Corpus ID: 219922004

A Nonlinear Back-stepping Controller of DC-DC Non Inverting Buck-Boost Converter for Maximizing Photovoltaic Power Extraction

Fabio Corti, Okba Boutebba, Krim Fateh, Samia Semcheddine, Alberto Reatti, Francesco Grasso less

Published 2020

Engineering

This work focuses on integration of the backstepping control for tracking the maximum power point of a photovoltaic (PV) chain. This control strategy is applied for a series-parallel DC-DC power converter type non inverting buck-boost (NIBB) in order to regulate the output voltage of the PV generator, according to the reference voltage generated by the known perturb and observe (P&O) MPPT (maximum power point tracking) algorithm. The robust and nonlinear backstepping controller is based on Lyapunov function for ensuring the local stability of the system. The basic idea of the nonlinear backstepping controller (BSC) is to synthesize a control law in a recursive way, that is to say step by step. This controller has a good transition response, a low tracking error, and a very fast response to the changes in solar irradiation and environmental temperature. To prove the effectiveness of the suggested control method, a comparative study through numerical simulations is presented with the classical PI (proportional-integral) controller.