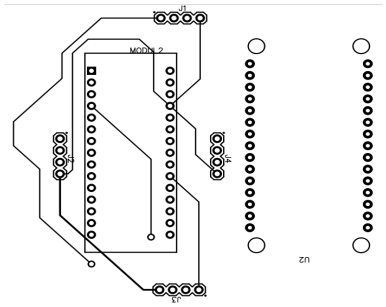

Fig. 4. TOP AND BOTTOM CLAD PICS

A. *SOFTWARE LAYOUT*

B. *PCB LAYOUT DESIGN OF ALTIUM*

VII. ACKNOWLEDGMENT

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VIII. CONCLUSION

- This will make it more clear the discussion of the gas present and must be identified.
- In this manner understanding and separating harmful gases.
- Along these lines, it will ensure human life.

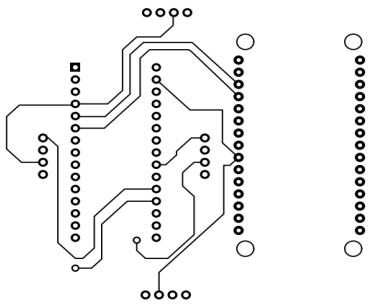

Fig. 5. TOP AND BOTTOM CLAD PICS

IX. FUTURE SCOPE

- The ability of the electronic nose to detect the odourless compound makes it perfect for use in the police force, for example, its ability to recognize drug odours notwithstanding other airborne odours equipped for befuddling police dogs. However, this is improbable in the close to term as the expense of the electronic nose would be very high.
- It might likewise be utilized as a bomb discovery strategy in airports. Through the cautious position of a few or more electronic noses and powerful PC frameworks, one could triangulate the area of bombs to inside a couple of meters of their area in under a couple of moments.
  For recognizable proof of volatile organic compounds in air, water and soil tests.
- For ecological insurance.
  Different application notes depict investigation in zones, for example, flavour and scent, nourishment and drink, bundling, pharmaceutical, cosmetics and perfumes, and chemical companies.
  All the more as of late they can likewise address open worries in time of olfactory disturbance checking with systems of on-field devices. It can give an apparatus to follow vacillations and slants and survey the circumstance continuously. It will permit the operator to comprehend which periods and conditions are putting the facility in danger. Additionally, existing business frameworks can be customized to have active alerts (in view of set-highlights) to start fitting activities.

X. REFERENCES

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