Enhancing the Performance of Photovoltaic Systems under Partial Shading Conditions Using Cuttlefish Algorithm

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Abstract

Improving the control of Photovoltaic (PV) power plants is an increasing interest worldwide. This improvement would hopefully help in reaching the maximum benefit of PV performance all the time. A lot of challenges are facing the control of PV systems such as Maximum Power Point Tracking (MPPT) of PV. Partial shading has become recently one of the most important challenges facing MPPT. This calls for improving the control strategy of PV power plants to cope with it. The work in this paper utilizes a relatively new optimization method which is the Cuttlefish Algorithm (CFA) to tune a Second Order Amplifier (SOA) for enhancing the PV system performance. The CFA has proved to be a very effective and fast optimization technique that can reach an accurate optimum solution with minimum effort and time. In addition, the SOA also has been found capable of enhancing the PV system performance at any condition if well-tuned. The main objective of this paper is to enhance the performance of a PV system under partial shading conditions through the use of a well selected combination of both the CFA and SOA. The needed mathematical models along with the required computer simulations are developed and the obtained results are analyzed. The reached at conclusions prove that the proposed control system and strategy are successful in achieving the declared objectives of the paper.

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