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DEVELOPMENT OF INDOOR AIR QUALITY MONITORING SYSTEM USING ARDUINO UNO AND MULTIFUNCTIONAL SENSORS

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This research introduces an indoor air quality monitoring system based on the Arduino Uno microcontroller. The system is enhanced with a moving average filter and incorporates data fusion techniques from two multifunctional sensors. The primary innovation of this system lies in its capability to process and integrate data from multiple sensors, ensuring high accuracy and reliability in indoor air quality (IAQ) evaluations. Comprehensive testing and empirical analysis were performed in various residential environments to validate the system's performance. The outcomes demonstrate that the system furnishes real-time and precise insights into the air quality. This investigation makes a substantial contribution to the field by presenting an effective solution for air quality monitoring. It employs state-of-the-art sensor technology and advanced data processing techniques to enhance the indoor living conditions.

The indoor air quality monitoring system, which is based on the Arduino Uno microcontroller, employs a range of versatile sensors, including the BME680 and CCS811, to accurately monitor a multitude of indoor air quality parameters, such as temperature, humidity, atmospheric pressure, CO_2, and volatile organic compound (VOC) levels. The integration of these sensors is enhanced through the use of sophisticated data fusion methods and a moving average filter, which collectively improve the system's accuracy and dependability by reducing noise and rectifying sensor biases. The processed data is presented on the Nextion NX3224T028 screen, enhancing user engagement. Furthermore, an audible alert system notifies users when air quality parameters surpass predefined thresholds. This combination of features and technologies responds to the growing demand for intelligent home systems, enhances performance, and offers practical insights for enhancing indoor air quality and safety.

To assess variations in indoor air quality, two separate experiments were conducted. The initial experiment investigated air quality fluctuations across different rooms, including the bedroom, kitchen, and bathroom, within a single building over a span of 10 days. The second experiment evaluated the impact of scented products, such as aromatic diffusers, perfumes, and aerosol sprays, on IAQ. Advanced analytical techniques were employed to measure the levels of CO_2 and VOC, which are essential for assessing indoor ventilation effectiveness and identifying potentially harmful compounds emitted by these products. These studies collectively contribute to a better understanding of IAQ factors influenced by both structural differences and common household items.

References

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