

ABSTRACT

Hydroponic systems require precise environmental management to ensure optimal plant growth. Manual measurement of parameters such as pH, temperature, humidity, light intensity, and total dissolved solids (TDS) is time-consuming and labor-intensive, and is prone to human error, such as inconsistent data recording. To address this issue, SIMPONI (Indoor Hydroponic Monitoring System) was designed and developed as an IoT-based solution for real-time monitoring of hydroponic environments. The system uses an ESP32-S3 UNO microcontroller integrated with six types of sensors and stores data in the Firebase cloud platform. Additionally, a web interface built with the Next.js framework provides users with live access to sensor data. SIMPONI is designed not only for monitoring purposes but also as a foundation for future developments in automated control and Artificial Intelligence. The implementation results show that the system can reliably record and display environmental data, thereby supporting hydroponic practitioners in maintaining optimal plant conditions efficiently.

Keywords: hydroponics, IoT, monitoring, sensor, website