

“A Hybrid MPPT Technique for Partially Shaded Photovoltaic Arrays”

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Abstract - Photovoltaic panels are the most important green energy source because of their inexhaustible moreover its clean. It is important to connect the PV panels to the maximum power point tracking (MPPT) controller to optimize its output power. The PV panels output power efficiency is related to the rapidly variation of the incident irradiance moreover the partial shading pattern. The variation of the incident irradiance and the partial shading pattern makes the tracking of the global maximum peak (GMP) through the local ones too difficult, which extremely decrease the efficiency of the PV panels. The problem is the GMP value varies as the sun irradiance varies so; the detection of the GMP needs an efficient and fast algorithm which cannot be done by the traditional MPPT. In order to solve the problem, proposed system a hybrid new algorithm can combine a traditional MPPT algorithm, such as perturb and observe, or incremental conductance, with the ANN (artificial neural network) This new algorithm can combine a traditional MPPT algorithm, the proposed hybrid MPPT algorithm is based on the ANN and used to predict the global MPP region by estimating its voltage boundaries. Consequently, the conventional MPPT algorithm searches for the MPP in the predicted region. The proposed technique is modeled and simulated using MATLAB/Simulink.

Key Words: PV, MPPT, GMP, ANN, MATLAB/Simulink.

1. INTRODUCTION

Fossil fuels are non-renewable, limited in supply and environment polluting. Fossil fuels are the cause of global warming and climate change. The interest for alternative energy sources are increased to reduce our dependence on the primary energy supplies like fossil fuels as they are costly and deficient. Production of energy from alternative energy sources like solar, wind and moving water is required to fulfill the future energy demands of the society and to improve the energy security. The solar energy is most preferable as it provides clean green energy. The solar panels produce solar energy for free and have less maintenance cost. The solar electricity can be used for household appliances or sold renewable energy back to the National Grid. The Photovoltaic (PV) system converts solar energy into electricity. The number of series and parallel PV modules are connected together to form PV array. The current-voltage and power-voltage characteristics of PV system are highly non-linear. The peak point of the power-voltage characteristic is called as maximum power point (MPP). The PV should operate at MPP to maximize the utilization of the PV system. A controller is required to track the MPP and the technique is known as Maximum power point tracking (MPPT). The MPP controller has to be connected in between the PV array and boost

converter. When some part of the PV array is not fully illuminated the situation is known as partially shaded condition. The solar illumination in shaded condition is obstructed by trees, houses, buildings etc. The characteristics curve has only one peak for normal irradiance but contains multiple peaks in case of shading condition which makes the situation complicated. From the multiple peaks one is global peak and others are local peak. Different types of MPPT techniques have been proposed till date. Some commonly used MPPT techniques are Perturb and observe (P&O) method, Hill climbing method (HC), and Incremental conductance method (INC). The proposed hybrid MPPT algorithm is based on the ANN and used to predict the global MPP region by estimating its voltage boundaries. Consequently, the conventional MPPT algorithm searches for the MPP in the predicted region. The proposed technique is modeled and simulated using MATLAB/Simulink. The results will be shown effectiveness of the proposed hybrid MPPT technique to track the global MPP accurately with a rapid response. This increases the output power level of the PV array under various shading patterns.

