Journal of Advances and Scholarly Researches in Allied Education
Vol. 16, Issue No. 5, April-2019, ISSN 2230-7540

Research on an IoT Based Air Pollution

Ashish Jaiswal[1]* Dr. Megha Kamble[2]

[1] Research Scholar

[2] Supervisor

Abstract – To keep people healthy, the air they breathe needs to be of high quality. Nearby locations have been found to have high levels of hazardous substances and air pollution. The suggested system measures air quality parameters such IAQI, which is an effective technique to detect poor air quality. System has ESP8266 to link to IOT platform and pass pollution information to the staff. The ability to identify environmental contaminants improves self-care. We're building an IOT-based pollution monitoring system to track the quality of the air using an internet server as a data source. Monitoring systems currently in use have poor precision and sensitivity, and require lab testing to verify results. As a result, better surveillance systems are required. Because of factors such as industry, urbanisation, population growth, and vehicle use that can harm human health, pollution levels are rising rapidly. In order to monitor the quality of the air, an internet-based web server monitoring system called an IOT-based system is used. It will sound an alert if the air quality deteriorates beyond a specific point, i.e. when dangerous gases such as CO2, smoking, alcohol, benzene, NH3, and NOx are present in substantial quantities in the atmosphere. It will display the air quality in parts per million (PPM) both on the LCD and on the webpage, making it simple to keep tabs on pollution levels.

Key Words – Air Pollution, IOT, Monitoring System, Air Quality, Gas Sensors.

----------X----------

INTRODUCTION

Pollution of the air is a major issue for all countries, developed or underdeveloped. More and more people are suffering from health issues as a result of industrialisation and an increase in the number of vehicles on the road in developing countries. Pollution causes everything from minor allergy reactions like itchy eyes, noses, and throats to more major health issues including bronchitis, heart disease, pneumonia, and lung and exacerbated asthma. Pollution is bad. Using the Internet of Things, an Air Pollution Monitoring System can keep tabs on the quality of the air and send out an alert if the quantity of dangerous gases in the air, such as CO2, drops below a predetermined threshold.,[1]

Air pollution can be defined as the presence of momentary details that interfere with the smooth operation of standard procedures and have detrimental effects on human health. Contamination can also affect the typical periodicity and aggravate the well-being of the individual in other ways. Modernization and automation are growing more widespread in all respects, and as a result, pollution is appearing in more places. WHO has developed particular standards to limit the cutoff values of specific gases like O3, NO2, and SO2 because air pollution is currently a major concern around the world. [2]

Our habitat, and therefore the entire ecosystem, depends heavily on the Air Quality Index (AQI). Toxic gas emissions as well as particulate matter (PM) pollution are increasing due to rapid economic and industrial development and an inflow of the car industry, and these pollutants are harming our environment and producing air pollution. Impurities (particles) and gases in the air combine to create pollution, which can be detrimental at any time of day or night, inside or outside. Breathing polluted air leaves us vulnerable to different airborne chemicals that can do a lot of damage. Additionally, it has the potential to have an adverse effect on the ecosystem and potentially lead to its demise.[3]

One of the most critical components of a person's environment is fresh air. Oxygen, nitrogen, carbon monoxide, and other common gases can be found in the earth's atmosphere, as well as traces of uncommon elements. Humans require a contaminant-free environment for breathing. This is critical to the well-being of the human race. Any alteration to the air's normal composition could have disastrous consequences for all life on Earth. A pollutant in the air is present when there are

large amounts of one or more gases in the atmosphere that are harmful to humans, animals, or plants. ppm and ug/m are units of measurement for air pollution. Primary pollutants are those that are emitted into the atmosphere on contact with the ground or with no intermediate treatment. When a primary pollutant combines with other chemicals in the atmosphere, secondary pollutants are created. [4]

Ambient air pollution is defined by the WHO as all of the contaminants in the atmosphere, including those generated from sources such as factories, homes, and cars. In addition to gaseous air pollution, particulate matter (PM) pollutes the air. The fine particulate matter generated from the combustion of fossil fuels in automobiles, power plants, industries, and homes, as well as from biomass burning, has a serious impact on human health. Fine particulate matter has been linked to 25 percent of all lung cancer deaths, 8 percent of all COPD deaths, and 15 percent of all stroke deaths. They can settle deep in your lungs, causing problems like emphysema, chronic bronchitis, and heart problems. Secondary particulate matter production could be triggered by gaseous air contaminants. [5]

