

IOT Based Air Pollution Monitoring System

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Abstract— The level of pollution is increasing rapidly due to factors like industries, urbanization, increasing in population, vehicle use which can affect human health. IOT Based Air Pollution Monitoring System is used to monitor the Air Quality over a web server using Internet. It will trigger an alarm when the air quality goes down beyond a certain level, means when there are sufficient amount of harmful gases present in the air like CO₂, smoke, alcohol, benzene, NH₃ and NO_x. It will show the air quality in PPM on the LCD and as well as on webpage so that air pollution can be monitored very easily.

Keywords: Air Pollution, MQ135 Sensor, IOT, Arduino Uno

I. INTRODUCTION

Air pollution is the biggest problem of every nation, whether it is developed or developing. Health problems have been growing at faster rate especially in urban areas of developing countries where industrialization and growing number of vehicles leads to release of lot of gaseous pollutants. Harmful effects of pollution include mild allergic reactions such as irritation of the throat, eyes and nose as well as some serious problems like bronchitis, heart diseases, pneumonia, lung and aggravated asthma. According to a survey, due to air pollution 50,000 to 100,000 premature deaths per year occur in the U.S. alone. Whereas in EU number reaches to 300,000 and over 3,000,000 worldwide. IOT Based Air Pollution Monitoring System monitors the Air quality over a web server using Internet and will trigger an alarm when the air quality goes down beyond a certain threshold level, means when there are sufficient amount of harmful gases present in the air like CO₂, smoke, alcohol, benzene, NH₃, LPG and NO_x. It will show the air quality in PPM on the LCD and as well as on webpage so that it can monitor it very easily. LPG sensor is added in this system which is used mostly in houses. The system will show temperature and humidity. The system can be installed anywhere but mostly in industries and houses where gases are.

II. BLOCK DIAGRAM

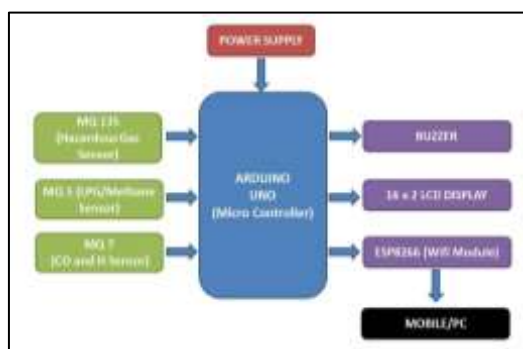


Fig. 1: Block Diagram of IoT based air pollution monitoring system

A. Block Diagram Description

Proposed Air Pollution Monitoring System is based On the block diagram as shown in Fig.1. The data of Air is recognized by MQ135 gas sensor and MQ6 LPG

Gas sensor. The MQ135 sensor can sense NH₃, NO_x, Alcohol, Benzene, smoke, CO₂. So it is dynamic gas Sensed for our Air pollution Monitoring system. When it will be connected to Arduino then it will sense All gases, and it will give the Pollution level in PPM(parts per million). MQ135 gas sensor will give the Output in form of voltage levels and we have to convert It into PPM. So for converting the output in PPM, we Have used a library for MQ135 gas sensor and MQ6 Sensor.

When the value will increase from 1000 PPM, then the buzzer will start beeping and the LCD And webpage will display “Poor Air, Open Windows”. And when it will increase 2000, the buzzer will keep Beeping and give an alert message on smartphone Through GSM. The LCD and webpage will display “Danger! Move to fresh Air”. It will contain Temperature and humidity so it will possibly show the Current temperature and humidity of the air.

III. CIRCUIT DIAGRAM

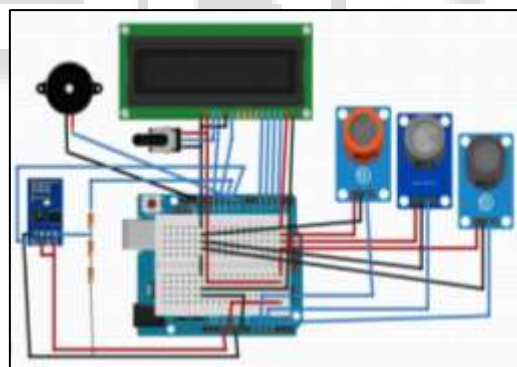


Fig. 2: Circuit Diagram of IOT based air pollution monitoring system.

