UNDERGRADUATE THESIS

PID (PROPORTIONAL–INTEGRAL–DERIVATIVE) CONTROL SYSTEM WITH PSO ALGORITHM ON IOT-BASED BIOACTIVE VIVARIUM FOR CROCODILE SKINKS

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PID (PROPORTIONAL–INTEGRAL–DERIVATIVE) CONTROL SYSTEM WITH THE PARTICLE SWARM OPTIMIZATION (PSO) ALGORITHM ON IOT-BASED BIOACTIVE VIVARIUM FOR CROCODILE SKINKS

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ABSTRACT

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ABSTRACT

The stability of micro-environmental parameters is a crucial factor in the maintenance of Crocodile Skinks (Tribolonotus gracilis) within bioactive vivarium ecosystems. Instability in temperature and humidity often triggers biological stress and increases mortality risks due to opportunistic bacterial infections, such as *Aeromonas hydrophila*. This research aims to design an Internet of Things (IoT)-based automated control system using the ESP32 microcontroller to maintain the stability of temperature, air humidity, and soil moisture. The implemented control method is Proportional-Integral-Derivative (PID), with parameters optimized using the Particle Swarm Optimization (PSO) algorithm to minimize overshoot and accelerate system response time in reaching the set-point. The development methodology employed is Rapid Application Development (RAD). The system integrates DHT22 and YL-69 sensors as inputs, and actuators including a Peltier cooler, mist maker, and mini submersible pump as outputs. The expected results of this research are the creation of a stable micro-environment within the ideal temperature range of 22°C - 25°C, air humidity of 70% - 85%, and soil moisturize in 70% to support biotic welfare and the sustainability of self-sufficient nutrient cycles in bioactive vivariums.

Keywords: Crocodile Skink, Bioactive Vivarium, IoT, PID, PSO, ESP32.

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Surabaya, July 10 2026

Author

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