VisionAir: IoT Air Quality Monitoring System

Abstract of the Disclosure

The present invention pertains to the VisionAir device, a sophisticated air quality monitoring system that incorporates several advanced mechanical and electronic components. These include high-precision sensors for detecting particulate matter (PM2.5 and PM10), volatile organic compounds (VOCs), carbon dioxide (CO2), temperature, and humidity. The device is designed to provide accurate real-time air quality data for residential, commercial, and industrial applications.

This invention was developed to address the challenges associated with monitoring and maintaining indoor air quality. The VisionAir device can be applied to residential, commercial, and industrial environments to ensure optimal air quality. Traditional air quality monitoring systems often require extensive setup and maintenance, limiting their usability. VisionAir eliminates these issues by providing an easy-to-use, highly accurate system that can be operated by anyone, regardless of technical expertise. This device empowers individuals and businesses to maintain a healthy indoor environment efficiently and effectively.

To address the issue of effective air quality monitoring, the VisionAir technology undertook a comprehensive field analysis followed by an exhaustive patent search to evaluate existing technologies. This foundational research informed the subsequent development of a more innovative and efficient solution. The VisionAir device was meticulously designed to overcome the limitations of

traditional air quality monitoring systems, incorporating user-friendly mechanisms to facilitate ease of operation. This advancement obviates the difficulties previously encountered in air quality assessment and management. As a result, VisionAir provides a robust and accurate means for ensuring optimal air quality across residential, commercial, and industrial environments.

S P E C I F I C A T I O N

VisionAir: IOT Air Quality Monitoring System

Technical Field

The present invention pertains to an advanced air quality monitoring system known as VisionAir. Specifically, the invention relates to innovative techniques for assessing and maintaining indoor air quality, utilizing a combination of high-precision sensors and user-friendly mechanisms. This system aims to simplify the process of air quality management while ensuring accuracy and reliability across various environments. VisionAir effectively addresses the limitations of traditional air quality monitoring systems, promoting inclusivity and ease of use for individuals regardless of technical expertise or physical capability.

Background of the Invention

Air quality monitoring in indoor environments requires a diverse array of tools to perform specific tasks. Traditional methods of air quality assessment often involve complex and labor-intensive processes, which can be cumbersome and inefficient. The old methods typically rely on standalone devices with limited capabilities, necessitating manual data collection and analysis.

The patent document US20240167707 describes a device for detecting and reducing radon concentration in an indoor environment. While this technology is effective at targeting radon, it lacks the capability to detect other types of gases or particulate matter in the air.

These prior art examples underscore significant technical and practical challenges, such as the necessity for high accuracy in detecting various gases and particulate matter, user-friendliness, and low maintenance requirements. Therefore, there is a pressing need for an innovative solution that addresses these limitations comprehensively.

The objective of the VisionAir invention is to provide a sophisticated air quality monitoring system that mitigates the disadvantages of prior technologies. VisionAir aims to deliver a user-friendly, highly accurate, and low-maintenance solution that facilitates efficient air quality management across various settings.

Summary of the Invention

To address the technical challenges posed by existing air quality monitoring systems, the primary objective of the present invention is to provide an efficient and user-friendly solution for real-time air quality assessment and management. VisionAir incorporates advanced mechanisms and technologies to ensure accurate, reliable, and easy-to-use air quality monitoring.

The VisionAir system employs high-precision sensors to detect various pollutants, including particulate matter (PM2.5 and PM10), volatile organic compounds (VOCs), and carbon dioxide (CO2), as well as monitoring temperature and humidity levels. These sensors are strategically placed to provide comprehensive coverage of the monitored environment. The data collected is processed

in real-time, providing immediate feedback and actionable insights.

The device features an intuitive interface that allows users to easily interact with the system, access data, and configure settings. It generates automatic alerts when air quality parameters exceed predefined thresholds, enabling prompt corrective actions. VisionAir supports wireless connectivity, allowing seamless integration with other smart devices and data analytics platforms. Designed for longevity and minimal maintenance, the device reduces operational costs and downtime.

Another significant advantage of the VisionAir system is its inclusivity, as it eliminates the need for specialized technical knowledge or physical strength to operate, thereby addressing the gender issues prevalent in traditional air quality monitoring practices.

These and other benefits of the VisionAir system will become more apparent upon reading the detailed description provided herein, supported by the accompanying drawings.

Brief Description of the Drawings

The invention will be better understood by reference to the accompanying drawings.

