Air Pollution Monitoring System Using IoT

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Abstract - Every vehicle has its emission of gases, but the difficulty is the emission of the gas outside the uniform values. This emission from the vehicles cannot be completely avoided, but in certain things, we can able to control this. In this situation, in most countries, air pollution is a major problem. In our life there are three needed necessities are used on earth i.e. air, liquid substances (water), solid substances (food). Before it consumed the water, the water permits through a reliable cleaning process. From the statistics, without significant weather, the air polluted or not, living beings that breathe over 3000 tons of air per day. Therefore this suggests raising awareness to the public regarding air quality and air pollutants. Because of air pollution not only human health is affected it also damages the atmosphere and surroundings so decrease the mature of live hood.

Key Words: Internet of Things, Arduino UNO, Air pollution, Gas sensor, Arduino IDE

1. INTRODUCTION

Pollution can be well-defined as the presence of tiny elements that distract the working of ordinary processes and also yields undesirable health. In other words, pollution can disturb the natural phase and also can disturb the health of the living being. As industrial development is growing widely pollution is also getting make known to a huge manner. At present, there is Air, Water, and Soil is polluted worldwide. This only concentrates on Air pollution. Air pollution is the being there of impurity or tiny elements that affect living being health and surroundings. These pollutants result from vehicles, industries. The WHO (World Health Organization) states that 2.3 million persons die per year due to reasons directly qualified by air pollution. Based on the information above points out, the humanoid should focus on air pollution observing. Air pollutants are measured in Parts per Million (ppm) or ug/m3. Primary pollutants are released directly into the atmosphere. Secondary pollutants are produced when the primary pollutant reacts with other atmospheric chemicals. Air quality affects public health [2]. There are two approaches to checking air pollution at present-day. One is an inactive sample (non-automatic), and the other is constant online checking (automatic). The Inactive sample uses simple tools but it does not deliver real-time values. The procedure of continuous online monitoring uses sensors to monitor the parameters, and then send it to the control center by the network. The way records transmission includes wired and wireless organizations. Even although

the system is dependable it is consuming small developments at big and dynamic range, such as complex network cabling, expensive, etc. at length rising communication knowledge, now a day's air pollution checking method is often aimed in the wireless method. To implement such a system single-chip microcontroller along with an array of sensors, the IoT module is used. This system focus on gases such as CO_2, temperature, and humidity via sensors. The hardware part collects air pollutant stages also packs them into the frame. The frame is uploaded to the IoT modem communicated to the significant server via IoT. This organization is low budget and energy effective in terms of devices.

2. METHODOLOGY

In this project, we are working to make an IOT Based Air Pollution Monitoring System in which we will observe the Air Quality done on mobile using the internet and will initiate an alarm when the air quality goes beyond a certain level. When there is a sufficient quantity of dangerous gases are exist in the air like CO_2, smoke, temperature, humidity, and rain. It will show the air value in Parts per Million (PPM) on the LCD so that we can display it very easily.

3. HARDWARE COMPONENTS
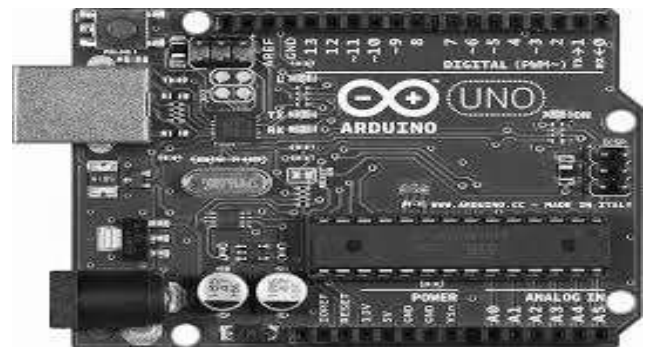
3.1 Arduino UNO

Fig -1: *Arduino UNO*

Arduino Uno is a microcontroller board that In this project, we are working to make an IOT Based Air Pollution Monitoring System in which we will observe the Air Quality done on mobile using the internet and will initiate an alarm when the air quality goes beyond a certain level. When there is a sufficient quantity of dangerous gases are exist in the air

like CO2, smoke, temperature, humidity, and rain. It will show the air value in Parts per Million (PPM) on the LCD so that we can display it very easily. The Arduino Uno board includes 14 digital input/output pins 6 analog inputs, a USB Connection, a power jack, a reset button. The user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects [3]. The Arduino microcontroller is not only for technical persons but is intended for designers and artists also because of its focus to usability based on its plan which helps to achieve the intended goal [5].