LITERATURE REVIEW

Praviss Yesyand, Anand Jayakumar, Venkstesh Prashanth, and Ramkumar (2018) We're building an IOT-based pollution monitoring system to track the quality of the air using an internet server as a data source. It is necessary to conduct laboratory analysis in order to evaluate current monitoring systems because they have low precision and sensitivity. As a result, better surveillance systems are required. We propose a three-phase pollution monitoring system to alleviate the drawbacks of the current setup. On the LCD and as a webpage, it will display the air quality in parts per million (PPM), making it easy to monitor. Using your computer or mobile device and the Internet of Things, you can keep tabs on pollution levels in real time. Air Quality is monitored via MQ2 and MQ7 sensors, both of which are integrated into the system. It accurately determines their volume and identifies potentially dangerous gases. [6]

Mukesh Pandian, Meivel, Mahesh, and Mohnish (2018) To keep people healthy, the air they breathe needs to be of high quality. Nearby locations have been found to have high levels of hazardous substances and air pollution. The suggested system measures air quality parameters such IAQI, which is an effective technique to detect poor air quality. System has ESP8266 to link to IOT platform and pass pollution information to the staff. The ability to recognise environmental toxins improves one's ability to take care of one's self. [7]

Air quality levels in a region should be monitored on a regular basis, according to T Dineshkumar, V Suresh Babu, Pachaivannan Partheeban, and R Puviarasi(2018). The goal of this research was to create an Internet of Things (IoT)-based air quality monitoring system that could be used to assess local air quality. Sensors allow the gadget to keep tabs on the concentrations of various compounds in the air, such as O3, SO2, CO, and particle matter. The Arduino sensor detail can be found by reading the Arduino microcontroller's datasheet. An Arduino WIFI module was used to connect to the cloud system and retrieve the data delivered there. A cloud Site page displays the tracking's results. The present model has been successfully constructed and can be used to implement real systems. [8]

Irwin S. Wen & Irwin T. T. Wen (2018) Respiratory allergies and the elderly are particularly sensitive to poor indoor air quality. This study built an indoor air quality monitoring system based on the Internet of Things smart home design to investigate how people can live in an environment with good air quality. For this research, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers's (ASHRAE) carbon dioxide index and AQI were chosen from among the several AQIs available. Environmental Protection Agency data is used to examine indoor and outdoor environmental characteristics. Controllable environmental variables are simulated to determine their impact on air quality. The common points of the two indices are then integrated..[9]

Vashti, Priyanka, Mudaliar, Rutuja, Jaid, and Mandal Kranti M Kamble all contributed to this article. (2018) The application is easy to use and provides proactive real-time air quality warnings. It's our goal to develop a system that detects ambient parameters like carbon monoxide and particulate matter (PM) levels in real time, alerts individuals when the sum of these elements exceeds a certain limit, and provides the data in an easily understood way..[10]

ADVANTAGES AND DISADVANTAGES

IoT-based noise pollution monitoring system has the advantage of allowing machines to communicate with one another, ensuring that the data collected is accurate. Devices are also wirelessly connected, making automation and control of them simple tasks for a human. It's capable of recording data even when no one is there to interact with it. Installing this system and having it work automatically saves a significant amount of time. All that's left is to do is go over the information and make sense of it. In comparison to IoT devices, most current noise pollution recording equipment are expensive. Since IoT devices are inexpensive, they will save money.

Disadvantages: Because these gadgets are interconnected via the internet, malevolent individuals or other systems may hack them or

monitor them. Data security can be a concern while using these types of devices..

APPLICATION OF IOT BASED NOISE POLLUTION MONITORING

1. Industrial areas with a lot of noise pollution may benefit from its use.

2. On city streets, there is noise from traffic.

3. Shooting, outdoor events, football, and cricket games are examples of recreational activities.

4. This gadget can be used at a modest scale, such as at schools and colleges.

IOT DEVICE PROTOTYPE

When it comes to IoT, the advantage of OSI layered architecture is used to link clever devices (implanted hardware gadgets) to Itb. It proposes a group of Air Quality Monitoring Sensor Bits for this study, which is used to estimate the convergence of air contaminations that may be seen everywhere. As a result, all of the Air Sensors have been outfitted with system availability and are connected to Itb, forming a global network of affiliated items with a minor implanted stage. Open source development sheets with ESP8266-12E chips have been used in the Node MCU. The MQ-2 Gas Sensor collects gas concentration estimates. We'd use sensors to collect this information and send it to the Thing Speak cloud for IoT-based data acquisition. The proposed framework is shown in Fig. 1.

