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REVIEW OF INTERNET OF THINGS-BASED AIR QUALITY MONITORING

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ABSTRACT

Air pollution is a serious environmental problem that can affect human health and the environment. Wireless air pollution monitoring systems based on IoT typically involve a network of sensors placed in strategic locations to measure various air pollutants such as particulate matter (PM), ozone (O3), nitrogen dioxide (NO2) and sulfur dioxide (SO2).). Sensors are connected to a central controller that collects sensor data and sends it to a cloud-based platform for analysis and visualization. The cloud-based platform provides users with real-time weather information or a mobile application over the Internet. Users can use the data to monitor the air quality in their area and make informed decisions about their health and well-being to decide.

I. INTRODUCTION

Pollution is the biggest challenge for the world in present time. It is not limited to developed country but developing countries also. It may be air pollution, water pollution, soil pollution etc. It directly or indirectly affects the health of the individual. Air pollution is the contamination of the air with substances that are harmful to human health and the environment. These substances can come from a variety of sources, including vehicles, factories, power plants, and agriculture. Air pollution can cause a variety of health problems, including respiratory infections, heart disease, lung cancer, and asthma. It can also damage the environment by harming plants and animals, and it contributes to climate change. Air pollution is a growing concern in urban environments and industrial areas, posing serious threats to human health and the environment. As the world becomes increasingly urbanized and industrialized, the need for effective air quality monitoring systems has never been greater. The Internet of Things (IoT) offers a transformative solution to this problem by enabling the development of wireless air pollution monitoring systems that are more efficient, accurate, and accessible than traditional methods. Air pollution is a growing concern in urban environments and industrial areas, posing serious threats to human health and the environment. As the world becomes increasingly urbanized and industrialized, the need for effective air quality monitoring systems has never been greater. The Internet of Things (IoT) offers a transformative solution to this problem by enabling the development of wireless air pollution monitoring systems that are more efficient, accurate, and accessible than traditional methods. IoT-based air pollution monitoring uses the power of connected devices and appliances to collect real-time data on various air pollutants such as particulate matter (PM2.5 and PM10), volatile organic compounds (VOCs), nitrogen dioxide (NO2). sulfur. carbon monoxide (CO) and ozone (O3). These sensors can be placed in urban areas, industrial areas, and other contaminated areas, providing continuous data that can be accessed and analyzed remotely. The data collected by these devices enables government, scientists, and environmental scientists to better understand pollution, measure the effectiveness of climate control, and measure measurements over time. Nowadays, the Internet of Things (IoT) plays an important role in the technological age. So the Internet of Things, which is very close to human life, provides a great way to control these pollutants and use sensors to control air quality. Sensors and IoT devices are designed to use the Internet of Things (IoT). These sensors help monitor hazardous gases dissolved in the air and understand air quality. We can monitor the percentage of pollution in the environment using sensors. For example, if these sensors are installed in a crowded city, pollution and local weather data can be detected and sent to the cloud. In reality, IoT devices are used and sensors can be used to monitor pollution and predict the problem. The higher incidence of heart diseases in human society is associated with the high content of problems.

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II. LITERATURE SURVEY

1. Wireless Sensor Networks for Air Quality Monitoring:

Authors such as Varatharajan and Priya discuss the use of wireless sensor networks for air quality monitoring. Their work provides insight into network architecture and sensor selection for effective monitoring.

2. Internet of Things Technology in Environmental Monitoring:

Hossain et al. The use of IoT technology in environmental monitoring (such as air quality) is discussed. This article discusses the role of IoT in data collection, transmission, and analysis to help make better decisions.

3. Low Cost Air Quality Sensors:

Study by Holstius et al. Focus on low-cost air quality sensors and their use in IoT based systems.

In this study, the accuracy, reliability and problems of sensors are discussed.

4. Data assembly and analysis:

Article by Liu et al. An indepth study of data fusion and analysis in air quality monitoring based on the Internet of Things. It discusses how data from multiple sources can be combined to provide a more comprehensive understanding of air quality.

5. Air Quality Index (AQI) Development:

Kumar et al. The study conducted by. Investigating the creation of air quality index (AQI) using IoT sensor data. This article discusses how IoT data can be used to measure air quality and its impact on health.

6. Machine Learning and Predictive Modeling:

Zhou et al.'s work focused on machine learning and predictive modeling in air quality. They highlighted the potential of these methods to predict pollution

7. Urban Weather Monitoring:

Study by Kumar et al. Focus on using the Internet of Things to monitor urban climate. They discussed the deployment of IoT sensors in cities and its impact on public health.

8. IoT-based mobile applications:

Some articles, such as the work of Hernández-Solano et al., discuss the development of IoT-based mobile applications for social media mood over time. These practices increase public awareness and participation.

