ESP32-BASED FIRE MONITORING SYSTEM BY IMPLEMENTING DEEPSLEEP MODE

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ABSTRACT

The development of Internet of Things (IoT) technology has facilitated the creation of efficient and sustainable environmental monitoring systems. This research aims to design and implement a fire monitoring system based on the ESP32 microcontroller, integrated with several sensors: the MQ2 sensor for detecting smoke and hazardous gases, a flame sensor to identify the presence of fire, a DHT11 sensor to monitor environmental temperature and humidity, and an INA219 sensor to measure voltage, current, and battery power as the system's energy source. The system utilizes the MQTT communication protocol to transmit measurement data online and employs the ESP32's Deep Sleep mode to conserve battery power, allowing for longer operation in areas without access to the PLN electricity network. The system's primary power source is a battery managed through power management techniques to ensure efficient and sustainable use in limited field conditions. Test results indicate that the flame sensor can detect fire at a maximum distance of 29 cm. The DHT11 sensor demonstrates an accuracy rate of 99.973% for temperature measurements and 99.947% for humidity measurements. The INA219 sensor achieves an accuracy rate of 99.909% for voltage readings. Additionally, implementing Deep Sleep mode on the ESP32 significantly enhances energy efficiency, increasing the operating time from 17 hours to 24 hours, with the final voltage remaining above 10.8 V.

Keywords*: Internet of Things, ESP32, Deep Sleep, Sensor, Fire*