

# ENHANCING ALL DAY EFFICIENCY THROUGH HYBRID OPTIMIZED POWER POINT TRACKING SYSTEM TO PHOTOVOLTAIC ARRAY

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**ABSTRACT:** *This thesis presents a novel technique to determine the peak power point based on observes of the open circuit voltage of the photovoltaic cells, and a nonlinear expression for the optimum functioning voltage is established based on this open circuit voltage. The methodology is thus a mixture of the nonlinear and enhanced Hybrid power point tracking algorithm. The simulation and experimental consequences show that the method develops clearly the tracing efficiency of the extreme power obtainable at the production of the photovoltaic array. The new technique decreases the fluctuations around the peak power point, and raises the average efficiency of the maximum power point tracking attained. The novel maximum power tracking technique will provide additional power to energy storage.*

**Key Area:** PV Cell, HPPT, MATLAB Simulink, Solar Cell, PV array

## I. INTRODUCTION

### 1.1 Photovoltaic

Photovoltaic's (PV) is the name of a method of converting solar energy into direct current electricity using semiconducting materials that exhibit the photovoltaic effect, a phenomenon commonly studied in physics, photochemistry and electrochemistry. A photovoltaic system employs solar panels composed of a number of solar cells to supply usable solar power. The process is both physical and chemical in nature, as the first step involves the photoelectric effect from which a second electrochemical process take place involving crystallized atoms being ionized in a series, generating an electric current. Power generation from solar PV has long been seen as a clean sustainable energy technology which draws upon the planet's most plentiful and widely distributed renewable energy source the sun.

### 1.2 Current development

For best performance, terrestrial PV systems aim to maximize the time they face the sun. Solar trackers achieve this by moving PV panels to follow the sun. The increase can be by as much as 20% in winter and by as much as 50% in summer. Static mounted systems can be optimized by analysis of the sun path. as with other semiconductor devices, temperatures above room temperature reduce the performance of photovoltaic.

### 1.3 Efficiency of PV cell

Although it is important to have an efficient solar cell, it is not necessarily the efficient solar cell that consumers will use. It is important to have efficient solar cells that are the

best value for the money. Efficiency of pv cells can be measured by calculating how much they can convert sunlight into usable energy for human consumption. Maximum efficiency of a solar photovoltaic cell is given by the following equation.

(Maximum efficiency)=  $\frac{P}{(E(S)(\text{incident radiation flux}) * A(c)(\text{Area of collector}))}$

If the area provided is limited, efficiency of the PV cell is important to achieve the desired power output over a limited area. The most efficient solar cell so far is a multi-junction concentrator solar cell with an efficiency of 43.5% produced by Solar Junction in April 2011. The highest efficiencies achieved without concentration include Sharp Corporation at 35.8% using a proprietary triple-junction manufacturing technology in 2009, and Boeing Spectrolab (40.7% also using a triple-layer design). The US Company Sun Power produces cells that have an energy conversion ratio of 19.5%, well above the market average of 12–18%.

## II. LITERATURE SURVEY

**Guillermo Velasco-Quesada, Francisco Guinjoan** proposed a dynamical electrical array reconfiguration (EAR) strategy on the photovoltaic (PV) generator of a grid-connected PV system based on a plant-oriented configuration, in order to improve its energy production when the operating conditions of the solar panels are different.

**Jonathan Storey, Peter Wilson** proposes an improved strategy for the optimization of dynamic photovoltaic arrays (DPVA) utilizing the 'irradiance equalization' reconfiguration strategy. This type of reconfigurable array is already very robust as it amalgamates the flexibility of dynamic reconfiguration with the averaging ability of Total Cross Tied (TCT) array architecture.

**Vijayalekshmy S, Bindu G R, and S Rama Iyer** proposed the various losses due to partial shading on different photovoltaic array configurations under moving non-uniform illumination conditions (passing cloud). Each solar array is composed of modules which are interconnected in series and parallel. Bypass diodes are also modelled to avoid hotspot conditions in a photovoltaic module.

**SaravananKaliyaperumal, SharmeelaChenniyappan** proposed Energy demand increases day by day. Role of Renewable power sources unavoidable, because of depletion of fossil fuels. Solar energy is promising source among the other renewable resources. Renewable energy is eco-friendly

as it is available free of cost and clean and green. In PV module cells converts the photons of the insolation into electricity.

**Paula dos Santos Vicente, Tales CleberPimenta, and Enio Roberto Ribeiro** proposed a dynamic reconfiguration method for electrical connections in a Series-Parallel connected photovoltaic array under partial shading conditions. It is desirable to extract the maximum energy from the array, but it does not occur in situations where the modules have different points of operation caused by shading. The proposed method is then characterized by the maintenance of the PV array dimensions, that is; no module is removed or added to the array.

### III. EARLIER WORK

A novel method to forecast existing PV array production in diverse environmental conditions. In this approach, field measurement data is used to identify module parameters once and for all. The proposed method simulates PV arrays with adaptable module interconnection schemes in order to reduce mismatch losses. The model has been validated by experimental results taken on a 2.2 kWp plant, with three different interconnection schemes, which show reliable power production forecast precision in both partially shaded and normal operating conditions. Field measurements show interest in using alternative plant configurations in PV systems for decreasing module mismatch losses.

### IV. PROPOSED WORK

In this thesis, PV array output voltage has been optimized by increasing the HPPT algorithm performance. A new hybrid fuzzy-neural HPPT controller is proposed. Training data in neural network are optimized by genetic algorithm. The proposed controller is simulated and studied using MATLAB software. The obtained results show superior capability of the suggested method in HMPP tracking under rapid fluctuation of atmospheric conditions and converter load throughout all day.

### V. CONCLUSION & FUTURE WORK

In furthestmost of the maximum peak power point tracking approaches described presently in the literature, the finest function point of the photovoltaic schemes is assessed by linear calculations. Nevertheless these estimates can lead to less than optimum functioning conditions and henceforth decrease significantly the performances of the photovoltaic scheme.

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