3.2 Gas Sensor

Fig -2: *Gas Sensor*

The Gas Sensor (MQ2) component is used for the gas leakage finding. It is used for recognizing LPG Liquefied petroleum gas, CH4, CO (carbon monoxide), Smoke. The circuit is very simple. Gas sensor of the MQ-2 gas sensor is SnO2 (stannic oxide), which with lesser conductivity in clean air.

3.3 DTH11 Sensor

Fig -3: *DTH11 Sensor*

DHT11 is featured to measure temperature and humidity sensor complex by using temperature & humidity sensing technique with output in the form of the standardized digital signal [1]. DHT11 is an inexpensive humidity and temperature sensor which offers high consistency and long period steadiness. DHT11 can be interfaced with any microcontroller like Arduino and get instant results. It gives the output in voltage.

3.4 LCD

Fig -4: *LCD Display*

LCD (Liquid Crystal Display) an electronic display module. This is a basic (16x2) 16 character by 2 line display [4]. Black text on Green background. It is used to show the Air and Humidity. A (16x2) LCD is a very plain module and is very normally used in different types of devices and circuits [5].

3.5 Buzzer

Fig -5: *Buzzer*

A Buzzer or beeper is an electronic audio signalling device. Whenever the air pollution or the toxic level in the air goes beyond the threshold level the Buzzer makes sound starts beeping indicating Danger [4].

3.6 Wi-Fi Module

Fig -6: *WI-FI Module*

The ESP8266 is low-cost. Every ESP8266 component comes pre-programmed with an AT expertise set firmware, meaning, we can simply join to the Arduino device. The ESP8266 module is a low-cost board [5]. This module has a dominant sufficient on-board processing and storage capability that allows it to be combined with the sensors.

4. SOFTWARE REQUIREMENTS

4.1 Arduino IDE

The Arduino is an Integrated Development Environment (IDE) or Arduino Software has a text editor for writing programs. It also has a message area, text console, a toolbar with buttons for functions and a series of menus. It links to the Arduino hardware to upload programs and connect with them [6].

4.2 Thing speak

Thing Speak is an Internet of Things (IoT) platform that lets you gather and hold sensor records in the cloud and develop IoT applications. The Thing Speak IoT platform delivers apps that let you study and visualize your value.
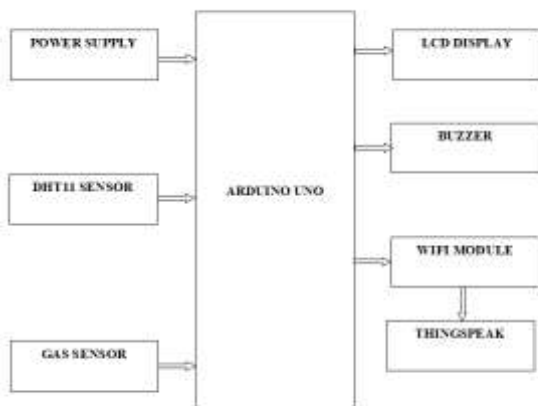
5. SYSTEM DESIGN

5.1 BLOCK DIAGRAM

Fig-7: Represents the arrangements of components.