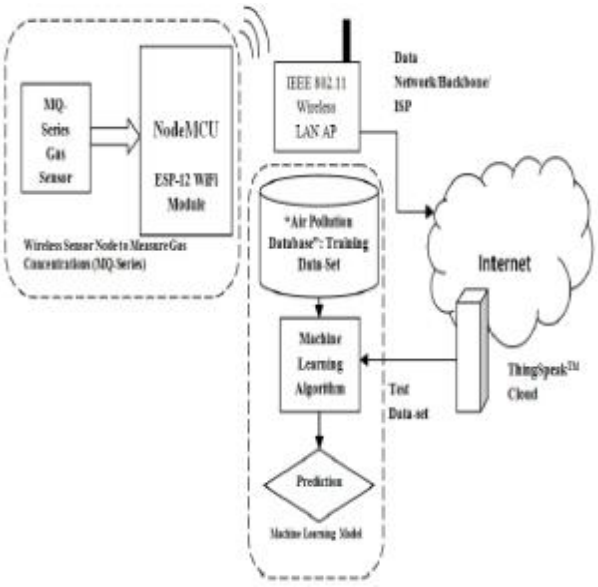

Figure 1: Block diagram of proposed IoT based Air Pollution Monitoring System

Figure 2 shows the Node MCU Board's stick design, which is used to connect the MQ2 gas sensor to the ESP8266 WLAN connector within the device.

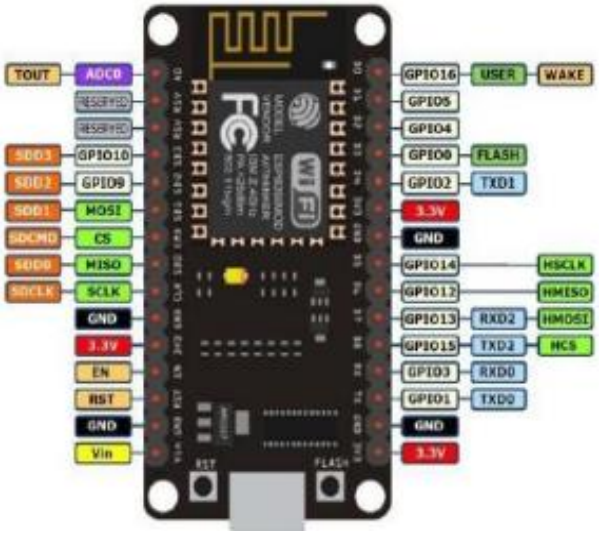

Figure 2: Node MCU Board with PIN configuration

A tendency of scaling down gadgets that ask for lowest effort sensors, low power, and rough gadgets has emerged as a result of recent invention. Accordingly, WSNs have grown in importance across a range of industries, from business to agriculture to domestic to industries to traffic management and natural monitoring. To monitor and manage the city's air quality, the module includes a wireless detector arrangement framework. Suspended Particulate Matter, NOx, and SO2 are all measured by a natural air pollution monitoring system. The Pollution regulator organization's typical air quality monitoring framework is astronomically expensive. Air quality announcements would rarely be able to use expensive, time- and energy-consuming investigative estimate equipment. With the goal of developing testing frameworks that utilise readily available standard poison gas sensors and CC2530ZDK boards that adhere to the IEEE 802.15.4 standard and provide superior low power consumption, an effort has been made to create the hub of a Wireless Sensor Network using monetarily accessible poison gas sensors and the CC2530ZDK board. A Lab VIEW docket is used to plan and direct the system's operation, as well as to estimate detection probabilities.

