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Battery management system using Jaya maximum power point tracking technique
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Abstract
This paper introduces the development of a battery management system (BMS) utilizing the Jaya-based maximum power point tracking (MPPT) technique. Previous studies have combined various MPPT techniques with switching methods, each having its pros and cons. Traditional MPPT methods are common but have limited performance. Therefore, artificial intelligence (AI)-based approaches are introduced to enhance and reduce the limitations faced. The Jaya technique is straightforward and easy to implement, making it an attractive choice for MPPT in photovoltaic systems. It is recognized for its effectiveness in eliminating the worst solutions and identifying the best solution with only a few control parameters required for operation. The proposed work aims to develop a BMS using a DC-DC buck converter and the Jaya MPPT technique. The objective is to find the MPP to achieve the desired performance level and ensure the effectiveness of maintaining battery quality, preventing overcharging or undercharging. The system is modeled in MATLAB/Simulink. The findings indicate that the Jaya MPPT demonstrates a tracking speed of less than 1 second to locate the maximum power point (MPP). Furthermore, the BMS is capable of monitoring changes in state of charge (SoC) to determine whether the system is in charging or discharging mode.

Author Keywords
DC-DC buck converter; Jaya technique; Maximum power point; Maximum power point tracking; Photovoltaic

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