IV. RESULT



Fig. 3: Resulting Effect of HEALTH HUB on human

A. Circuit Diagram Description

- 1) 1) Arduino UNO: Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB Connection, power jack, an ICSP header and a reset button.
- 2) MQ135 sensor: The MQ135 sensor can sense NH₃, NO_x, alcohol, Benzene, smoke, CO₂ and some other gases. It gives the output in form of voltage levels.
- 3) Buzzer: A Buzzer or beeper is an audio signaling device. Whenever the air pollution goes above the threshold level the Buzzer starts beeping indicating Danger.
- 4) LCD (Liquid Crystal Display): This is a basic (16x2) 16 character by 2 line display. Black text on Green background. It is used to indicate the Air and Humidity in PPM.
- 5) Gas sensor.
The Grove - Gas Sensor(MQ5) module is useful for gas leakage detection (in home and industry). It is suitable for detecting H₂, LPG, CH₄, CO, Alcohol. Due to its high sensitivity and fast response time, measurements can be taken as soon as possible. The sensitivity of the sensor can be adjusted by using the potentiometer.
- 6) MQ7 SENSOR.
Sensitive material of MQ-7 gas sensor is SnO₂, which with lower conductivity in clean air. It makes detection by method of cycle high and low temperature, and detects CO when low temperature (heated by 1.5V). The sensor's conductivity is more higher along with the gas concentration rising. When high temperature (heated by 5.0V), it cleans the other gases adsorbed under low temperature. Please use simple electrocircuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-7 gas sensor has high sensitivity to Carbon Monoxide. The sensor could be used to detect different gases contains CO, it is with low cost and suitable for different application.
- 7) WIFI Module (ESP8266): The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and MCU (microcontroller unit) capability. It runs on 3.3V and gives our system access to Wi-Fi or internet.

B. Observation

Fig. 3 shows the results we get from applying all the sensors on different people and getting its output at different levels.

C. Result Explanation

It is being observed that we have obtained the result through different sensors and it being played on different human at same time.

As the header of this title that smart healthcare system or health hub it says that it is very much efficient for the clinic or hospital staff and also for the patients. And patient can take the result or the reading of itself from anywhere and visit the clinic or hospital if needed. With the help of our prototypes it will always show the real time values of different health parameters which are measured and it would be very helpful for the doctors to operate immediately rather than waiting for the reports to appear before them.

V. ADVANTAGES

- 1) Easy to Install.
- 2) Accurate Pollution monitoring.
- 3) Remote location monitoring.

VI. DISADVANTAGES

- 1) Sensors are used.
- 2) Humidity should be less than 95% and sound should be less than 85db.
- 3) Accurate measure of containing gases cannot be detected in ppm and sound in db.

VII. FUTURE SCOPE

- Roadside pollution monitoring.
- Industrial perimeter monitoring.
- Site selection for reference monitoring.
- Indoor air quality monitoring.
- Interface SD CARD to store data.
- Interface GPS module to monitor the pollution.

VIII. CONCLUSION

The system to monitor the air of environment using Arduino microcontroller, IOT Technology is proposed to improve quality of air. With the use of IOT technology enhances the process of monitoring various aspects of environment such as air quality monitoring issue proposed in this paper. Here, using the MQ135 and MQ6 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project.

The result we are getting from that we can conclude our project is enough to detect any kind of disease present on people in 40 to 50 seconds our health hub kit is working fine.

REFERENCE

- [1] RD, F.B. Brook, W Cascio, Y Hong, G Howard, M Lipsett, R Luepker, et al., "Air pollution and cardiovascular disease: a statement for healthcare professionals from the Expert Panel on Population and Prevention Science of the American Heart Association", *Circulation*, vol. 109, no. 21, June 2004.
- [2] H. Ali, J. K. Soe and S. R. Weller, "A real-time ambient air quality monitoring wireless sensor network for schools in smart cities", In the Proceedings of the IEEE First International Smart Cities Conference (ISC2'15), 25-28 Oct. 2015.
- [3] J. Dutta et al., "AirSense: Opportunistic crowd-sensing based air quality monitoring system for smart city", In the Proceedings of the IEEE SENSORS, 30 Oct.-3 Nov. 2016.