PROPOSED METHOD

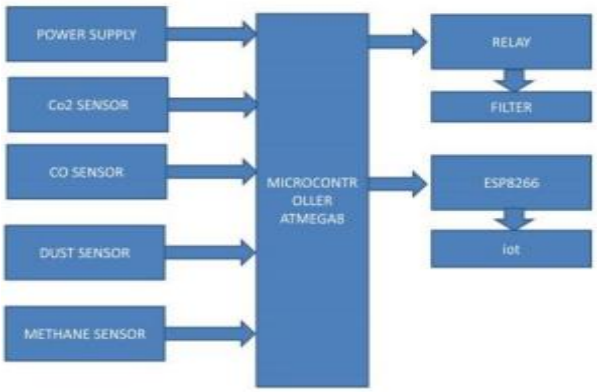

Figure 3: Block Diagram of the Proposed Method

When exposure reaches a certain amount, people will have harm to their central nervous system and respiratory degradation, as well as heart disease and other problems. Air monitoring is critical in today's technologically advanced environment, whether in industry or at home. To determine the level of gas in the environment, a developed model system makes use of Sensors. Input from the sensors feeds the microcontroller, which then sets threshold levels for each gas and uploads the detected data to the cloud to be analysed. When the gas level exceeds the predetermined threshold, an alarm will go off, alerting the person who needs to know and the rest of the workforce. Gas sensors have a role in detecting the atmospheric gas concentration. According to gas concentration, the sensor provides an appropriate potential difference by changing the resistance of the It is possible to calculate the output voltage by using the sensor's material. This voltage value can be used to figure out the type of gas and its concentration. The system can monitor and estimate gas levels in the environment by finding this voltage value. There will be less oxygen available for breathing if methane concentrations rise above a particular point. Mood swings, slurred speech, vision problems, memory loss, nausea, vomiting, flushing of the face, and headaches are all side effects that can occur with using this medication.. If the condition is severe, symptoms such as rapid respiration and heartbeat, dizziness, numbness, and unconsciousness may appear. Methane's danger limit is 50,000 parts per million (ppm), or about.5% of the gas's total weight in the atmosphere. Sensors measure the amount of gas in the air and give an alert if the quantity exceeds a predetermined threshold.

PROTOTYPE MODULE

The system uses gas sensors to continuously monitor the environment, and the microcontroller receives the detected value. It is possible to load data into the Internet of things with the ESP8266. If there's anything out of the ordinary, an Alert message will be sent to the person via the module. Using a carbon monoxide, methane, and dust sensor, the prototype module keeps tabs on the environment.

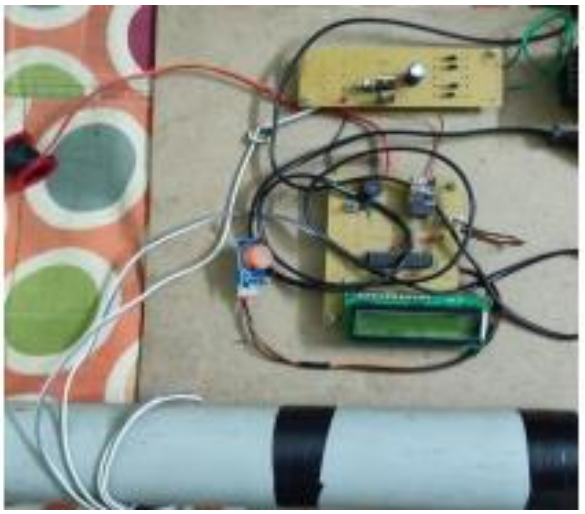

Figure 4: Prototype Module

The air quality monitoring device we created was inexpensive in cost but high in accuracy, so we put it to the test. When the threshold is reached, the system will send a notification to the staff and gather the data, which it will then communicate through Wi-Fi. In developing countries and places where air quality is poor and poses a health risk, the system will fulfil a significant humanitarian need by tracking the quality of air that children breathe near schools and playgrounds, in factories or high-traffic areas where emissions are not adaptable level and impact a large number of people. By including additional gas sensors to this prototype, it might be used in hospitals and research labs to regulate air concentrations.

It was our goal with this project to make it easier for someone to identify, monitor, and evaluate local air quality. The package includes a smartphone application that tells the user how polluted their entire trip will be in advance. Users will be able to determine their level of exposure to air pollutants thanks to this new planned air pollution monitoring kit and mobile application integration. The app included the following features: real-time air quality indices, daily reports on air quality depending on travel distance, and particular reports for air quality measurements based on locations. It was available for iOS and Android devices.

