Dalia Yousri, Dalia Allam, M. B. Eteiba, PN Suganthan. “Static and Dynamic Photovoltaic Models’ Parameters Identification Using Chaotic Heterogeneous Comprehensive Learning Particle Swarm Optimizer variants”. Elsevier, Energy conversion and Management, Accepted, 00 (2018) 1–35

Abstract

Photovoltaic modeling has attracted researchers’ attention worldwide because of its importance in the photovoltaic system design. Therefore, several photovoltaic models have been introduced as static and dynamic photovoltaic models. Moreover, a novel fractional order dynamic photovoltaic model has been recently developed to enhance the accuracy and flexibility of the conventional integral order one. The unknown parameters of these models should be extracted accurately to achieve a proper photovoltaic system design and operation. In this work, novel Chaotic Heterogeneous Comprehensive Learning Particle Swarm Optimizer variants are introduced, where the Heterogeneous Comprehensive Learning Particle Swarm Optimizer is combined with ten different chaos maps to adapt its parameters. Six Chaotic

Heterogeneous Comprehensive Learning Particle Swarm Optimizer variants are proposed in addition to the standard Heterogeneous Comprehensive Learning Particle Swarm Optimizer version to identify the parameters of both the static and the dynamic models based on different experimental datasets. To demonstrate the superiority of the developed variants, their results are compared to the most recent state-of-the-art algorithms with the aid of statistical analysis methods. The main outcome is that, in both of the static and the dynamic photovoltaic models, the Chaotic Heterogeneous Comprehensive Learning Particle Swarm Optimizer variants show their efficiency, accuracy and robustness not only over Heterogeneous Comprehensive Learning Particle Swarm Optimizer but also over recently published algorithms. They provide better fitting relative to the experimental datasets with the least deviation error and the fastest convergence speed as well. In the case of static models, the fourth variant of Chaotic Heterogeneous Comprehensive Learning Particle Swarm Optimizer with an iterative map for the single diode model, the third variant of Chaotic

Heterogeneous Comprehensive Learning Particle Swarm Optimizer with singer map for the double diode model of solar cell. On the other hand, for the dynamic models, the second Chaotic Heterogeneous Comprehensive Learning Particle Swarm Optimizer variant with sinusoidal map for the integral order dynamic photovoltaic model and the sixth variant of Chaotic Heterogeneous Comprehensive Learning Particle Swarm Optimizer with Gauss/mouse map for the fractional order dynamic photovoltaic model offer the best performance.