IOT Based Air Pollution Monitoring System

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Abstract- Today it's a very serious issue of air pollution in our environment. Day by Day its increasing because of industries, vehicles and constructions sites. So, this IOT based Air Pollution Monitoring System works to monitor the current quality of air over a web server using the internet. Air Pollution effects mainly human lungs and by this they face many serious disease as well. The particle which is generated from these sectors are categorized in two types and first PM 2.5 which is generated from vehicle, bricks chimneys and industries and second one is PM 10 which is generated from construction sites, mines etc.

Keywords: Air Pollution, Internet of Things, Arduino Uno, MQ135 Sensor.

1. INTRODUCTION

Air Pollution is the serious issue of all over the world weather it is developing country or developed country. If we talk about developing country then the comparison of air pollution is more than developed countries because in developing countries they are working on their infrastructure and the pollution coming from their sites are very dangerous and harmful because the size is upto PM 10. Today the main source of air pollution is smog coming out from the vechicles atr the size upto PM 2.5. Recently a servey done by the World Bank, due to air pollution the death ratio of all over the world is up to 9 million per year and in this report they also said that the main resaon of death due to air pollution in major is tuberculosis. In the air pollution India and China lead in the top of the table with around 2.3 and 1.8 million death respectively. IoT based Air Pollution monitoring system and it us the latest model and uptodate with all the components and not much costly also and suitable in all the areas wherever you to install it you install.

The process of installation is also easy and the output is shown in the LCD board and all the work process is done with the help of internet. IoT BASED Air Pollution Monitoring System monitor the real time of air quality and give the accuracy of upto 99.99% because it's a technology only which is made by human so we can't except frrom a technology is upto 100% result of related to environment. It means where there is sufficient amount of pollution present then the sensor sense [CO2, LPG, NH3] and the many more poisnous gas and show the result in LCD board in the form of PPM.

LPG sensor is brought in this gadget that is used mainly in homes. The system will display temperature and humidity. The system may be installed anywhere however commonly in industries and houses wherein gases areLPG fuel is detected the usage of MQ6 sensor and MQ135 sensor is used for monitoring Air high-quality because it detects maximum dangerous gases and might measure their amount accurately. on this IOT assignment, it may monitor the pollutants degree from anywhere using your computer or cell.

This system can be set up anywhere and might also cause some tool whilst pollution is going past some degree, like we will send alert SMS to the user.

2. LITERATURE REVIEW

1. Zigbee-based wireless air pollution monitoring system using low-cost, energy-efficient sensors. Mr.Vasim K. Ustad, Prof.A.S.Mali, Mr.SuhasS.Kibile, PG Student, Department of Electronic Engineering, Tatyasaheb Kore Institute of Engineering & Technology, Warananagar, Maharashtra, India. Air pollution is not only a natural health issue that affects the creation of nations. The powerful effect of air pollution on well-being is extremely overwhelming because there is a wide range of sources and their specific effect varies from one to another. Synthetic substances cause the assortment of mankind and natural medical problems to increase in the effects of air contamination on human fitness and well-being. A WSN framework is expressed to screen this contamination. The proposed framework consists of a Mobile-DAQ unit and a fixed internet-enabled contamination monitoring system. The Mobile-DAQ unit includes a self-contained chip microcontroller, an exhibit of air pollution sensors, and a GPS device. Pollution-Server is a high-end individual computer application server with an Internet network. The Mobile-DAQ unit collects airborne toxin levels (CO, NO2 and SO2) and packages them into a package with GPS physical distribution, time and date. The reason is sending the Pollution-Server using the zig bee device. The hub communicates with Google Maps and displays the equipment area. It can associate a database server with the Pollution-Server to store a range of toxins for future use by various users, such as state control authorities, vehicle registration professionals and holidaymakers, and insurance agencies.

2. Pollution Monitoring System Using WSN in Visakhapatnam P.VijnathaRaju, M.Tech Student R.V.R.S. Aravind, Associate

Professor Noval School of Engineering and Technology Jangareddigudem, W.G Distict, AP, India, Department of ECE, Sanketika Institute of Technology and
Management, Visakhapatnam, India. As technology increases, so does the level of robotic work (cutting work) in virtually all parts. WSNs are taking hold in all areas of life; from homes to industrial facilities, from traffic management to natural controls. The air pollution monitoring system contains sensors for monitoring the pollution parameter of interest with respect to the condition. It re-introduced the three air contaminating gases including CO, CO2 and SO2 in the air in light of the fact that these gases choose the level of pollution. It can additionally use the methodology in different domestic activities, such as cooking gas spills in our homes, to alert oil and gas workers to recognize spills, and so on. This repetition raises awareness among individuals in urban communities.

