Grey wolf optimization and differential evolution-based maximum power point tracking controller for photovoltaic systems under partial shading conditions

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ABSTRACT

Photovoltaic (PV) energy is one of the most abundant energy in the world for generating huge electrical power to meet the desired load. However, the arduous task in the electrical industry is to contribute to the uninterrupted power supply by the PV system as a result of partial shading conditions (PSC). To track the global maximum peak power (GMPP) instead of local maxima peak power (LMPP), the combination of gray wolf optimization (GWO) and differential evolution (DE) algorithm is hybridized (GWO-DE) in this work. Furthermore, the proposed system is developed in the MATLAB/Simulink software. The system is investigated under distinct atmospheric conditions and compared its performance with other studied approaches. The simulation results disclose that the hybrid GWO-DE approach shows a greater performance as compared to other studied methods with respect to convergence time, accuracy, extracted power, and efficiency. Moreover, the proposed system is developed experimentally and tested in four different cases. The outcomes of the GMPP are 984.65 W at 0.08 sec for case 1, 630.39 W at 0.08 sec for case 2, 602.56 W at 0.07 sec for case 3, and 650.08 W at 0.05 sec for case 4. It is found that the suggested hybrid GWO-DE method ensures a greater performance than other studied methods.

KEYWORDS

GWO-DE; Maximum peak power; Partial shading conditions; Photovoltaic; PSO

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