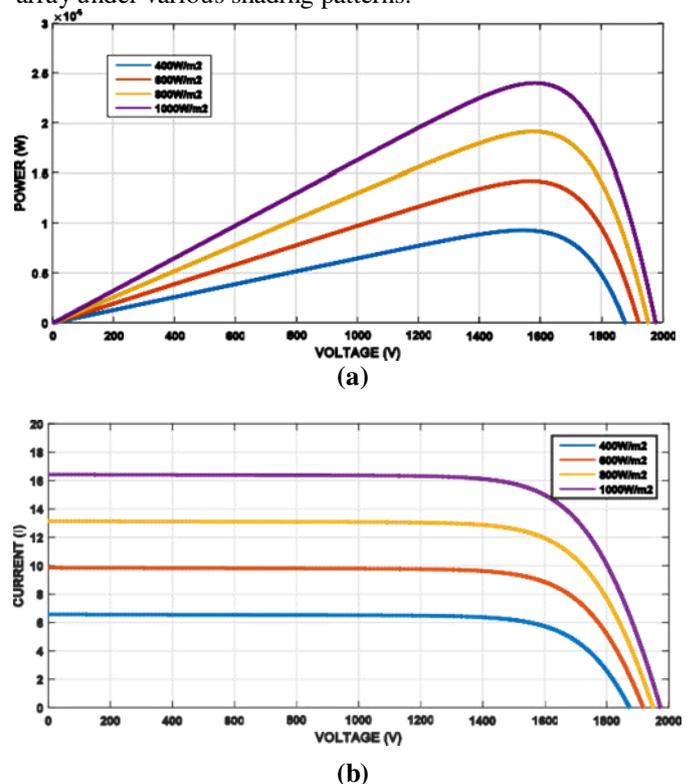


Fig. Photovoltaic array characteristics:-(a) Power-voltage curve. (b) Power-current curve.

2. Body of Paper

Design and simulation of A Hybrid Maximum Power Point Tracking Technique for Partially Shaded condition to improve for efficiency of PV system Photovoltaic Arrays using MATLAB software.

1. Main objective of project to predict the global MPP region by estimating its voltage boundaries.
2. To Increase efficiency of PV panel.
3. To increase power output of PV system.

Project Methodology

The proposed work is planned to be carried out in the following manner:-

1. Study of basic concepts of Partially shaded PV system.
2. Finding the problems from conventional system by surveying literature.
3. Design the grid tied PV system.
4. Design and study of Boost converter.
5. To design Hybrid Maximum Power Point Tracking Technique.
6. Analysis of the proposed topology
7. Study of the control strategies of system.
8. Design and Implementing a Hybrid Maximum Power Point Tracking Technique for Partially Shaded Photovoltaic Arrays.
9. Simulation of the model can be done in MATLAB software.

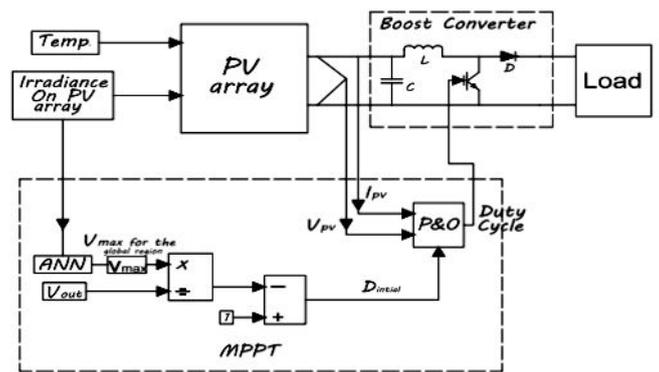


Fig.1 Schematic diagram of the photovoltaic system using the proposed hybrid maximum power point tracking method.

Charts:

