AIR QUALITY MONITORING AND CONTROL SYSTEM BASED ON WIRELESS SENSOR NETWORK (WSN)

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ABSTRACT

This study aims to design an air quality monitoring and control system based on a wireless sensor network (WSN). The system uses a DHT11 sensor to monitor temperature and humidity, and an MQ-135 sensor to measure air quality in Parts Per Million (PPM). Sensor data is sent wirelessly via the NRF24L01 PA LNA module and displayed in real-time on the LCD and the IoT Thingsboard platform. Test results show that the DHT11 sensor has an error margin of 0%-7% compared to reference thermometers and hygrometers, and provides consistent data. The MQ-135 sensor accurately detects hazardous gases with PPM values of 50-500, is sensitive to changes in gas concentration, and provides fast readings. Communication testing of the NRF24L01 module shows stability up to 50 meters, with a data error rate of 2% at 10 meters and 10% at 50 meters. The system also shows good performance in various environmental conditions with an average response time of 2 seconds. Overall, this system meets the research objectives, offering a reliable and easy-to-use air quality monitoring solution, and is flexible in placement and integration with IoT platforms for broader monitoring. This system is useful for applications in urban, industrial, and household environments.

***Keywords**: Air Quality Monitoring System, Wireless Sensor Network, DHT11 Sensor, MQ-135 Sensor, PPM, NRF24L01 PA LNA, Internet of things, Thingsboard.*