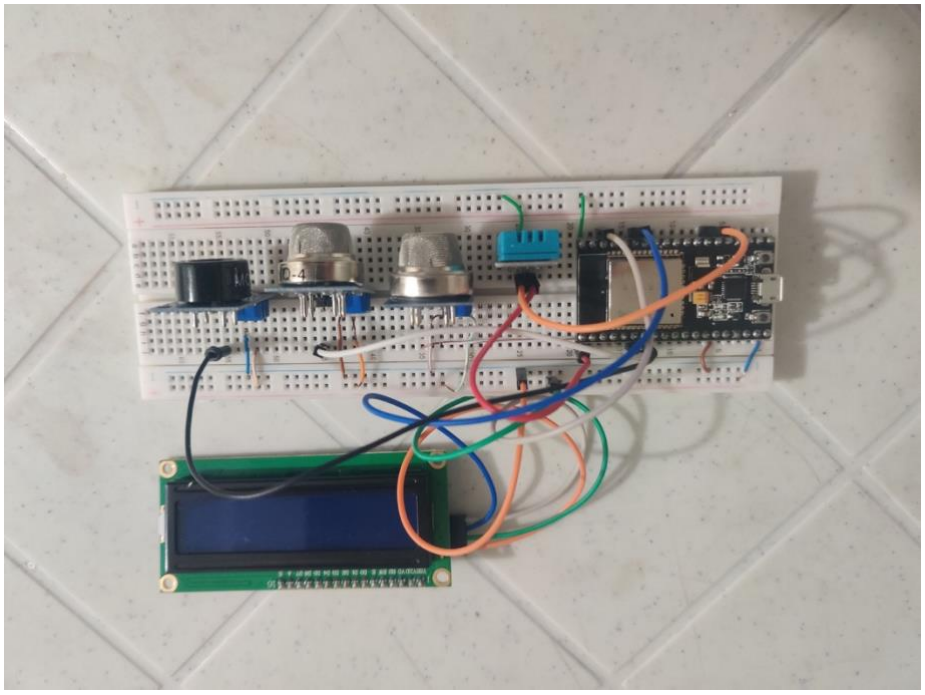
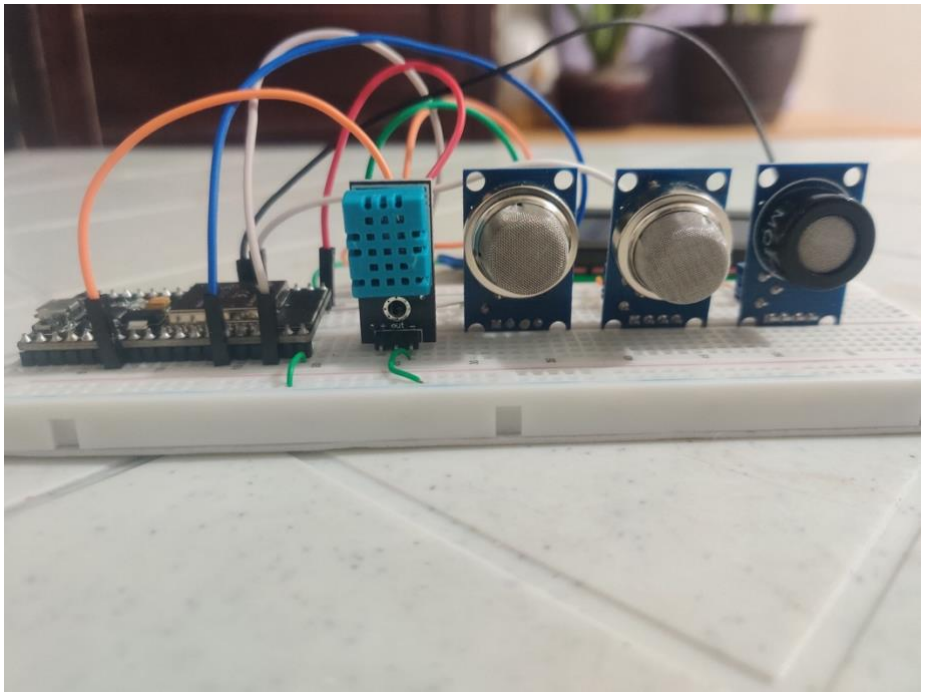


Figure 1: Top view of the device.



