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Analysis and control the air quality using NodeMCU

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ABSTRACT

Due to the increase in vehicles and industries quality of air has gone worse and it affects living beings. Diseases like asthma and other respiratory disorders have increased even with children below the age of ten. Chimneys from Industries releases lots of harmful gases, though air control monitoring is established in most parts of the world. Still increasing in industries has caused a major air pollution problem. This creates a toxic atmosphere around the factories and spoils the wellbeing of a human. With the drastic evolution in the field if the Internet of Things (IoT) it is made possible to monitor the amount of toxic substances in air particles and can even control the quality of air. The objective is to develop a system which can sense the amount of toxic particles in air using the MQ135 sensor. The quality of air can be controlled over the web using a dedicated server. When the toxic particles in the air like CO2, methane, alcohol, benzene increases an alarm will be triggered. Air quality in PPM is displayed on the web server when the toxicity in the air crosses the threshold value and automatically air purifier gets switched on, and it detoxifies the air. This device can be installed anywhere and can and when pollution crosses the safe region some external devices can be triggered, like displaying an alert message over the LCD display or can send a notification to all the people over there through a speaker or via SMS by using a GSM module.

Keywords: *Air Toxicity, MQ135, NodeMCU, Buzzer, Air Purifier.*

1. PROBLEM STATEMENT

To monitor the quality of air and calculate the number of toxic gases in the atmosphere and detoxify it.

2. INTRODUCTION

Air pollution is a critical issue faced by various countries. Health problems have been growing at drastic rate especially in urban areas of developing countries due to industrialization and growing number of vehicles. It leads to release of a 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. Premature deaths occur due to the presence of pollutants in the air. Pollutants are pumped into the atmosphere that undergoes a chemical reaction and further leads to the formation of new pollutants normally called as secondary pollutants. For instance, according to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change(IPCC), nearly all climate-altering pollutants either directly or indirectly (by contributing to secondary pollutants in the atmosphere) are responsible for health problems. Almost every citizen spends 90% of their time in the indoor air. The outdoor air quality of the cities of developed countries improved considerably in recent decades. On the contrary, indoor air quality degraded during this same period because of many factors like reduced ventilation, energy conservation and the introduction of new sources and new materials that cause indoor pollution. The design of buildings for lower power consumption resulted in a decrease of ventilation which further decreases the quality of air inside the building. This increases the need for indoor air quality (IAQ) monitoring Due to this fact and use of new building materials, IAQ often reaches to unacceptable levels.

3. PURPOSE

Air toxicity is increased when hazardous particles from factories and vehicles are introduced into the atmosphere. This causes various biological disorders to mankind as well as to Animals and even damages the environment.

4. EXISTING SYSTEM

The existing system makes use of gsm module, the prototype was equipped with basic functionalities, it enables the detection of pollutants and notifies the end user via message. Comparison of air quality for each timeslot cannot be done.

5. PROPOSED SYSTEM

The proposed system is linked to a cloud service 'thinkspeak.com'. The system enables to monitor the exact amount of pollutants at the given timeslot. The data will be stored in the database for comparing with the value obtained in future executions. For each execution, the database will be modified. The final resultant includes a line graph that depicts the amount of pollutants ranging from each time slot. If the amount of pollutants is increasing graph will be growing. If not the graph will be diminishing.

6. BLOCK DIAGRAM AND WORKING

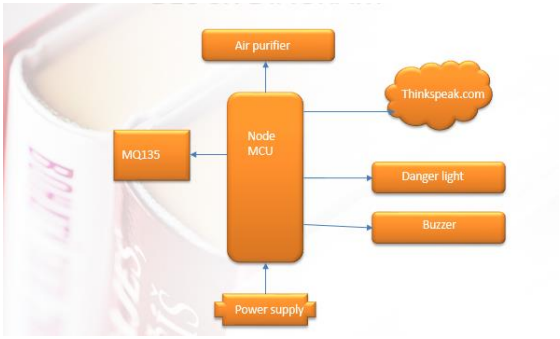


Fig.1 Block Diagram of the system

Node MCU acts as the microprocessor for the circuit. It is connected to MQ135. MQ135 is a gas sensor used for detecting the presence of a various type of gases. It is a dynamic gas sensor that can be detected using this sensor are NH3, NOx, alcohol, Benzene, smoke, CO2. The amount of gas is measured in parts per million. If the amount of gases exceeds the threshold value, the danger light will be switched on automatically along with the buzzer and air purifier. The system is connected to Think to speak .com. It is a cloud service that stores the data from the sensor. These data stored during each execution will be plotted as a line chart. On the x-axis time of execution is noted. On the y-axis amount of pollution corresponding to each time slot will be plotted, the resultant line graph can be viewed in the browser.

7. HARDWARE REQUIREMENTS

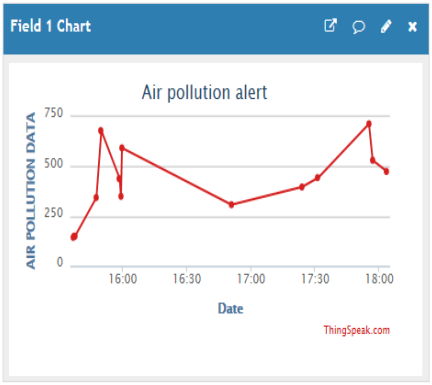
7.1 NodeMCU

It is open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espress if Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

7.2 MQ135

It is a gas sensor capable of detecting multiple gases. It is dynamic in nature. These are commonly used in air quality monitor equipment for buildings/office. It has wide detecting scope, fast response, high sensitivity, and durability. it can also be used to detect gas leakage and presence of alcohol.

8. TESTING AND OUTPUT



The above chart depicts the amount of pollutants at various time slot. This is the consolidated result of multiple executions during integration testing. Integration testing is done once the hardware components are properly connected and the code is completely debugged.

9. CONCLUSION

The device to monitor the toxicity in the air environment is designed using NodeMCU, IoT technology is implemented to control the air quality. By using IoT technology the process of monitoring the toxicity of air and controlling the various gases in the environment is proposed in this paper. The use of MQ135 sensor senses various hazardous gases and NodeMCU is the heart of this application, which controls the whole process. Wi-Fi module controls all the process to the internet and monitor is used for displaying all the web pages over the internet.

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