ABSTRAK

PERANCANGAN SISTEM MANAJEMEN *BATTERY* LITHIUM-ION DENGAN MENGGUNAKAN METODE *ARTIFICIAL INTELLIGENCE* (AI) MODEL *DEEP LEARNING* (*LONG SHORT-TERM MEMORY*)
(2026: 114 Halaman: 40 Gambar: 10 Tabel + Daftar Pustaka + Lampiran)

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Baterai lithium-ion merupakan salah satu sumber energi yang banyak digunakan pada berbagai perangkat elektronik karena memiliki densitas energi yang tinggi, efisiensi yang baik, dan umur pakai yang relatif panjang. Namun, baterai lithium-ion rentan terhadap kondisi *overcharge* dan *overdischarge* yang dapat menurunkan performa serta mempercepat degradasi baterai. Perancangan ini bertujuan untuk merancang sistem *Battery Management System* (BMS) berbasis *Artificial Intelligence* (AI) menggunakan metode *Deep Learning Long Short-Term Memory* (LSTM) untuk memprediksi *State of Charge* (SOC) *dan Depth of Discharge* (DOD) pada baterai lithium-ion. Metode perancangan dilakukan melalui pengambilan data tegangan dan arus baterai selama proses *charging* dan *discharging* pada baterai 13.50V dan 24.800 mAh , kemudian data diolah menggunakan Google *Colaboratory* untuk pelatihan dan pengujian model LSTM. Hasil perancangan menunjukkan bahwa sistem mampu memprediksi SOC DOD dengan nilai RMSE 0.3419% dan MAE 0.3231%, serta akurasi prediksi mencapai 98%. Kesimoulannya menunjukkan bahwa model LSTM mampu memprediksi nilai SOC dan DOD berdasarkan pola historis data baterai dengan baik. Penerapan metode LSTM pada sistem BMS dapat membantu meningkatkan keamanan, efisiensi, dan keandalan penggunaan baterai lithium-ion pada berbagai perangkat elektronik.

Kata Kunci: *Battery Management System*, Baterai Lithium-Ion, *Deep Learning*, *Long Short-Term Memory, State of Charge, Depth of Discharge.*

ABSTARCT

LITHIUM-ION BATTERY MANAGEMENT SYSTEM DESIGN USING ARTIFICIAL INTELLIGENCE (AI) DEEP LEARNING MODEL (LONG SHORT-TERM MEMORY)
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Lithium-ion batteries are one of the energy sources widely used in various electronic devices because they have high energy density, good efficiency, and a relatively long service life. However, lithium-ion batteries are susceptible to overcharge and overdischarge conditions that can reduce performance and accelerate battery degradation. This design aims to design an Artificial Intelligence (AI)-based Battery Management System (BMS) using the Deep Learning Long Short-Term Memory (LSTM) method to predict State of Charge (SOC) and Depth of Discharge (DOD) in lithium-ion batteries. The design method is carried out by collecting battery voltage and current data during the charging and discharging process on 13.50V and 24,800 mAh batteries, then the data is processed using Google Colaboratory for training and testing the LSTM model. The design results show that the system is able to predict SOC DOD with an RMSE value of 0.3419% and MAE of 0.3231%, and the prediction accuracy reaches 98%. The results indicate that the LSTM model is capable of predicting SOC and DOD values based on historical battery data patterns. Implementing the LSTM method in a BMS system can help improve the safety, efficiency, and reliability of lithium-ion batteries in various electronic devices.

Keywords: *Battery Management System, Lithium-Ion Battery, Deep Learning, Long Short-Term Memory, State of Charge, Depth of Discharge.*