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Deep Sleep**
Ahmad Zainul Qomar, Ir. Unan Yusmaniar Oktiawati, S.T., M.Sc., Ph.D., IPU.
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INTISARI

RANCANG BANGUN SISTEM MONITORING GREENHOUSE BERBASIS IOT MENGGUNAKAN METODE BATCH PROCESSING DAN DEEP SLEEP

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Pemantauan larutan nutrisi pada *greenhouse* hidroponik *Nutrient Film Technique* (NFT) masih sering dilakukan secara manual atau berkala, sehingga perubahan kondisi tidak selalu cepat diketahui. Penelitian ini merancang sistem *monitoring greenhouse* berbasis *Internet of Things* (IoT) menggunakan ESP32 untuk memantau parameter utama, yaitu *Electrical Conductivity* (EC)/*Total Dissolved Solids* (TDS) dan suhu air. Sistem dilengkapi metode *batch processing*, *deep sleep*, dan *force upload* untuk menurunkan beban komunikasi data, mengurangi aktivitas perangkat saat tidak melakukan pembacaan atau pengiriman data, serta tetap menjaga respons sistem terhadap kondisi anomali. Pengujian dilakukan secara komparatif di *Greenhouse Field Research Center* (FRC) Sekolah Vokasi UGM dengan membandingkan *node batch* dan *node transmisi per interval* berdasarkan pola pengiriman data. Hasil pengujian menunjukkan bahwa metode *batch processing* mampu menurunkan beban komunikasi untuk setiap data pembacaan sensor. Dibandingkan metode transmisi per interval, rata-rata *overhead* per data turun sebesar 81,21%, sedangkan rata-rata *total usage* per data turun sebesar 73,62%. Selain itu, *node batch* dapat beroperasi selama 9 hari 9 jam 19 menit, sedangkan *node transmisi per interval* bertahan sekitar 2 sampai 3 hari.

Kata kunci: IoT, *greenhouse*, hidroponik NFT, *batch processing*, *deep sleep*, monitoring.

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ABSTRACT

DESIGN AND IMPLEMENTATION OF AN IOT-BASED GREENHOUSE MONITORING SYSTEM USING BATCH PROCESSING AND DEEP SLEEP

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Monitoring nutrient solution in a Nutrient Film Technique (NFT) hydroponic greenhouse is still often carried out manually or periodically, so changes in conditions are not always detected quickly. This study designed an Internet of Things (IoT)-based greenhouse monitoring system using ESP32 to monitor the main parameters, namely Electrical Conductivity (EC)/Total Dissolved Solids (TDS) and water temperature. The system was equipped with batch processing, deep sleep, and force upload methods to reduce data communication load, reduce device activity when it is not reading or sending data, and maintain system response to anomaly conditions. The comparative test was conducted at the Greenhouse Field Research Center (FRC), Vocational College, Universitas Gadjah Mada, by comparing a batch node and an interval-based transmission node based on their data transmission patterns. The results showed that the batch processing method reduced the communication load for each sensor reading. Compared to the interval-based transmission method, the average overhead per data decreased by 81.21%, while the average total usage per data decreased by 73.62%. In addition, the batch node was able to operate for 9 days, 9 hours, and 19 minutes, while the interval-based transmission node lasted around 2 to 3 days.

Keywords: IoT, greenhouse, NFT hydroponics, batch processing, deep sleep, monitoring.