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Parameter identification of solar cells using improved Archimedes Optimization Algorithm

Harvin Krishnan [a], Muhammad Shafiqul Islam [a], Mohd Ashraf Ahmad [b,*], Muhammad Ikram Mohd Rashid [a]

[a] Faculty of Electrical and Electronics Engineering Technology, University Malaysia Pahang Al-Sultan Abdullah, Pekan, Pahang 26600, Malaysia
[b] Centre for Advanced Industrial Technology, University Malaysia Pahang Al-Sultan Abdullah, Pekan, Pahang 26600, Malaysia

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ABSTRACT

The parameters of solar cells for five PV models are identified using an Improved Archimedes Optimization Algorithm (IAOA) in this paper. Two modifications are made to the original Archimedes Optimization Algorithm (AOA). To control the unequal exploration and exploitation phases, the initial adjustment is to incorporate an augmented density decreasing factor. A random average calculation between the current object position and the best object position is implemented for the second modification to solve the local optima issue. The proposed IAOA is then used to tackle the problem of identifying PV model parameters from experimental I-V data. Different PV models, such as the one-diode model (ODM), the two-diode model (TDM), and the PV module model (PMM), have been distinguished using the suggested IAOA. The proposed IAOA outperforms other present algorithms and even outperforms the original AOA based on the revealed results. As closely as feasible to the experimental I-V data of real PV solar cells and module models, the proposed IAOA can choose the best parameter values for PV models.

1. Introduction

There has been a rise in the request for electrical energy due to several factors which includes issues such as global warming, a steady depletion of fossil fuel resources, political challenges, etc. Conventional energy sources use fossil fuels which causes pollution which has made renewable energy sources a necessity as a clean and sustainable energy for the ever-increasing power demands. This in turn has promoted the use of alternative energy sources especially solar energy [1]. In 2016, according to the International Energy Agency (IEA), numerous countries have expanded their PV capacity installation and the trend resumes [2]. The popularization of PV solar cells is now a reality, with decreasing number of countries opting currently to advance the development of PV solar cells. PV systems are the only solitary energy technology system that has demonstrated the distribution of such configuration and adaptability. Solar energy via photovoltaic (PV) systems are popular around the world due to it being environmentally friendly, effortless to install and easily accessible [3]. PV systems use solar PV modules or cells to capture the Sun's energy and convert it to electricity. A PV system's most critical component is the PV cell/module. As a result, proper PV cell/module modelling is critical for designing a photovoltaic system and optimising its efficiency [4].

Many scholars have observed the precise modelling of solar cells in current times. There are two processes to modelling PV solar

* Corresponding author.
E-mail address: mashraf@ump.edu.my (M.A. Ahmad).

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