ABSTRAK

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RANCANG BANGUN SISTEM PEMANTAUAN DAN KONTROL INTENSITAS CAHAYA SERTA PENYIRAMAN TANAMAN OTOMATIS PADA *GREENHOUSE* BERBASIS I*NTERNET OF THINGS*
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(xvi + 129 halaman; 33 gambar; 15 tabel; 4 lampiran)

Greenhouse adalah solusi efektif untuk mengendalikan lingkungan pertumbuhan tanaman. Namun, pengelolaan lingkungan dalam *greenhouse* saat ini memerlukan banyak tenaga kerja dan biaya yang tinggi. Untuk mengatasi tantangan ini, ada kebutuhan mendesak untuk mengembangkan sistem otomatisasi yang mampu memantau kondisi tanaman dan mengontrol intensitas cahaya dan penyiraman tanaman pada tanaman *greenhouse*. Sistem ini menggunakan teknologi *Internet of Things* dengan mikrokontroler ESP32 Devkit v1 untuk pemantauan dan kontrol otomatis dan *realtime* lingkungan pertumbuhan tanaman. Melalui implementasi sistem pemantauan kualitas karbon dioksida (CO_2), cahaya, kelembapan tanah dan pH tanah serta kontrol otomatis intensitas cahaya dan penyiraman tanaman otomatis pada *greenhouse*, diharapkan produktivitas pertanian dapat ditingkatkan. Sistem pemantauan dan kontrol tanaman *greenhouse* ini telah diuji dengan menggunakan mikrokontroler ESP32 Devkit v1 dengan sensor-sensor pemantauan seperti intensitas cahaya, kualitas karbon dioksida (CO_2) pada tanaman, sensor kelembapan tanah dan sensor pH tanah serta sensor-sensor kontrol seperti pompa dan lampu. Data-data sensor diambil dan dibaca oleh mikrokontroler yang kemudian ditampilkan dan dikirimkan ke 4 *platform*, yaitu Serial Monitor, *display* OLED, *Platform website* dan Google *Spreadsheet*. Mikrokontroler berhasil membaca data-data sensor yang terpasang, data yang terbaca pada Serial Monitor, *display* OLED, *platform website*, dan Google *Spreadsheet* sama dan data-data sensor tersebut dapat ditampilkan secara *realtime* pada beberapa platform. Data-data pengujian ini memberikan gambaran konkret tentang kinerja sistem pemantauan dan kontrol tanaman *greenhouse* yang dikembangkan. Hasil verifikasi terhadap alat ukur komersial menunjukkan sensor LDR mempunyai kesalahan sebesar 1.15%, sensor CO_2 mempunyai kesalahan sebesar 0.86%, sensor pH tanah mempunyai kesalahan 3.22%, sensor kelembaban tanah mempunyai kesalahan 1.46%. Uji fungsional menunjukkan sistem memberi respon menyalakan lampu *growlight* saat intensitas cahaya turun sampai 500 Lux dan menyalakan pompa saat kelembaban tanah turun di bawah 40% kelembapan tanah yang disesuaikan dengan *setting* titik *threshold* yang diberikan pada masing-masing tanaman.

Kata Kunci : *Internet of things*, pemantauan lingkungan tanam, kontrol lingkungan tanam, *greenhouse*
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ABSTRACT

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DESIGN AND IMPLEMENTATION OF AN INTERNET OF THINGS BASED MONITORING AND CONTROL SYSTEM FOR LIGHT INTENSITY AND AUTOMATIC PLANT IRRIGATION IN A GREENHOUSE

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Greenhouses are an effective solution to control the plant growth environment. However, environmental management in greenhouses today requires a lot of labor and high costs. To address this challenge, there is an urgent need to develop an automation system capable of monitoring plant conditions and controlling the light intensity and watering of plants in greenhouse plants. The system uses Internet of Things technology with an ESP32 Devkit v1 microcontroller for automatic and real-time monitoring and control of the plant growth environment. Through the implementation of a carbon dioxide (CO2), light, soil moisture and soil pH quality monitoring system as well as automatic control of light intensity and automatic watering of plants in greenhouses, it is hoped that agricultural productivity can be increased. This greenhouse plant monitoring and control system has been tested using the ESP32 Devkit v1 microcontroller with monitoring sensors such as light intensity, carbon dioxide (CO2) quality in plants, soil moisture sensors and soil pH sensors as well as control sensors such as pumps and lights. The sensor data will be taken and read by the microcontroller which is then displayed and sent to 4 platforms, namely Serial Monitor, OLED display, website platform and Google Sheets. The microcontroller successfully reads the installed sensor data, the data read on the Serial Monitor, OLED display, website platform, and Google Sheets are the same and the sensor data can be displayed in real-time on several platforms. These test data provide a concrete picture of the performance of the greenhouse plant monitoring and control system developed. The results of verification of commercial measuring instruments showed that the LDR sensor had an error of 1.15%, the CO2 sensor had an error of 0.86%, the soil pH sensor had an error of 3.22%, and the soil moisture sensor had an error of 1.46%. The functional test shows that the system responds to turn on the growlight when the light intensity drops to 500 Lux and turn on the pump when the soil moisture drops below the 40% soil moisture adjusted to the threshold point setting given to each plant.

Keywords : Internet of things, planting environment monitoring, planting environment control, greenhouse
Reference : 13 (2017-2023)