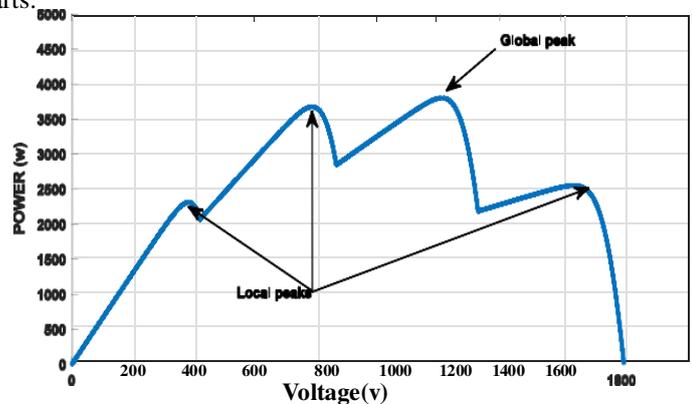


fig. 4. Photovoltaic array characteristics under the partial shading

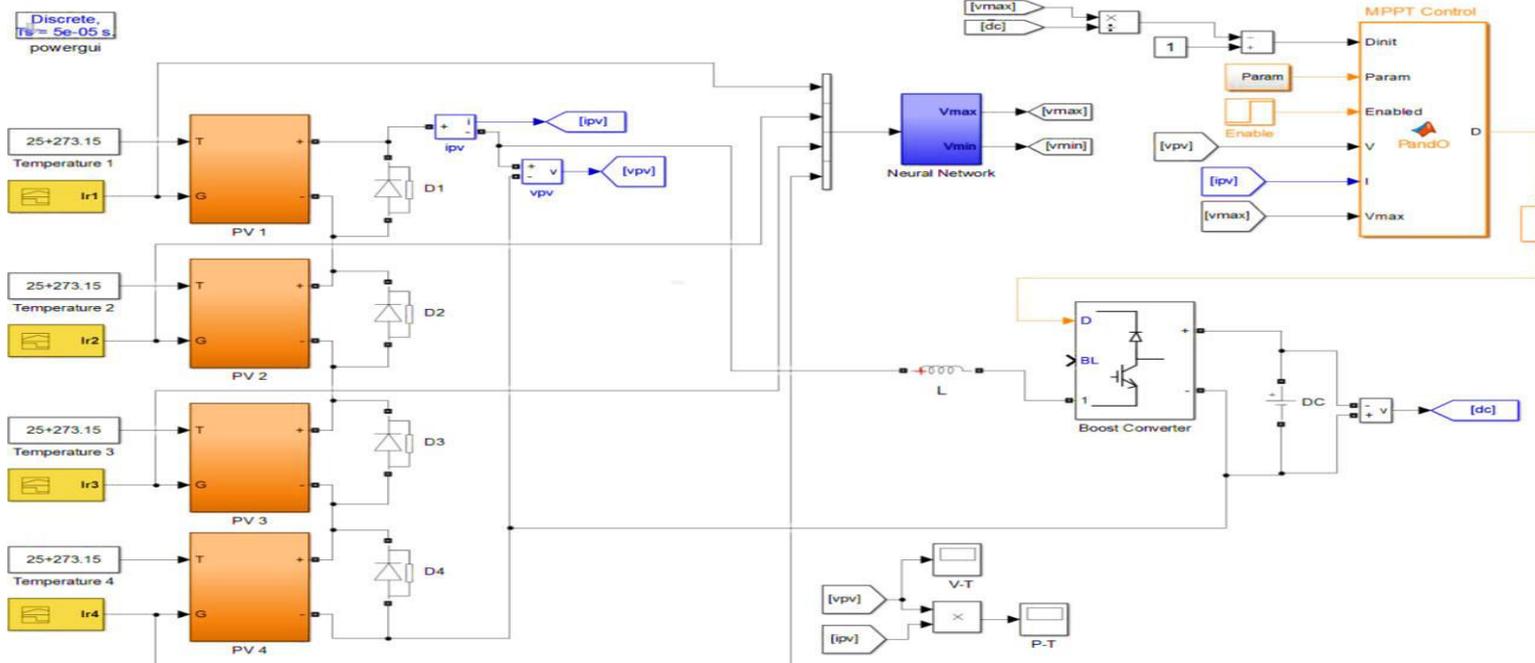


Fig. MATLAB/Simulink model of the proposed system.

Proposed system introduces a new concept as mentioned above, a power electronics converter is essential to connect PV arrays to the grid or load, as well as to execute the MPPT algorithm. There are different types of the DC/DC converters that can be utilized to carry out MPPT.

3. CONCLUSIONS

There are various types of conventional algorithms that can be used to track the MPP, such as P&O and IC. However, these algorithms may fail to track the MPP under PSCs, and they may become trapped at a local peak. This paper presents an efficient hybrid algorithm for PV systems working under PSCs. A simplified ANN was proposed to obtain the region for the global MPP of the PV characteristics by estimating its boundary voltages, which varied with changes in the shading pattern on the PV array. After finding this region, a conventional method—namely P&O—was used to locate the MPP in the estimated region by adjusting the duty cycle of the boost converter. The results demonstrated the adequacy of the suggested hybrid MPPT technique in tracking the global MPP of the PV array with different partial SPs and under both steady-state and dynamic conditions.

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BIOGRAPHIES



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