ABSTRAK

RANCANG BANGUN GREENHOUSE OTOMATIS BERBASIS MIKROKONTROLER UNTUK MONITORING DAN DETEKSI IKLIM MIKRO

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Perubahan iklim yang semakin tidak menentu membuat kondisi suhu dan kelembapan di lingkungan budidaya tanaman menjadi sulit dikendalikan, yang pada akhirnya berdampak pada pertumbuhan dan hasil produksi tanaman. Penelitian ini mengembangkan sistem *Greenhouse* otomatis berbasis mikrokontroler yang dapat memantau dan mengendalikan kondisi iklim mikro secara langsung dan berkelanjutan. Sistem yang dibangun menggunakan ESP32 sebagai unit pengendali utama, dilengkapi sensor XY-MD02 untuk mendeteksi suhu dan kelembapan udara, serta LCD 16×2 I2C untuk pemantauan di lokasi. Pemantauan jarak jauh dilakukan melalui platform Blynk berbasis IoT, sementara *Solid State Relay* (SSR) difungsikan sebagai pengendali *Exhaust Fan*. Pengendalian suhu menggunakan metode *hysteresis control*, di mana *Exhaust Fan* akan aktif ketika suhu mencapai 30°C dan berhenti beroperasi saat suhu turun ke 28°C. Dari hasil pengujian, sistem terbukti mampu memantau suhu dan kelembapan secara *Real-Time* dalam rentang suhu 27°C–42°C dan kelembapan 36%RH–89%RH. Seluruh data pengukuran berhasil ditampilkan pada LCD maupun aplikasi Blynk, dan *Exhaust Fan* dapat bekerja secara otomatis sesuai setpoint yang ditetapkan.

Kata Kunci: Greenhouse, ESP32, Internet of Think (IoT), Monitoring, Iklim Mikro

ABSTARCT

DESIGN AND CONSTRUCTION OF A MICROCONTROLLER-BASED AUTOMATED GREENHOUSE FOR MICROCLIMATE MONITORING AND DETECTION

(2026: 62 Pages + 26 Figures + 6 Tables + References + Appendices)

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Increasingly unpredictable climate changes make it difficult to control temperature and humidity conditions in plant cultivation environments, ultimately impacting plant growth and yield. This research developed a microcontroller-based automated greenhouse system capable of monitoring and controlling microclimate conditions in real-time and continuously. The system utilizes an ESP32 as the main control unit, equipped with an XY-MD02 sensor to detect air temperature and humidity, and a 16×2 I2C LCD for on-site monitoring. Remote monitoring is conducted via the IoT-based Blynk platform, while a Solid State Relay (SSR) is used to control the exhaust fan. Temperature control employs a hysteresis method, wherein the exhaust fan activates when the temperature reaches 30°C and stops operating when the temperature drops to 28°C. Test results demonstrate that the system is capable of monitoring temperature and humidity in real-time within the ranges of 27°C–42°C and 36%RH–89%RH. All measurement data were successfully displayed on both the LCD and the Blynk application, and the exhaust fan operated automatically according to the established setpoints.

Keywords: Greenhouse, ESP32, Internet of Things (IoT), Monitoring, Microclimate