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Evolutionary based maximum power point tracking technique using differential evolution algorithm

Abstract

This paper presents a maximum power point tracking (MPPT) technique for photovoltaic (PV) system using a modified differential evolution (DE) algorithm. The standard DE is modified to deal with dynamic objective function problem to suit with the nonlinear time-varying MPPT nature. Using this approach, a fast and accurate convergence to MPP can be achieved. The performance of the algorithm is evaluated under large and rapid fluctuations of irradiation. For benchmarking, comparison to the conventional hill climbing (HC) technique is carried out. The results show that it outperforms the HC in terms of convergence speed and accuracy. In addition, the power oscillation at steady state is significantly diminished. The effectiveness of the proposed technique in handling partial shading conditions is also demonstrated. With this capability, the proposed technique can be suitably used for building integrated PV (BIPV) system.

Keywords

Buck-boost converter; Building integrated PV (BIPV); Differential evolution (DE); Hill climbing (HC);Maximum power point tracking (MPPT); Partial shading; Photovoltaic (PV)