5 Figure 2: Front view of the device.

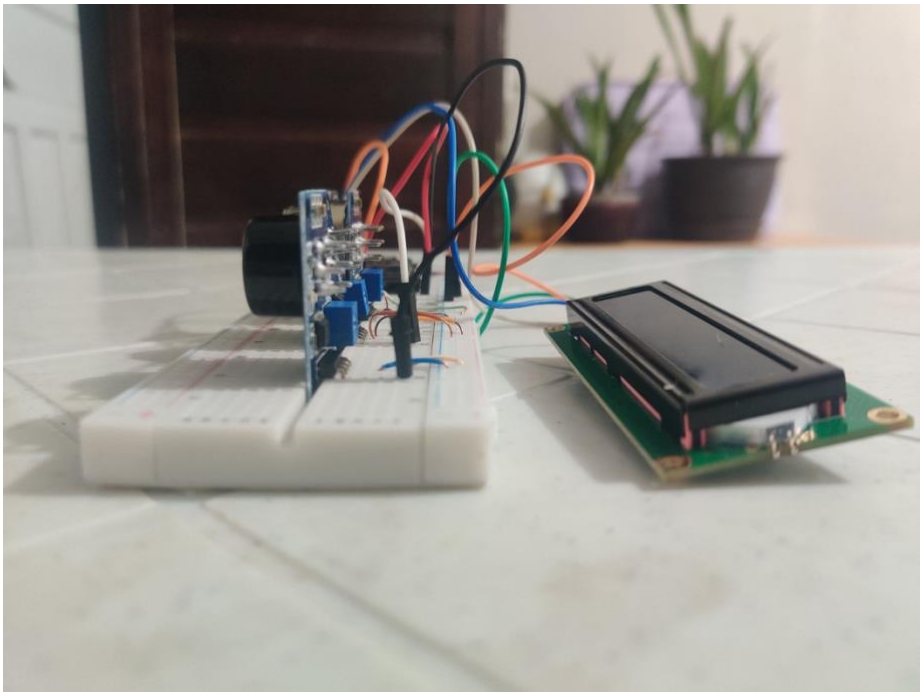


Figure 3: Side view of the device.

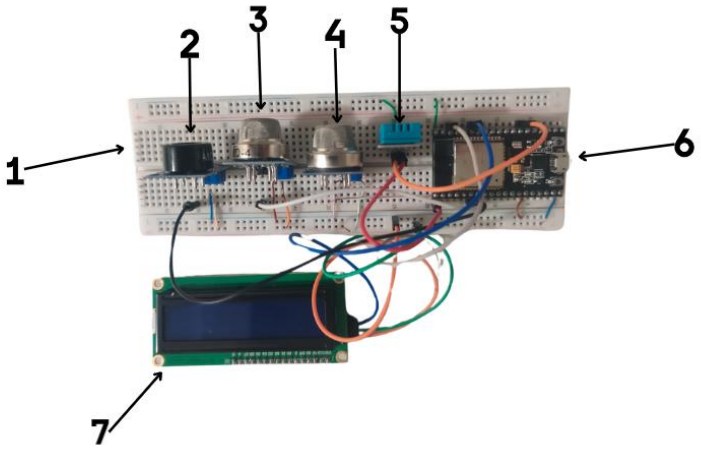


Figure 4: Device components labeled numerically.

Detailed Description

Before describing the present invention in detail, it is to be understood that the phraseologies and terminologies used herein are for the purposes of description and should not be regarded as limiting. Referring now to the drawings, wherein like reference numerals designate the components

or elements throughout the ensuing enabling description, the present invention provides for an air quality monitoring device.

Referring to the device generally, it comprises a breadboard (1) serving as the foundation for mounting all components. The system includes multiple gas sensors: MQ-7 (2), MQ-4 (3), and MQ-135 (4), which detect various gases like carbon monoxide, methane, and air quality respectively. Additionally, it features a DHT11 sensor (5) to measure temperature and humidity levels.

The device is controlled by an ESP32 module (6), which functions as the main microcontroller, facilitating communication between the sensors and an external display. An LCD display (7) is connected to the system to provide real-time visual feedback of the sensor data.

The operation of the air quality monitoring device begins with the sensors (2, 3, 4, 5) detecting the respective parameters they are designed to monitor. These readings are processed by the ESP32 module (6), which then outputs the data to the LCD display (7) for real-time monitoring.

To fabricate this invention, standard electronic components and sensors are required, which are readily available in the market. The components are mounted on a breadboard (1) for prototyping purposes. Wires are used to connect the sensors (2, 3, 4, 5) to the ESP32 module (6), and additional connections are made to the LCD display (7) for output.

