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Novel Hybrid MPPT Technique for Partially Shaded Photovoltaic Arrays-A review

Sumit Gavhale[1] and Vaishali Malekar[2]
Students, Department of Electrical Engineering[1]
Assistant Professor Department of Electrical Engineering[2]
Abha Gaikwad College of Engineering and Technology, Nagpur, India

Abstract: *This paper introduces a Review on hybrid MPPT control for photovoltaic (PV) arrays working under partial shading conditions. In This new algorithm will combine a traditional MPPT algorithm, such as perturb and observe, with the artificial neural network (ANN) technique. 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. This technique increases the output power level of the PV array under various shading patterns. The proposed technique is modelled and simulated using MATLAB/Simulink.*

Keywords: Hybrid MPPT, ANN , P&O

I. 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 powervoltage 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 [3], Hill climbing method (HC) [4], and Incremental conductance method (INC) [5]. Perturbation in PV voltage and current is used in P&O method periodically to calculate PV output power at any instant which will be compared with the previously calculated power. If there is increase in PV power due to the perturbation then the direction of the perturbation is maintained till the MPP has reached. HC method is similar as the P&O method except the perturbation here is taken in the duty cycle. But the above methods are erroneous in partially shaded condition as steady state oscillations around 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 ill be show the 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

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II. EXISTING SYSTEM

Exiting system with conventional algorithms is the most versatile device. 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 Perturbation in PV voltage and current is used in P&O method periodically to calculate PV output power at any instant which will be compared with the previously calculated power. If there is increase in PV power due to the perturbation then the direction of the perturbation is maintained till the MPP has reached. But the above methods are erroneous in partially shaded condition as steady state oscillations around MPP are present. In Fig.1 a block diagram of the PV system is shown where the MPPT controller generates the reference voltage which is given to the control unit to generate duty cycle for the boost converter [1-2].

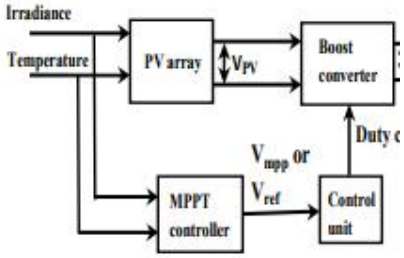

Fig. 1. Block diagram of PV system with boost converter

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

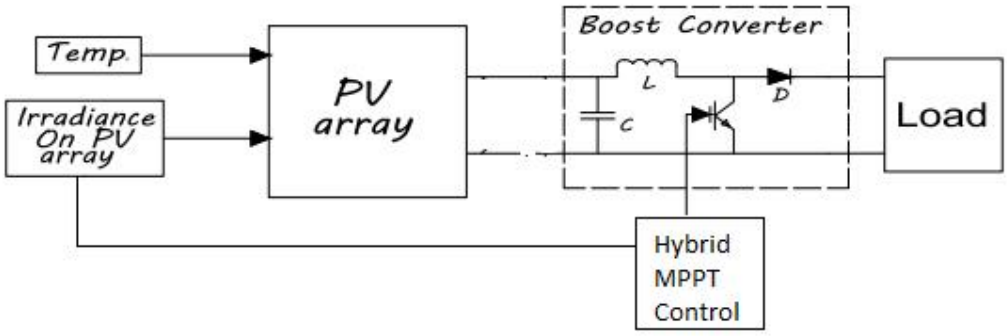

Fig:2 Circuit Diagram of Proposed System

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Table 1- Parameter of system

Sr. no	Parameter	Value
1	Pmax	200
2	Number of cell in each module	54
3	Voc	39.2
4	Vmp optimal voltage	26.3
5	Isc	8.21
6	Imp	7.61

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3.1 Research Objectives

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

3.2 Expected Conclusion

The work will presents a new high efficiency transformer-less inverter for grid tied PV systems. The key benefits of this research work in brief as:

1. Proposed converter will the overall efficiency.
2. By keeping common mode voltage fixed at center point of bus DC voltage due to this less leakage current will flow through the network than H6 topology.
3. The illustrated work, which minimizes THD at output side, does not require PWM dead time.
4. Bridge legs.

3.3 Control Strategy

The main idea of the proposed MPPT technique is to identify the global MPP region and recognize its minimum and maximum voltages using an AI technique. Consequently, one of the conventional MPPT methods, such as P&O or IC is utilized in this region to obtain the reference voltage, Vref [9]. In order to accomplish the above proposed technique, the ANN technique is employed to recognize the region owing the global peak. In addition, the P&O technique is utilized to allocate the optimal operating voltage inside the recognized region by controlling the duty cycle of the boast converter, as shown in Fig. 8. Large datasets are needed to train the neural network. To generate these datasets, the PV array is modelled and simulated in the MATLAB/Simulink environment under various shading conditions The outputs of the ANN are the minimum and maximum voltages for the region with the global peak. The output signal from the ANN is used as an input for the next step. The next step is based on utilizing the P&O MPPT technique in the region bounded by the minimum and maximum voltages recognized by the ANN. This action guarantees reaching the global MPP and avoiding operation at local MPPs.

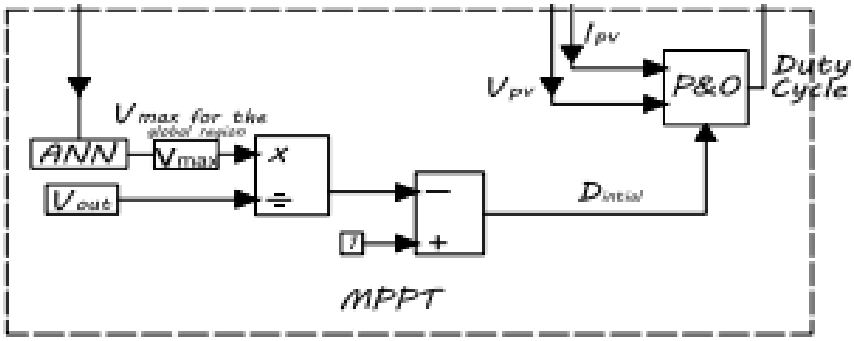

Figure 3: Hybrid MPPT control (P&O and ANN) for converter

3.4 Advantages of Proposed Work

Hybrid MPPT for Partial shading having following advantages

1. Achieving high efficiency
2. Economical Low cost
3. Low conduction Loss.
4. 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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