ABSTRACT

Coastal environments increasingly affected by climate change require precise weather monitoring systems. To address this need, an automatic weather monitoring system has been designed, integrating various environmental sensors for continuous and direct data acquisition. The system incorporates a BME280 sensor for measuring air temperature, humidity, and pressure; an HC-SR04 sensor for detecting water level; a DS18B20 sensor for water temperature monitoring; an anemometer for wind speed measurement; a tipping bucket for recording rainfall; and a GPS NEO 8NM module to determine the system's location. All sensor data are processed by an Arduino Mega 2560 and transmitted to a server via an ESP32 module connected to a Wi-Fi network, enabling real-time data monitoring. The system development methodology includes hardware design, sensor integration, and microcontroller programming for data acquisition and transmission. System evaluation was conducted by testing sensor accuracy and the reliability of data transmission. The results indicate that the system is capable of generating environmental data with sensor accuracy 95% compared to standard measuring instruments, and an average data transmission latency of 115.77 milliseconds. These findings demonstrate that the developed automatic weather monitoring system is effective in improving accuracy of coastal environmental monitoring. Consequently, it can support rapid and precise decision-making for sustainable coastal management.

Keywords: Automatic Weather Station, Sensor Integration, Coastal monitoring, Real-Time Data Transmission, Sensor Accuracy