3. WSN-based Air Pollution Monitoring System in Metropolitan Cities WSN-based Air Pollution Observation Framework
depends on the AVR ATmega-32 microcontroller. The sensor network is used to distinguish sensor values from different detectors such as MQ5, MQ7, temperature and humidity specifics. The ID3 calculation is used to detect despicable qualities. Bluetooth
the device serves as a control interface with the customer, and the customer connects to the server using web administration. This framework not only counts the pollution present all around, but additionally can create a number to prevent future contamination in a particular dirty zone. Here they basically consider the substance of Industry close Pune and I.T. as a zone
Hinjewadi.

The disadvantages of conventional monitoring devices are their large dimensions, heavy weight and extraordinary price. This leads to a sparse distribution of monitoring stations. To be effective, monitoring station locations must be carefully spaced, as the air pollution situation in urban areas is closely related to human activity (e.g. construction activities) and location dependent (e.g. traffic choke points have much worse air). quality than average). The IOT Based Air Pollution Monitoring System monitors the air quality through a web server using the internet and triggers an alarm when the air quality falls below a certain level, i.e. when there is an amount of harmful gases such as CO2 smoke, alcohol, benzene, NH3, NOx and LPG present in the air.

3. REQUIREMENTS

3.1 Hardware Requirements

1) MQ135 Gas sensor
2) Arduino Uno
3) Wi-Fi module ESP8266
4) 16x2 LCD
5) Breadboard
6) 10K potentiometer
7) 1K ohm resistors
8) 220ohm resistor
9) Buzzer
10) MQ 6 LPG gas sensor
11) Temperature sensor LM35
12) Humidity sensor SY-H52

3.2 Software Requirements

1) Arduino 1.6.13 Software
2) C Language

4. BLOCK DIAGRAM AND WORKING

The sensor gives us a value of 90 when there is no gas near it and the safe level of air quality is 350 PPM and should not exceed 1000 PPM. When it exceeds 1000 PPM, it causes headaches, drowsiness and stagnant, stuffy air. If it exceeds 2000 PPM, it will cause increased heart rate and many different diseases. When the value is less than 1000 PPM, the LCD and web page will show "Fresh Air". When the value increases from 1000 PPM, the buzzer will beep and the LCD and web page will display "Poor Air, Open Windows". And when it increases to 2000, the buzzer will continuously beep and issue a warning message to the smartphone via GSM. The LCD and web page 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. We used an LM35 sensor for temperature and a SY-HS-220 sensor for humidity.

According to the model, 4 sensors work as input data, they transmit data to find out what gas it is, what the temperature and humidity are. LCD and buzzer are output devices. The LCD displays gas readings in ppm (parts per million) and a buzzer is used when the ppm exceeds a threshold.

