HYBRID BAT ALGORITHM HYBRID-ARTIFICIAL NEURAL NETWORK FOR MODELING OPERATING PHOTOVOLTAIC MODULE TEMPERATURE

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ABSTRACT

Bat Algorithm (BA) was hybrid based Multi-Layer Feedforward Neural Network (MLFNN) for modeling the temperature operating of photovoltaic module. Bat algorithm is an optimizer tool and developed using of echolocation characteristics of bats, while the neural network is learning methods that approach the human brain using artificial neurons. Bat algorithm was employed to optimize the training parameters such as learning rate, momentum rate and number of neurons in hidden layers. Multi-Layer Feedforward Neural Network utilized the solar irradiance (W/m^2), ambient temperature (^oC) and wind speed (ms^{-1}) as it's input data and photovoltaic module temperature (^oC) as its output data neural network and conducted training and testing process. During the training process, bat algorithm is search the best one for number of neurons in hidden layer, learning rate and momentum rate which at the same time result the lowest mean absolute percentage error. In other words, the implemented bat algorithm in neural network structure is to get global optimization in order to minimize mean absolute percentage error, MAPE. As a conclusion, the MAPE obtained for the Bat Algorithm based Multi-Layer Feedforward Neural Network is 4.79 in %.

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CHAPTER 1

INTRODUCTION

1.1   PROJECT BACKGROUND

Solar electricity or photovoltaic (PV) is the one type of renewable energy technologies which is generate electrical power by convert sunlight into direct current electricity. Renewable energy is the energy generated from the original resource such as wind, geothermal heat, sunlight, waves, rains, and tidal in which the characteristic of renewable energy is an exhaustible. Nowadays, its application is widely used in Malaysia because of more benefits to consumers in term of money profits which at the same time preserve the environment. As well known, the application of photovoltaic (PV) helps a global to reduce carbon emission, pollution and dependency on fossil fuels.

Figure 1.1: Photovoltaic (PV) modules containing a lot of cell which consist of semiconductor material