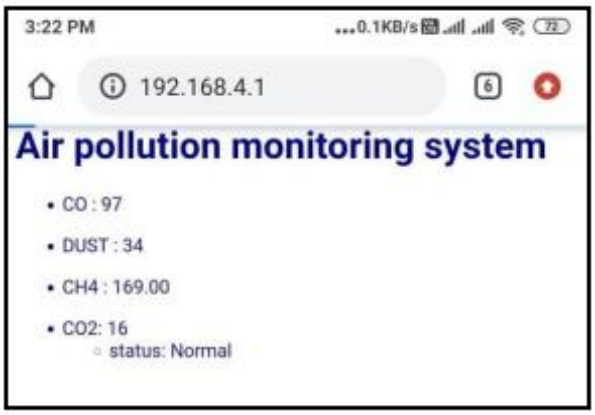

Figure 5: Results of Air pollution Report

CONCLUSION

The most significant influence on our environment comes from pollution in the air. Not only can it have an impact on the environment, but it can also have negative effects on one's health. The smartphone app is designed to track how much radiation a person has been exposed to in a day using the monitoring device. Carbon monoxide, smoke, and propane leaks were detected using the gas sensors. To show the data, the sensor must transform from analogue to digital form. PPM is the unit of measurement for the exposure level (Parts per Million).

REFERENCES

1. D. Yaswanth, Dr Syed Umar (2013). "A Study on Pollution Monitoring system in Wireless Sensor Networks",- D. Yaswanth et al | IJCSET |September 2013 | Vol. 3, Issue 9, pp. 324-328.

2. Pratima Gupta and Ranjit Kumar, Shalendra Pratap Singh and Ashok Jangid (2016). "A study on monitoring of air quality and modeling of pollution control", IEEE conference, pp. 1-4.

3. Yu-Lin Zhao, Jiali Tang, Han-Pang Huang, Ze Wang, Tse-Lun Chen, Chih-Wei Chiang, Pen-Chi Chiang (2015). "Development of IoT Technologies for Air Pollution Prevention and Improvement," Aerosol and Air Quality Research, 20: pp. 2874–2888, ISSN: 1680-8584.

4. Gagan Parmar, Sagar Lakhani, Manju K. Chattaopadhyay (2017). "An IoT Based Low Cost Air Pollution Monitoring System", IEEE conference, pp. 524-528.

5. Anand Jayakumar, Praviss Yesyand, Venkstesh Prashanth, Ramkumar: "IoT Based Air Pollution Monitoring System," International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056.

6. Meivel, Mahesh, Mohnish, Mukesh Pandian (2018). "Air Pollution Monitoring System Using IOT And Artificial intelligence," International Journal of Modern Agriculture, Volume 10, No.2, ISSN: 2305-7246.

7. T Dineshkumar, V Suresh Babu, Pachaivannan Partheeban, and R Puviarasi (2018). "Air Quality Monitoring System Based on IoT," Journal of Physics: Conference Series IOP Publishing doi:10.1088/1742-6596/1964/6/062081.

8. Wen-Tsai Sung & Sung-Jung Hsiao(2018). "Building an indoor air quality monitoring system based on the architecture of the Internet of Things," EURASIP Journal on Wireless Communications and Networking volume,

9. Vaishnavi Kulkarni, Priyanka Mudaliar Rutuja, Jaid Abhijeet Kumar, Mandal Kranti M Kamble (2018), "IOT Based Application for monitoring and Predicting Air Quality in the environment," / VOL 7 NO 2 (2018): VOLUME 7 ISSUE

10. J. Huang et. al. (2019). "A Crowd source-Based Sensing System for Monitoring Fine-Grained Air Quality in Urban Environments," in IEEE Internet of Things Journal, vol. 6, no. 2, pp. 3240-3247, DOI: 10.1109/JIOT.2018.2881240.

11. S. Ameer et. al. (2019). "Comparative Analysis of Machine Learning Techniques for Predicting Air Quality in Smart Cities," in IEEE Access, vol. 7, pp. 128325-128338, DOI: 10.1109/ACCESS.2019.2925082. International Journal of Modern Agriculture, Volume 10, No.2, 2018 ISSN: 2305-7246

12. Carbon Monoxide (CO). 2015. Available online: https://www.environment.gov.au/protection/publications/factsheet-carbonmonoxide-co (accessed on 11 June 2015).

13. . K. S. E. Phala, A. Kumar, and Gerhard P. Hancke: 'Air Quality Monitoring System Based on ISO/IEC/IEEE 21451 Standards', IEEE.

14. G. Lo Re, D. Peri, S. D. Vassallo, (2013). 'A mobile application for assessment of air pollution exposure', IEEE

Corresponding Author

Ashish Jaiswal*

Research Scholar