

**IMPLEMENTASI *VISUAL PROGRAMMING* UNTUK OTOMATISASI
BUDIDAYA BASIL HIDROPONIK**

SKRIPSI



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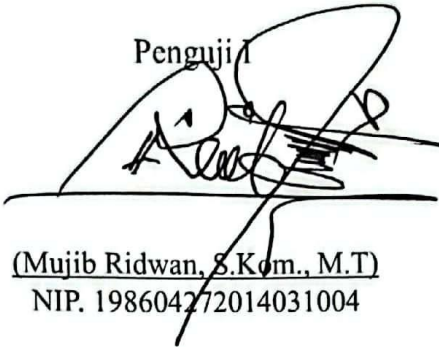
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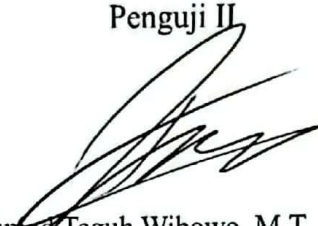
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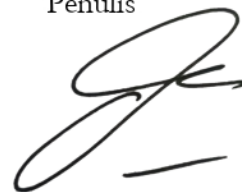
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ABSTRAK

IMPLEMENTASI VISUAL PROGRAMMING UNTUK OTOMATISASI BUDIDAYA BASIL HIDROPONIK

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Keterbatasan lahan pertanian dan kebutuhan pangan global mendorong penerapan teknologi hidroponik, namun metode pemantauan parameter *pH* dan nutrisi secara manual dinilai kurang efisien dan rentan terhadap kesalahan manusia. Penelitian ini bertujuan merancang sistem otomatisasi hidroponik *Nutrient Film Technique (NFT)* yang terjangkau dengan memanfaatkan *visual programming* n8n sebagai pusat logika kontrol dan *Set-Top Box (STB)* bekas sebagai server lokal. Menggunakan metode *Research and Development (R&D)* dengan model pengembangan *Waterfall*, sistem dirancang dengan arsitektur terdistribusi di mana beban komputasi dialihkan dari mikrokontroler ESP32 ke server STB. Prototipe perangkat keras mengintegrasikan sensor *pH* dan TDS dengan modul isolasi daya untuk akurasi tinggi, serta aplikasi Android berbasis *MVVM* untuk pemantauan *real-time*. Hasil uji coba sistem selama 72 jam menunjukkan bahwa logika kontrol otomatis berhasil menstabilkan kondisi air dengan tingkat presisi yang cukup baik, ditunjukkan oleh nilai *Mean Absolute Error (MAE)* *pH* sebesar 0,72 dan TDS sebesar 7,82 ppm. Selain itu, sistem terbukti mampu dalam menangani gangguan jaringan melalui mekanisme penyimpanan data *fail-safe* dan notifikasi status perangkat secara *real-time*. Penelitian ini menyimpulkan bahwa integrasi n8n dan STB efektif sebagai solusi otomatisasi presisi yang fleksibel dan hemat biaya untuk pertanian modern.

Kata kunci: Hidroponik, *Internet of Things (IoT)*, *Visual Programming (n8n)*, *Set-Top Box (STB)*, Otomatisasi, *Mean Absolute Error (MAE)*.

ABSTRACT

**IMPLEMENTATION OF VISUAL PROGRAMMING
FOR AUTOMATION OF HYDROPONIC
BASIL CULTIVATION**

By:
Nur Fatiq

Land scarcity and global food demands drive the adoption of hydroponic technology, yet manual monitoring of pH and nutrient parameters remains inefficient and susceptible to human error. This study aims to design an affordable automated Nutrient Film Technique (NFT) hydroponic system utilizing n8n visual programming as the control logic center and a repurposed Set-Top Box (STB) as a local server. Employing the Research and Development (R&D) method with the Waterfall model, the system features a distributed architecture where computational loads are offloaded from the ESP32 microcontroller to the STB server. The hardware prototype integrates pH and TDS sensors with galvanic isolation for high accuracy, accompanied by an MVVM-based Android application for real-time monitoring. A 72-hour system trial demonstrated that the automatic control logic successfully stabilized water conditions with high precision, evidenced by a Mean Absolute Error (MAE) of 0.72 for pH and 7.82 ppm for TDS. Furthermore, the system proved reliable in handling network disruptions through fail-safe data storage mechanisms and real-time device status notifications. This research concludes that integrating n8n and STB offers an effective, flexible, and cost-efficient precision automation solution for modern agriculture.

Keywords: Hydroponics, Internet of Things (IoT), Visual Programming (n8n), Set-Top Box (STB), Automation, Mean Absolute Error (MAE).

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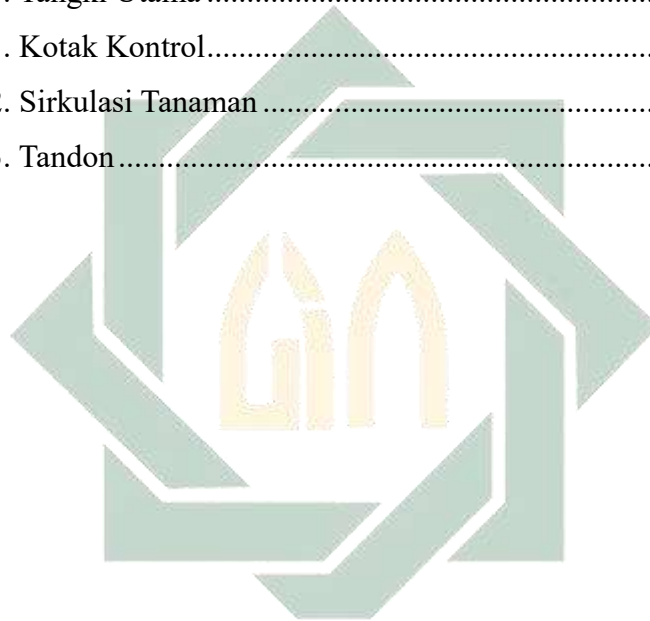
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