IOT Based air pollution monitoring system

One of the fundamental elements for a healthy life is clean air. Air is invisible gaseous substance. On average, a person breathes in about approximately 11,000 liters of air every day [1]. The presence of harmful particles in the air can have long-term effects on health. Over the past few decades, there has been an enormous increase in industries and vehicles. Emission of the pollutants into the air makes people more concerned about the air they breathe. World Health Organization estimates around 7 million people die every year from air pollution-related diseases [2].

In 2005 WHO published, a guide that establishes criteria and reference values for the monitoring of air pollutants which are most harmful to health,and their monitoring is essential for health of people. Below Table is taken from [3], which presents a summary of the risk assessment in the complete guide [4], lists the most important and essential air pollutants in a monitoring system with the respective maximum concentration values. The data presented is only a portion of the contribution that WHO offers through [4] for the development of air quality management policies. The complete guide presents scientifically proven health risk assessments and suggests a set of goals to encourage the reduction of air pollution

Guideline levels for each pollutant ($\mu g/m^3$)		
$PM_{2.5}$	1 year	10
	24 h (99th percentile)	25
PM_{10}	1 year	20
	24 h (99th percentile)	50
Ozone, O_3	8 h, daily maximum	100
Nitrogen dioxide, NO_2	1 year	40
	1 h	200
Sulfur dioxide, SO_2	24 h	20
	10 min	500

Monitoring air quality is essential for both the public and private sectors. A conventional air quality monitoring system includes stationary air pollution monitoring stations. These systems are typically equipped with complex and well-established sensing equipment which can measure a broad range of pollution parameters with high precision and reliability. However, such systems usually incur a very high acquisition and maintenance cost. For example, a typical air quality monitoring station costs about USD 200,000 and USD 30,000 per year for maintenance [5]. Thus, these systems are not economical for large-scale installation, and long-term usage is very costly. An affordable and scalable solution is necessary to monitor air quality parameters to improve the well-being of citizens.With the emergence of the Internet of Things (IoT) technology and smart city, such challenges can be overcome. IoT is a network of physical devices with integrated software, electronics, actuators, and sensors, allows objects to interconnect with each other and exchange data through the Internet. A smart city is a metropolitan city that utilizes the IoT network to manage assets and resources efficiently covering many aspects such as transportation, healthcare, education, information technology, and environmental control.As part of the smart

city initiative, continuous monitoring of the air quality is essential for the health of citizens. Therefore, in this paper, we propose a scalable and affordable air quality monitoring system for the smart city.

Software requirement

Arduino ide
Proteus
Google firebase

Hardware requirement

1) MQ135 Gas sensor– The MQ135 sensor can sense NH3, NOx, alcohol, Benzene, smoke, CO2 and some other gases.
2)MQ6: The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm
3) Arduino Uno- It is able to read inputs
4) 16x2 LCD
5) Breadboard
6) 10K potentiometer
7) 1K ohm resistors
8) 220 ohm resistor

Addition and updation

The semiconductor gas sensors can be successfully used to monitor the target gas concentrations. The usage of the semiconductor sensors adds several advantages to a system such as low cost, quick response, low maintenance, ability to produce continuous measurements, etc.The gateway node of Wireless Sensor Network, database server and web server all can be packed into a single compact credit sized micro-computer Raspberry Pi which will make the system very portable.

we can add solar panel in this system thus it will use solar energy and thus it makes the system more environment friendly

[6]**Applications:-**

1) Industrial perimeter monitoring
2) Indoor air quality monitoring.
3) Site selection for reference monitoring stations.
4) Making data available to users.

[6]**Advantages:-**

1) Easy to Install
2) Updates On mobile phone directly
3) Accurate Pollution monitoring
4) Remote location monitoring

Challenges

There are other parameters like Volatile organic compounds, bacteria and molds which can’t be detected by this system and they are major threats to human health when inhaled through air.
This system is limited to climate change as it does not have rain sensor so it cannot detect harmful chemicals present in the rain water.

Conclusion

Now a day the air pollution in urban areas is a major issue in developed cities due to significant impacts of air pollution on public health, global environment and the whole worldwide economy. The proposed work on an air pollution monitoring and prediction system is enables us to monitor air quality with the help IoT devices.
Here, using the MQ135 gas sensor gives the sense of different type of dangerous gas and arduino is the heart of this project Which control the entire process. Wi-Fi module connects the whole process to internet and LCD is used for the visual Output.

References

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