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Research Article

Use of Wiener-Hammerstein (WH) Model Optimized with Genetic Algorithm in Identification of Photovoltaic System

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Abstract

System identification is a method of identification or measuring a mathematical model of a system by measuring the inputs and outputs of the system. In this paper we apply the Genetic Algorithm (GA) approach to model a photovoltaic (PV) systems with a Wiener-Hammerstein structure. Non-linear dynamic systems have both dynamic elements (energy storage elements) and in these types of systems there are non-linear relationships between some variables. If in such systems it can be assumed that dynamic parts and non-linear parts are separable, they can be modeled with the structures of block-oriented models. These types of models are composed of a combination of linear dynamic block(s) and static nonlinear block(s). This approach is concerned with the estimation of a photovoltaic (PV) system based on observed data. The nonlinear input and output are taken from the irradiance and DC output current data of the real system, respectively. The simulation results revealed the effectiveness and robustness of the proposed model using a genetic algorithm. The simulation results show an MSE value of 0.000774 for normal operation of the PV system and 0.009863 for the shading effect between the estimated and reference information rates.

Keywords: System Identification, Wiener-Hammerstein Model, Photovoltaic (PV) System, Genetic Algorithm.

Highlights

- Identifying the photovoltaic system in normal and shadow operating conditions.
- Using the block-oriented model.
- Using Wiener-Hammerstein model optimized with genetic algorithm.

Citation: (in Persian).