

2- D. Yousri, S. Babu, Dalia Allam, V.K. Ramachandaramurthy, M.B. Eteiba. "Fractional Chaotic Ensemble Particle Swarm Optimizer for Identifying the Single, Double, and Three Diode Photovoltaic Models' Parameters". Energy, Elsevier. Volume 195, Article Number 116979, DOI 10.1016/j.energy.2020.116979, Published MAR 15 2020.

### Abstract

Solar Photovoltaic is a widely used renewable energy resource, and hence, the accurate and effective modeling of the PV system is crucial in real-time. The accurate PV modeling helps to predict the performance of the PV plant. In this paper, authors have proposed a novel optimization algorithm named Fractional Chaotic Ensemble Particle Swarm Optimizer (FC-EPSO) to model solar PV modules accurately. This article focused on the modeling of single, double, and three diodes models based on experimental data under different environmental conditions. In FC-EPSO, a new approach in the meta-heuristic algorithms is proposed, where fractional chaos maps are incorporated into the algorithm to enhance its accuracy and reliability. FC-EPSO variants performance is evaluated based on three-different experimental datasets, in which two are widely utilized for commercial applications, while the third is measured in the laboratory under four different irradiance and temperature levels. For validation purposes, several statistical analyses and comparisons are carried out with the recent state-of-the-art algorithms. The statistical measures and comparative studies illustrate the accuracy and consistency of the proposed algorithm. The introduced technique is capable of emulating the experimental datasets with less deviation, a fast convergence rate, and short execution time.