

ABSTRACT

Airborne particulate matter such as PM_{2.5} and PM₁₀ may pose risks to both environmental conditions and human health when present in elevated concentrations. To address this issue, a real-time monitoring system is required to provide continuous and accessible information about particulate levels in the surrounding environment. In this work, an Internet of Things (IoT)-based system is developed to monitor PM_{2.5} and PM₁₀ concentrations along with ambient temperature and humidity. The system is built around an ESP32 microcontroller as the central processing unit. A PMS5003 sensor is utilized to measure particulate concentrations, while a DHT22 sensor is employed to capture temperature and humidity data. The acquired data are displayed locally on an LCD and simultaneously transmitted to Blynk platform via an internet connection, allowing user to access the information remotely through a smartphone. Experimental results indicate that the system is capable of measuring PM_{2.5} concentrations within the range of 29 $\mu\text{g}/\text{m}^3$ to 69 $\mu\text{g}/\text{m}^3$ and PM₁₀ concentrations between 35 $\mu\text{g}/\text{m}^3$ and 89 $\mu\text{g}/\text{m}^3$. Furthermore, the recorded temperature ranges from 30.2°C to 35.0°C, while humidity values vary from 64.6% to 76.1%. These results demonstrate that the proposed system can effectively perform real-time monitoring of particulate matter and environmental parameters using an IoT-based application.

Keywords: *Internet of Things, PM_{2.5}, PM₁₀, ESP32, PMS5003, particulate monitoring.*