ABSTRACT

Indoor air quality (IAQ) significantly impacts health and productivity, influenced by building materials, furniture, and outdoor air quality. Fine particles ($PM_{2.5}$) are a major pollutant posing respiratory and health risks. IAQ-related diseases contribute to premature deaths, emphasizing the public health concern. Research gaps persist in microsensor-based IAQ evaluation methods, their accuracy, measurement reliability, and performance assessment within sensor networks. This study aims to propose a Wireless Sensor Network (WSN)-based IAQ monitoring system. The system includes sensor calibration for accuracy, a 7-day measurement period, data validation, and daily averaging based on $PM_{2.5}$ concentration standards. Quality of service assessment determines system specifications. Calibration tests show an R^2 value of 0.99 and a standard deviation of 11.65 µg/m³ for $PM_{2.5}$ sensors. $PM_{2.5}$ concentrations range from 48 µg/m³ to 75 µg/m³ indoors and 41 µg/m³ to 105 µg/m³ semi-indoors, influenced by environmental factors and air infiltration effects. Post-measurement sensor validation reveals a minimal error of 0.005%. The system achieves consistent data transmission up to 24 meters, even in obstructed environments.

Keywords: Indoor Air Quality, Microsensors, $PM_{2.5}$, Quality of Service.