ABSTRAK

Ketidakstabilan suhu pada inkubator bayi transport merupakan masalah serius yang dapat membahayakan kondisi bayi prematur, terutama saat proses transportasi. Sistem kontrol suhu konvensional sering kali tidak dapat merespons perubahan suhu lingkungan dengan cepat, sehingga diperlukan sistem yang lebih responsif dan efisien. Penelitian ini bertujuan mengembangkan sistem kontrol suhu berbasis metode PID-Fuzzy untuk inkubator bayi transport, dengan tujuan meningkatkan efisiensi baterai serta menjaga kestabilan suhu optimal selama transportasi bayi prematur. Inovasi yang ditawarkan dalam penelitian ini mencakup penggabungan kontrol PID dengan logika fuzzy untuk menghasilkan kontrol suhu yang lebih responsif, serta pemantauan suhu secara real-time menggunakan sensor DS18B20. Sistem ini diuji dalam berbagai kondisi lingkungan, baik ruang tertutup maupun terbuka, untuk memastikan keandalan dan ketahanannya. Pengujian menunjukkan bahwa sistem PID-Fuzzy mampu menjaga suhu inkubator lebih stabil, merespons perubahan suhu lebih cepat, serta mengurangi overshoot yang berpotensi berbahaya bagi bayi. Selain itu, efisiensi energi juga meningkat, memperpanjang masa pakai baterai inkubator selama transportasi. Implementasi sistem kontrol PID-Fuzzy ini terbukti efektif dalam meningkatkan keamanan dan kenyamanan inkubator bayi transport, serta dapat diterapkan pada inkubator transport lainnya untuk mendukung perawatan bayi prematur secara lebih optimal di berbagai fasilitas kesehatan, terutama di daerah yang memiliki keterbatasan sumber daya listrik.

Kata kunci: Inkubator bayi, PID-Fuzzy, kontrol suhu, transportasi, sensor DS18B20, efisiensi baterai, kestabilan suhu

ABSTRACT

Temperature instability in transport baby incubators is a serious problem that can jeopardize the condition of premature babies, especially during the transportation process. Conventional temperature control systems are often unable to respond quickly to changes in ambient temperature, so a more responsive and efficient system is needed. This research aims to develop a temperature control system based on the PID-Fuzzy method for transport baby incubators, with the aim of increasing battery efficiency and maintaining optimal temperature stability during transportation of premature babies. The innovations offered in this research include combining PID control with fuzzy logic to produce more responsive temperature control, as well as real-time temperature monitoring using a DS18B20 sensor. The system was tested in various environmental conditions, both closed and open spaces, to ensure its reliability and robustness. The tests show that the PID-Fuzzy system is able to maintain a more stable incubator temperature, respond faster to temperature changes, and reduce overshoots that are potentially harmful to the baby. In addition, energy efficiency was also improved, extending the battery life of the incubator during transportation. The implementation of this PID-Fuzzy control system is proven to be effective in improving the safety and comfort of transport infant incubators, and can be applied to other transport incubators to support more optimal care of premature infants in various health facilities, especially in hospitals.

Keywords: Baby incubator, PID-Fuzzy, temperature control, transportation, DS18B20 sensor, battery efficiency, temperature stability.