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Abstract

Developing a highly accurate simulation technique for Photovoltaic (PV) systems prior to the installation is very important to increase the overall efficiency of using such systems. Providing a more accurate optimization
algorithm to extract the optimal parameters of the PV models is therefore continuously required. Flower Pollination Algorithm (FPA) is proposed as a new optimization method to extract the optimal parameters of a single diode and a double diode models. The proposed extraction technique is tested using three different sources of data. The first source is the data reported in the previous literature, while the second source is the experimental data measured at the laboratory. The third source is the experimental data obtained from the data sheets of different types of solar modules. The FPA results are compared with the results of the previous literature to validate the performance of the proposed technique. The results prove that FPA achieves the least error between the extracted and the measured data relative to the other techniques over the entire ranges of different environmental conditions, especially at low irradiation levels. Moreover, FPA outperforms the other techniques from the point of view of both the convergence speed and the convergence time. In addition, comparison of (I–V) characteristics of the extracted parameters by FPA and that of the experimental data shows unnoticed deviation between
them. That is why the Flower Pollination Algorithm is recommended as the fastest and the most accurate optimization technique for the optimal parameters extraction process.