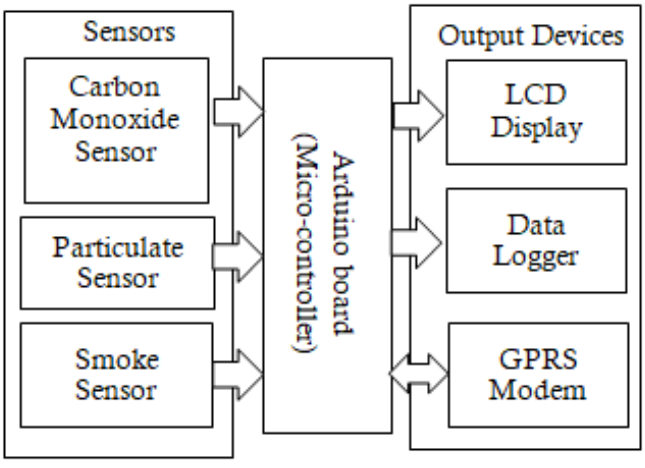

Fig. 1: Block Diagram

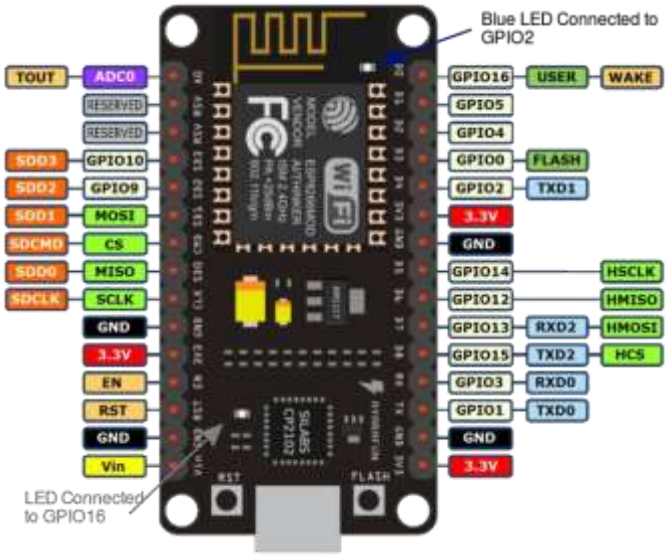

Fig. 2: Node MCU Board with PIN configuration Diagram

5. COMPONENTS

1) Arduino UNO:-

Arduino UNO is an open-source microcontroller board based on the ATmega328P microcontroller. It is one of the most popular boards in the Arduino family and is widely used by hobbyists, students and professionals for various projects. It has 14 digital input/output pins, 6 analog inputs, 16 MHz quartz crystal, USB connection, power connector, ICSP header and reset button.

The board can be programmed using the Arduino IDE (Integrated Development Environment) software and can be powered either via a USB connection or from an external power supply. Arduino UNO is easy to use, flexible and highly customizable, making it a great platform for learning and experimentation.

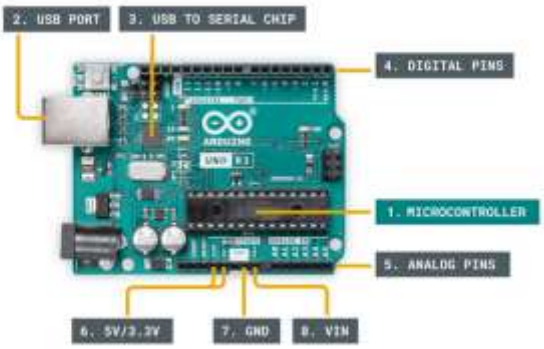

Fig. 3: Arduino Uno

2) MQ135 Sensor:-

The MQ135 is a gas sensor module commonly used for air quality monitoring. It is capable of detecting a wide range of gases, including ammonia (NH3), nitrogen oxides (NOx), benzene, smoke and carbon monoxide (CO). The sensor works on the principle of gas absorption using a sensing layer of tin dioxide, which changes its resistance when exposed to different gases. The change in resistance is then measured and converted into a voltage signal that can be read by a microcontroller or other electronics. The MQ135 is commonly used in air quality monitoring systems, indoor air quality monitors, gas leak detectors and other environmental monitoring applications. It is easy to use and can be integrated with various microcontrollers such as Arduino, Raspberry Pi and more.

Fig. 4: MQ135 Sensor

3) WIFI Module (ESP8266):-

Used in various projects that require wireless connectivity. The module is based on an ESP8266 microcontroller that includes a full TCP/IP stack and can be programmed using the Arduino IDE or other programming environments. It supports Wi-Fi 802.11 b/g/n and can be used as an access point, station or both.

The ESP8266 module also includes GPIO pins that can be used to control various sensors and devices. It is widely used in home automation systems, robotics and other IoT applications. The module can be easily integrated with various microcontrollers such as Arduino, Raspberry Pi and others, making it a popular choice for IoT projects. It is easy to use, has low power consumption and can work at a distance of up to 100 meters in open space.

Fig. 5: WIFI Module

4) LCD (Liquid Crystal Display):-

It is a type of electronic display technology that is widely used in a variety of applications, including televisions, computer

monitors, digital watches, and other electronic devices. It works by using liquid crystals that are inserted between two polarizing filters.

When a voltage is applied to the liquid crystals, they align in a specific way, allowing or blocking the passage of light through the polarizing filters. This will create the images and text that will be displayed on the screen.

In electronics projects, LCDs are often used to display information from sensors, microcontrollers, and other electronic devices. They come in a variety of sizes and formats, including character displays that can display text and numbers, as well as graphics displays that can display images and graphical user interfaces.

Fig. 6: LCD board

5) GSM Module:-

GSM modules are widely used in applications that require remote monitoring and control, such as security systems, industrial automation and vehicle tracking systems. They can also be used to send and receive Short Message Service (SMS) messages, make and receive voice calls, and transfer data over the Internet.

GSM modules can be integrated with various microcontrollers and other electronics using serial communication interfaces such as UART or SPI. They can also be controlled using AT commands, which are standardized commands used to control and configure modems.

GSM modules are available in different types and configurations, including 2G, 3G and 4G modules, offering different levels of connectivity and data transfer speeds. They are widely used in IoT applications and can be used in conjunction with other wireless communication technologies such as Wi-Fi and Bluetooth to create more sophisticated systems.

