A new meta-heuristic optimization-based MPPT control technique for green energy harvesting from photovoltaic systems under different atmospheric conditions

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ABSTRACT

At present, a photovoltaic (PV) system takes responsibility to reduce the risk of global warming and generate electricity. However, the PV system faces numerous problems to track global maximum peak power (GMPP) owing to the nonlinear nature of the environment especially due to partial shading conditions (PSC). To solve these difficulties, previous researchers have utilized various conventional methods for investigations. Nevertheless, these methods have oscillations around the GMPP. Hence, a new metaheuristic method such as an opposition-based equilibrium optimizer (OBEO) algorithm is used in this work for mitigating the oscillations around GMPP. To find the effectiveness of the proposed method, it can be evaluated with other methods such as SSA, GWO, and P&O. As per the simulation outcome, the proposed OBEO method provides maximum efficiency against all other methods. The efficiency for the proposed method under dynamic PSC is 95.09% in 0.16 s, similarly, 96.17% for uniform PSC and 86.25% for complex PSC.

KEYWORDS

Complex partial shading conditions (CPS); Global maximum peak power (GMPP); Grey wolf optimization (GWO) Opposition-based equilibrium optimizer (OBEO); Partial shading condition (PSC); Photovoltaic (PV)

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