The advantage of this air quality monitoring device is its ability to provide real-time data on multiple environmental parameters, facilitating better monitoring and management of air quality. It is designed to be user-friendly and does not require specialized technical

knowledge to operate, making it accessible to a broader audience.

Additional advantages and modifications of the present invention will readily occur to those skilled in the art in view of these teachings. The present invention in its broader aspects is not limited to the specific details, representative contrivances, and illustrative examples shown and described herein. Accordingly, various modifications may be made without departing from the spirit and scope of the general concept as defined in the appended claims and their equivalents. By utilizing this invention, users can effectively monitor air quality, contributing to improved health and environmental safety.

Claims

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An air quality monitoring device comprising:

    a breadboard (1)

    an MQ-7 gas sensor (2)

    an MQ-4 gas sensor (3)

    an MQ-135 gas sensor (4)

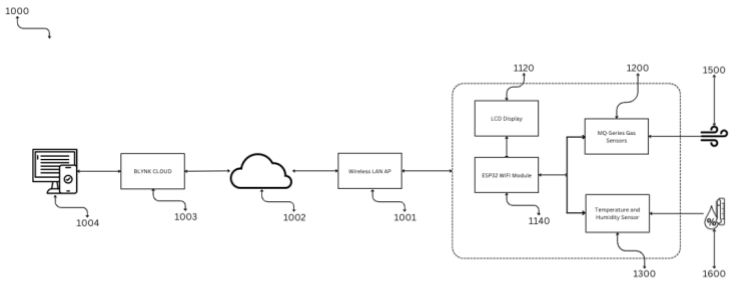
    a DHT11 sensor (5)

    an ESP32 module (6)

    an LCD display (7)

2. An air quality monitoring device according to claim 1, wherein the breadboard (1) serves as the foundation for mounting all components.
3. An air quality monitoring device according to claim 1, wherein the MQ-7 gas sensor (2) detects carbon monoxide levels.

4. An air quality monitoring device according to claim 1, wherein the MQ-4 gas sensor (3) detects methane levels.
5. An air quality monitoring device according to claim 1, wherein the MQ-135 gas sensor (4) measures air quality by detecting various harmful gases.
6. An air quality monitoring device according to claim 1, wherein the DHT11 sensor (5) measures temperature and humidity levels.
7. An air quality monitoring device according to claim 1, wherein the ESP32 module (6) is the main microcontroller that facilitates communication between the sensors (2, 3, 4, 5) and the LCD display (7).
8. An air quality monitoring device according to claim 1, wherein the LCD display (7) provides real-time visual feedback of the sensor data.
9. An air quality monitoring device according to claim 1, wherein the system is designed to be user-friendly and accessible to users without specialized technical knowledge.
10. An air quality monitoring device according to claim 1, wherein the device provides real-time data on multiple environmental parameters to facilitate better monitoring and management of air quality.



SYSTEM ARCHITECTURE

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The invention entitled VisionAir is a comprehensive air quality monitoring system designed to provide real-time data on various environmental parameters. The system

architecture, as depicted in the diagram, integrates several key components to achieve its purpose.

The core of the VisionAir system includes an ESP32 WiFi module (1140), which acts as the central processing unit for data acquisition and communication. This module interfaces with multiple sensors, including the MQ-Series gas sensors (1200) and a temperature and humidity sensor (1300). The MQ-Series gas sensors are responsible for detecting various air pollutants, while the temperature and humidity sensor measures the ambient conditions.

Data collected from these sensors is displayed on an LCD display (1120), providing immediate visual feedback on air quality parameters. The ESP32 WiFi module (1140) also ensures that this data is transmitted wirelessly to a broader network.

The system's connectivity is facilitated by a Wireless LAN Access Point (1001), which links the ESP32 WiFi module (1140) to the internet via the Blynk Cloud platform (1003). This cloud platform serves as a centralized hub for data storage and management, allowing users to access and analyze air quality data remotely. Users can interact with the system through a computer or mobile device (1004), enabling them to monitor air quality in real time and receive alerts if any parameters exceed predefined thresholds.

The purpose of VisionAir is to provide an inclusive, user-friendly solution for air quality monitoring. By utilizing advanced sensors and wireless communication technology, the system ensures high accuracy in detecting various pollutants and environmental conditions, addressing the limitations of prior art. Furthermore, its design eliminates the need for specialized technical knowledge, making it accessible to a broader audience and

promoting better environmental awareness and management.

The diagram illustrates the interconnected components and their functions within the VisionAir system, highlighting its capability to deliver comprehensive and reliable air quality data to users, ultimately contributing to improved health and environmental safety.