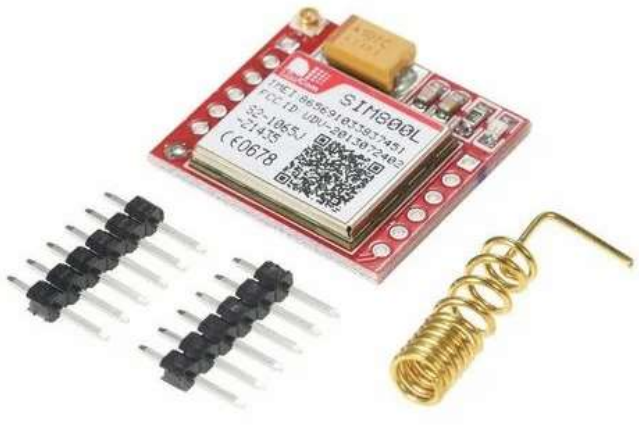

Fig. 7: GSM Module

6) Temperature Sensor:-

A temperature sensor is a type of electronic sensor that is used to measure temperature. It can be used in a variety of applications, including home automation, industrial control and automotive systems. Temperature sensors come in a variety of types, including thermistors, thermocouples, and resistance temperature detectors (RTDs).

Thermistors are temperature sensors that use a change in material resistance to measure temperature. They are commonly used in applications that require a high degree of precision, such as medical devices and laboratory equipment.

Thermocouples are temperature sensors that use the thermoelectric phenomenon to measure temperature. They consist of two different metals that are joined together, and when the temperature changes, a voltage is created at the junctions of the metals. Thermocouples are widely used in industrial applications and can operate at high temperatures.

Fig. 8: Temperature Sensor

7) Humidity Sensor:-

Humidity is the presence of water in the air. The amount of water vapor in the air can affect human comfort as well as many production processes in industries. The presence of water vapor also affects various physical, chemical and biological processes.

Humidity sensors work by detecting changes that alter electrical currents or temperature in the air. There are three basic types of humidity sensors: capacitive, resistive, and thermal. All three types will monitor minute changes in the atmosphere to calculate air humidity.

A capacitive humidity sensor measures relative humidity by placing a thin strip of metal oxide between two electrodes. The electrical capacity of the metal oxide varies with the relative humidity of the atmosphere. The main areas of use are weather, business and industry. Resistive humidity sensors use ions in salts to measure the electrical impedance of atoms. As the humidity changes, so does the resistance of the electrodes on both sides of the salt medium. Two thermal sensors conduct electricity based on the humidity of the surrounding air. One sensor is encapsulated in dry nitrogen, while the other measures ambient air. The difference between the two measures humidity.

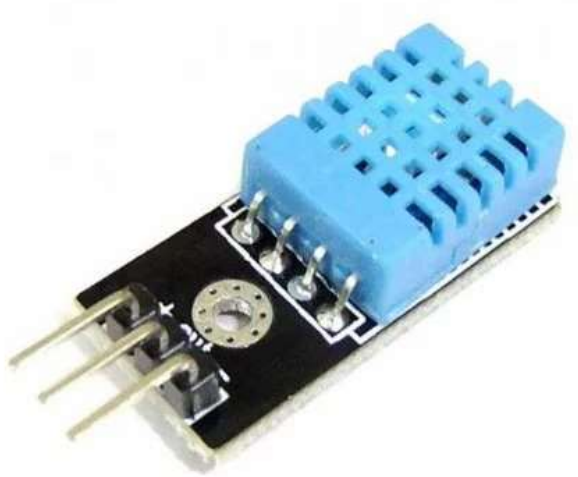

Fig. 9: Humidity Sensor

6. APPLICATIONS

1) Environmental monitoring
2) Industrial monitoring
3) Public health
4) Agriculture monitoring

7. ADVANTAGES

1. Easy to install
2. Provides real-time and accurate air quality data.
3. Can be used to identify sources of pollution.
4. Helps to inform public health policies and interventions.
5. Supports sustainable development and urban planning decisions.
6. Enables remote monitoring and management of air quality.
7. Increases public awareness of air pollution and its impacts on health and the environment.

8. CONCLUSION

The detection of temperature, pressure, humidity and especially PM2.5 and PM10 has a major role in domestic, industrial and air quality monitoring. The system we are introducing is as modest as compared to previous and existing automotive systems demanding air perfection. This design has the advantages of stability and low energy consumption and self-sufficiency. Users can track information in real time and track changes in information. This design will also play a significant role when the atmospheric conditions of a given space need to be checked, which is not suitable for humans to measure. Ambient air monitoring system using Arduino microcontroller, IOT technology is designed to improve air quality. With the use of IOT technology, it improves the monitoring process

Various aspects of the environment such as the air quality monitoring problem proposed in this paper. Here the use of MQ135 and MQ6 gas sensor gives the sense of different type of dangerous gas and Arduino is the heart of this project. Which controls the whole process. The Wi-Fi module connects the whole process to the Internet and the LCD is used for visual output.

9. REFERENCES

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