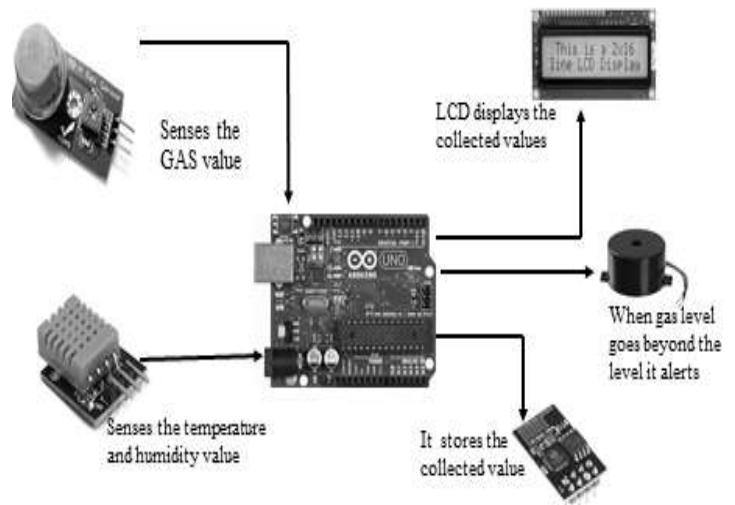### 5.2 Flow Diagram

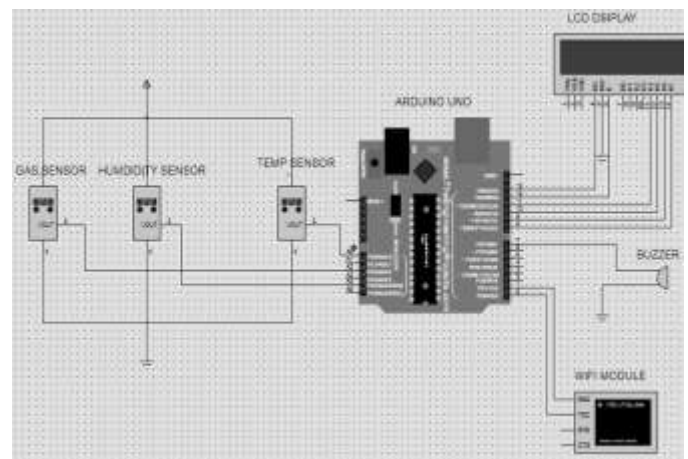**Fig -8**: Flow diagram.

5.3 Circuit diagram

Fig -9: Circuit diagram.

6. Working procedure

1. The above sensors can sense temperature, humidity, and smoke.
2. When we will join it to Arduino microcontroller then it will detect the gases, and it will progress the Pollution level in PPM (parts per million).
3. Then our project is based on the wireless that is stored in the cloud database.
4. For that, we have to require some programming concepts to run the project that's why we have to create a code using Aurdino1.6.10. Software.
5. In this software, the code should be written in simple C language with all descriptions of sensors, and another operating system in which the code

explains how the sensor, Wi-Fi module, LCD, and so on should be connected.

6. The whole program is dumped into the Arduino microcontroller.
7. With this Wi-Fi module, 8266 is used for Trans receiving the data from hotspot from another device.
8. And it useful for detecting the number of polluted gases in the air with that the values are displayed in the cloud.
9. The percentage levels are monitored continuously in LCD and cloud database also.
10. If the level of gas value more than the threshold value buzzer starts ON automatically.

7. RESULT AND DISCUSSION

In the pollution monitoring system gas sensor (mq2) is used to detect the gas likes oxygen, carbon dioxide, nitrogen, and other toxic gases. The DTH11 sensor is used to detect temperature and humidity. The concentration of air pollutants such as CO, Carbon dioxide (CO_2), methane, propane, NO2, and dust are displayed in 16X2 LCD. When the limit of sensed value exceeds the threshold value the buzzer that alerts. The online application needs to analyze air quality value got from sensors. Thing-speak is an open-source application programming interface that needs to store and recover data from interconnected things using the hypertext protocol over the internet or via a local area network. It also offers access to a wide range of embedded devices and web facilities.

8. CONCLUSION

The system utilizes city buses, industrial areas to collect pollutant gases such as CO, smoke, and temperature. Here we have successfully designed such a system that can monitor the real-time air pollution percentage present in the air which can be accessed from anywhere in the world so, here we have designed a circuit which makes takes corrective action on the increase of air pollution on the particular threshold value. The proposed Wireless Air Pollution Monitoring System be responsible for real-time info about the level of air pollution in these areas, as well as alerts in cases of extreme change in the quality of air. This data can then be used by the establishments to take prompt activities such as leaving people or sending crisis reply team. The system uses city buses to gather pollutant gases such as CO, NO2, and SO2. The pollution facts from several mobile sensor ranges are conveyed to a central some that make these facts accessible on the Internet. The facts display the pollutant range and their conformance to local air quality.

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