9. Environmental Data Visualization:

Study by Rana et al. Explore data visualization techniques to present high-quality weather data collected from the Internet of Things. Visibility is important for communicating with the public and policymakers.

10. Challenges and future directions:

Some literature reviews and research articles (such as Lin and Wang's paper) provide a comprehensive overview of the emerging issues. Internet of Things-based weather monitoring trends and future directions.

III. METHODOLOGY

There are many types of air quality sensors available, each with their own advantages and disadvantages. It is important to choose a sensor that is suitable for the specific organism to be monitored and the environmental conditions in which it will be placed. The communication technology used to transmit data from sensors to the central data management system must be reliable and have sufficient bandwidth to support the required data. Sensor nodes should be placed in strategic locations throughout the monitoring area. This will involve deploying nodes at different elevations and in different types of environments, such as urban, rural and commercial areas. Sensor nodes need to be configured and calibrated to ensure that they provide accurate and reliable measurements. This may involve changing variables and changing measured values and comparing them with reference values. Our IoT-based weather control system uses weather quality checks on the web to display results online. A warning will be issued if air quality reaches a certain toxicity level and pollutants (such as CO2, smoke, alcohol, benzene, NH3, NO2) reach sufficient levels. The system uses wind sensors to detect this information and send it to the microcontroller. The microcontroller then stores the data on the web server.

IV. PROBLEM STATEMENT

Air pollution is a major environmental problem that poses a serious threat to people living in cities and communities near factories. Traditional air quality monitoring is often limited by high infrastructure costs, limited coverage, and slow data delivery. To solve these problems and provide real-time and accurate weather

information, an Internet of Things-base Wireless weather monitoring system is proposed. Current air monitoring systems do not have the comprehensive coverage needed to capture local changes, especially in urban areas and near pollution sources. In addition, data collection is often slow and responses to pollution incidents that could endanger public health are delayed. The large amount of data generated by IoT-based air quality sensors can disrupt data reporting and analysis. The challenge is to make data available in real time, provide useful information, and communicate effectively with citizens, policymakers, and officials. This research is designed to develop an effective IoT-based wireless technology that can solve these problems in the weather monitoring system. The proposed system will use a wireless sensor network to collect real-time weather data, send it to a central database, and use advanced data science for timely measurement and correction. The main aim is to provide accessible and efficient weather information that enables communities and authorities to make informed decisions, reduce pollution and improve environmental sustainability.

V. PURPOSED SYSTEM

The aim of the system is to create new and effective solutions to monitor and control pollution using Internet of Things (IoT) technology. The goal is to provide a reliable, real-time, data-driven weather monitoring system with the following objectives:

1. Real-time monitoring: The main goal of the system is to provide continuous, accurate weather measurements. - schedule air quality monitoring. The system detects particulate matter (PM2.5 and PM10), gases (NO2, SO2, CO, O3) and volatile organic compounds (VOC) through a network of IoT-enabled air quality sensors strategically placed in urban, industrial and residential areas.
2. Accurate data collection: System sensors will be carefully selected and measured to ensure the accuracy and reliability of the data collected. This will allow contamination levels to be easily monitored, allowing informed decisions to be made and contamination quickly detected.
3. Data transmission and easy access: The proposed system will use wireless communications equipment to send weather data to a central database or cloud platform. Citizens, local governments and environmental organizations can easily access this information through user-friendly interfaces, mobile applications and websites.
4. Data analysis and visualization: The system will use advanced data science, including machine learning algorithms, to process large data sets generated by sensors. These tests will help identify pollution sources, trends and patterns, and the results will again be presented through visual data visualization tools to better understand and inform.
5. Public Awareness and Participation: The main purpose of this system is to raise public awareness about air quality. The system will provide easy-to-understand information on air quality, including Air Quality Index (AQI) values, enabling people to make informed decisions about their outdoor recreation forest and encouraging collaboration in improving air quality.
6. Timely warning and response: The system will include a warning system that will alert authorities and the public in case of bad weather or crime or good weather. This timely information will facilitate rapid response and emergency response.
7. Environmental health impact assessment: Data obtained from this system will support in-depth research on the health effects of air pollution. The system will track long-term exposure to infectious diseases, helping to assess public health impacts and inform health policy.
8. Policy Development: Local governments and environmental organizations can use the information gained from the process to develop evidence-based policies and regulations. These policies aim to reduce pollution and improve the overall quality of life.
9. Environmental Sustainability: Through continuous monitoring and informed decision-making, the planning process will support environmental sustainability by promoting clean practices and enforcement behaviors.

