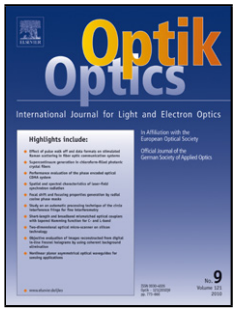

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An algebra method to fast track the maximum power of solar cell via voltage,irradiance and temperature

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Abstract. To maximize output power of photovoltaic, PV, systems, the maximum power, P_{max}, point tracking, MPPT, of solar cells is an important strategy of solar energy harvesting. Tracking voltage at the maximum power, $V_{P_{max}}$, via algebra method is the most effective strategy. For this purpose, a novel algorithm in form of general saturation function is derived from differential equation in form of decay rate that is illustrated to depict different kinds of current-voltage, I-V, among solar cells. Methodology appellations here is iterative nonlinear regression analysis and it is regarded as an approach to get the result of least squares estimates considering the constants working together to define the theoretical response of I to V. Graphs consequently showed exact prediction, and responses which can be observed experimentally. Indeed, $V_{P_{max}}$ can be easily calculated using equation with root function. The best parameters in saturation function are also generated from the approach mentioned above. It is suggested that this model can be used to evaluate solar cells requirements and to access the effects of irradiance and temperature on solar cells. We can tell from the outcome that all of the approaches applied are effective in estimating a concentrator's corresponding I–V curve, whose average relative error range from 1.75% to 4.93%, the correlation coefficient is 0.992 at least.

Keywords: Solar cells,Current-voltage, Explicit, Predict.

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1 Introduction

In order to accurately assess the electrical characteristics of a PV system, their output current, I, to output voltage, V, index is often assessed because the electrical performances of solar cells may be reflected by their I-V and capacitance-voltage [1-5]. Solar cells are essentially a very large p-n junction so that the correlation regarding current and voltage is nonlinear [6-11]. Only a little information can be provided via experimental results from solar cells in terms of its I-V, mathematical model for I-V of solar cells is a sufficient method to assess the important parameters of the solar cells such as open circuit voltage, V_{oc}, short circuit current, I_{sc}, fill factor, FF, and efficiency, even though it is not enough to know the detailed parameters inside the cell.