RESEARCH-ARTICLE

Development of novel Cuckoo search optimization-based controller for partially shaded Photovoltaic system

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Abstract

Among the list of reliability issues in Photovoltaic (PV) systems, partial shading is one of the crucial issues that affect the row current creating a wide range of current differences between rows these results in reduced output power and panel life span by creating hotspots. It also creates difficulty in tracking the power, because of multiple hotspot peaks obtainable in PV and IV (Current-Voltage) curves. Physical relocation of panels during shade occurrence is not an encouraging solution because of rooftop solar and domestic PV systems, where the area for PV installation is a ceiling. The optimization-based controller is retrofitted for the electrical relocation of panels. It is developed based on the Cuckoo Search Algorithm (CSA), which aims to reduce the row current difference with a minimum reposition of panels as constraints. For the 9*9 PV arrangement, the row current ranges from 3.747 A to 8.424 A. It is reduced and almost made zero. Hence, the Fill factor raises from 38.073 to 51.707%. The power output is enhanced by about 20%. To prove the algorithm's novelty a shading case for 4*3 asymmetric array arrangement is also considered for simulation studies. The proposed system proves to be economically