VI. DISCUSSION

IoT-based wireless air pollution monitoring offers a myriad of benefits and advantages, making it a compelling and innovative solution for addressing air quality issues. Here's a discussion of the key points in favor of implementing such a system: Real-Time Data: IoT-based monitoring provides real-time data on air quality. This

is a significant improvement over traditional monitoring systems that often have delays in data collection and reporting. Real-time data enables timely responses to pollution events, helping protect public health. Comprehensive Coverage: IoT-based systems can cover a wider geographical area, providing more comprehensive air quality information. This is crucial for densely populated urban areas, industrial zones, and locations near pollution sources, where localized variations in air quality can have significant health impacts. Highly Accurate Sensors: IoT-based systems use advanced, well-calibrated sensors that offer high levels of accuracy and reliability in pollutant measurement. This ensures that the data collected is reliable and useful in decision making. Data accessibility: Data collected by IoT sensors can be easily accessed by citizens, policymakers, researchers and environmental organizations. User-friendly interfaces, mobile applications and websites allow people to easily access real-time weather information. Data Analytics and Insights: IoT systems use data analytics and machine learning to process and analyze big data. This will lead to better understanding, including identifying pollution sources, patterns and standards to inform response plans and policies. Public Awareness: The availability of good weather data over time has made the public aware of the impact of bad weather on health and quality of life. It allows people to make decisions about outdoor activities, thereby contributing to public health and well-being. Warning and timely response: IoT systems include alert systems to inform authorities and citizens about pollution incidents. This allows for rapid responses, emergency response and follow-up air quality measures. Health impact assessment: Long-term data collected from IoT-based systems supports health assessment. This is invaluable for understanding the health effects of air pollution and tailoring healthcare policies to protect the public. Evidence-Based Policymaking: Environmental agencies and governments can use the data and insights from IoT systems to develop evidence-based air quality policies and regulations. These policies aim to reduce pollution and improve air quality standards. Environmental Sustainability: IoT-based air pollution monitoring encourages cleaner practices and behaviors by providing real-time feedback on the consequences of pollution. This fosters environmental sustainability by reducing emissions and improving air quality. Scalability: IoT-based systems are scalable and adaptable, making them suitable for various environments and regions. This flexibility ensures that the technology can be applied in diverse contexts. Cross-Disciplinary Insights: These systems bridge the gap between environmental science, data analytics, and technology. They foster collaboration between experts from various fields and drive innovations in air quality management.

VII. CONCLUSION

IoT-based wireless air pollution monitoring systems are a promising new technology that has the potential to revolutionize the way we measure and manage air quality. These systems have many advantages over traditional weather monitoring, such as instant data, more intensive service and lower costs. IoT-based systems can be used to protect public health, improve air quality and conduct climate research. For example, these systems can be used to detect areas with higher air pollution and warn people to avoid them. IoT-based systems can also be used to monitor the results of air quality management and identify areas where further action is required. Additionally, IoT-based systems can be used to collect data on weather patterns and changes in patterns over time, which can be used to study air pollution and its effects on consumption. Although there are some challenges in IoT-based wireless air pollutant systems such as power management, data management and security, researchers and developers are joining hands to solve these problems. As technology continues to grow, IoT-based systems must play a significant role in climate monitoring and control. In summary, IoT-based wireless air pollution monitoring system is a promising new technology with the potential to significantly improve air quality and protect public health.

VIII. REFERENCES

[1] K. Raghava Rao, M Vallabhaneni, S Narayanaraju, R KJonnalagadda, S k kanaparthi, “Monitoring air pollution using Zigbee based wireless sensor network”, International Journal of Electronics and Communication Engineering Technology (IJECET), May 2014.

[2] Sumeet Gupta, Shekhar Verma, G.S. Tomar, thiab Raj Kumar Abrol,“Smart Industrial Data Collection and Energy Monitoring Using Wireless Sensor Networks”, International Journal of Grid and High-Performance Computing, Vol. 2, No. 1 Issue. 3, p. 45-60, Lub Xya Hli 2010

[3] A Rai, V (Nigam) Saxena, S Kusrey; "Zigbee-based cloud monitoring and control using WSN", SSRG International Journal of Electronics and Communication Engineering, Volume 4, Issue 6, Pages 7-12, 2017 June.

[4] Sharma, B.S. Sohi and S. Chandra; "SN-based forest fire detection and early warning", International Journal of Innovative Technology and Research Engineering (IJITEE), Volume 8, Issue 9, pp. Page 209-214, July 2019.

[5] S. M. Shirsath, N.B. Waghile; "IoT based ntse ib puag ncig saib xyuas siv wireless sensor networks", International Journal of Advanced Research in Electrical, Electronic thiab Instrumentation Engineering, Volume 7, Issue 6, Pages 3023-3031, June 2018.

[6] S Sonawane, D. M. Lauter; "Internet of Things-based smart environment monitoring using wireless sensor networks and Raspberry Pi"; International Research Journal of Applied Sciences and Engineering Technologies (IJRASET), Volume 6, Issue 11, Nplooj 643-647, Kaum Ib Hlis 2018.

[7] https://www.engineersgarage.com/articles/sensor.