Predictive-TOPSIS based MPPT for PEMFC Featuring Switching Frequency Reduction

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Abstract

A maximum power point tracking (MPPT) for a proton exchange membrane fuel cell (PEMFC) using a combination of conventional, fuzzy control and model predictive control (MPC) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is proposed in the paper. The key idea is to maximize the power generation from a PEMFC while minimizing the switching frequency of the power converter. The Fuzzy MPC technique is formulated to track the maximum power of PEMFC highly affected by operating conditions. Moreover, the TOPSIS algorithm is applied to overcome the potential weaknesses of traditional fuzzy logic controller (FLC), which can only maintain a fixed switching frequency. In this paper, all simulations were run using MATLAB software to display the output power of the PEMFC system. As a result, the proposed predictive TOPSIS-based MPPT algorithm can track its MPP for various PEMFC parameters within 0.1 s with an excellent accuracy up to 99.97%. The proposed MPPT technique has fast-tracking of the MPP feature, excellent accuracy, robustness, and insensitivity to environmental changes.

Keywords

Fuel cells, Maximum power point tracker, Predictive control, Power electronics, TOPSIS

Reftacks

There are currently no reftacks.