RANCANG BANGUN SISTEM MONITORING INTENSITAS RADIASI MATAHARI MENGGUNAKAN SENSOR PYRANOMETER DI GEDUNG DTNTF UGM

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INTISARI

Matahari adalah sumber utama energi yang memancarkan radiasi penting bagi berbagai proses kehidupan. Dalam konteks bangunan, data intensitas radiasi matahari berperan penting dalam menentukan tingkat kenyamanan termal, sesuai dengan Peraturan Menteri Pekerjaan Umum Nomor 29/PRT/M/2006. Tidak hanya itu, pengembangan *soft sensor* dalam bangunan dalam memprediksi kenyamanan termal dalam bangunan juga semakin populer. Penerapan tersebut membutuhkan data intensitas radiasi matahari yang kontinu, valid, *real-time*, dan andal agar *building management system* dapat berfungsi optimal dalam hal kenyamanan termal. Namun, di Gedung DTNTF UGM, data intensitas radiasi matahari saat ini belum memenuhi keempat persyaratan tersebut.

Penelitian ini bertujuan untuk mendapatkan hasil rancang bangun sistem monitoring intensitas radiasi matahari yang valid, *real-time*, dan andal di Gedung DTNTF UGM. Perancangan dilakukan dengan merancang blok diagram, gambar *detail*, DED, *sequence diagram*, dan *flowchart*. Selanjutnya, pembangunan sistem melibatkan aktualisasi dari hasil perancangan yang telah dibuat.

Berdasarkan hasil pengujian sistem, sistem monitoring intensitas radiasi matahari yang valid, *real-time*, dan andal berhasil dirancang bangun dengan menggunakan sensor pyranometer SEM-228T, protokol Modbus, dan *personal computer*. Sistem komunikasi data memanfaatkan modul konektivitas, *local area network*, dan *database* MySQL. Tingkat kesalahan pengukuran sistem pada rentang 0-1200 W/m² adalah 3,90%, dengan latensi 80,63 ms dan *packet loss* 0%.

Kata kunci: *Intensitas, Matahari, Sistem Monitoring, Pyranometer*

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DESIGN AND CONSTRUCTION OF A SOLAR RADIATION INTENSITY MONITORING SYSTEM USING PYRANOMETER SENSORS IN THE UGM DTNTF BUILDING

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ABSTRACT

The sun is the primary energy source, emitting radiation that is essential for various life processes. In the context of buildings, solar radiation intensity data plays a crucial role in determining thermal comfort levels, in accordance with Regulation of the Minister of Public Works Number 29/PRT/M/2006. Additionally, the development of soft sensors for predicting thermal comfort in buildings is becoming increasingly popular. These applications require continuous, valid, real-time, and reliable solar radiation intensity data to ensure that building management systems can operate optimally in terms of thermal comfort. However, the solar radiation intensity data at DTNTF UGM Building currently does not meet these four requirements.

This research aims to design and develop a solar radiation intensity monitoring system that is valid, real-time, and reliable at the DTNTF UGM Building. The design process involves creating block diagrams, detailed drawings, Detailed Engineering Design (DED), sequence diagrams, and flowcharts. Furthermore, the system development involves the actualization of the designed plans.

Based on the system testing results, a valid, real-time, and reliable solar radiation intensity monitoring system was successfully designed and developed using the SEM-228T pyranometer sensor, Modbus protocol, and a personal computer. The data communication system utilizes connectivity modules, a local area network, and a MySQL database. The system's measurement error rate in the range of 0-1200 W/m² is 3.90%, with a latency of 80.63 ms and a packet loss of 0%.

Keywords: *Intensity, Sun, Monitoring System, Pyranometer*

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