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High Performance P&O Based Lock-on Mechanism MPPT Algorithm with Smooth Tracking

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ABSTRACT: This paper says that the high performance Perturbation&Observation based Lock-On Mechanism MPPT algorithm used to remove the steady state oscillations that are meeting in conventional P&O algorithms. The purpose of the Lock On Mechanism algorithm is to scale the size of the perturbation, the control parameter suitable to based on whether or not the maximum power point (MPP) has been placed. Fundamentally, the LOM component is forced on the reference input voltage and thus the P&O-LOM algorithm is introduced. Indeed, a separate controller involving a simple PI controller is then used to drive the circuit dynamics to achieve the desired reference. To verify the functionality of the proposed P&O-LOM algorithm, a Simulink simulation and an experiment involving the non-inverting Buck-Boost converter is conducted. By comparing the performance of the P&O-LOM algorithm to the conventional P&O algorithm and the hill climbing LOM algorithm. It shows that, the P&O-LOM algorithm can eliminate steady state errors and is also very strong to noise effects.

KEYWORDS: Renewable energy, Boost converter, multilevel inverter, PWM, MOSFET, Personal Computer.

I.INTRODUCTION

Maximum power point tracking operation is compulsory for grid-connected PV systems in order to maximize the energy yield. Serving for more Photovoltaic installations requires advancing the power control schemes as well as the regulations in order to avoid adverse impacts from Photovoltaic systems like power grid overloading. The PV system is operated in the MPPT mode, when the PV output power Ppv is below the setting-point Limit. However, when the output power reaches P_{limit}, the output power of the PV system will be kept constant, i.e., Ppv = Limit, and leading to a constant active power injection. These forms have the disadvantage that MPP is usually not accurately located and that the tracker will continuously oscillate between two power levels. while it is possible to reduce the oscillations size, it also sacrifice the increased transient response time. These drawbacks overcome by the researchers have developed Maximum power point tracking algorithms which involve variable step sizes. The P&O based lock on mechanism MPPT can eliminate steady state errors is also robust to noise effects. It is used to eliminate the commonly known steady state oscillations that are encountered in conventional P&O algorithms. The purpose of the LOM algorithm is to scale the perturbation size of the control parameter.

II.PROPOSED CONFIGURATION MODEL

Maximum power point tracking (MPPT) has become a fundamentally important technique for maximizing the efficiencies of DC renewable energy sources such as but not limited to solar panels. Various types of MPPT algorithms have been developed and there are numerous literature reviews on this matter Examples of MPPT algorithms that were mentioned in these reviews include the perturb and observe (P&O) algorithm, the hill climbing (HC) algorithm, fractional short circuit current and open circuit voltage methods. Amongst the various available MPPT algorithms, the P&O and HC algorithms have attracted the most attention and this is primarily attributed to their simplicity. While it is

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possible to reduce the control parameter perturbation size to reduce the size of the oscillations, this will also come at the sacrifice of an increased transient response time.

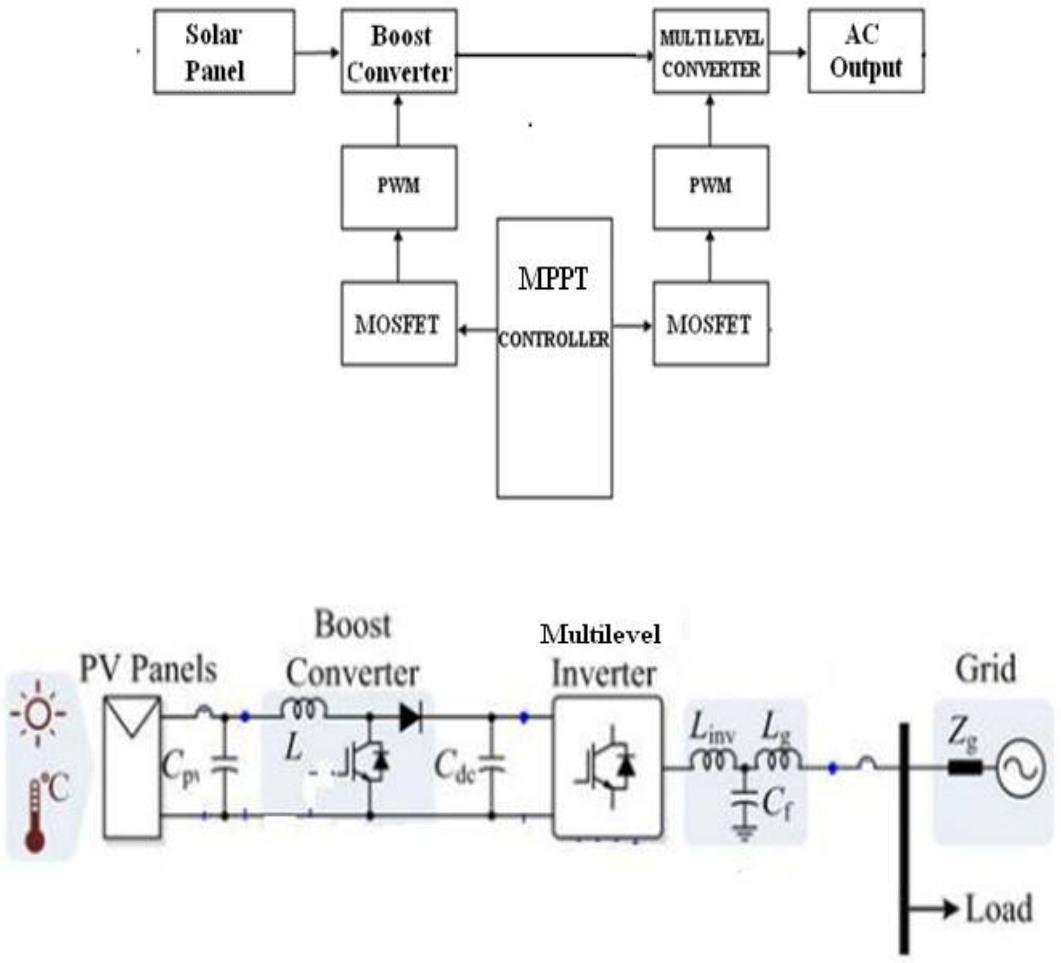

Fig.1 Schematic diagram of proposed model

III.PV PANEL

A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel is used as a component in a larger photovoltaic system to offer electricity for commercial and residential applications. Because a single solar panel can only produce a limited amount of power, many installations contain several panels.

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Crystalline silicon, which is commonly used in the wafer form in photovoltaic (PV) modules, is derived from silicon, a commonly used semi-conductor. Connected electrically to one another and to the rest of the system protected from mechanical damage during manufacture, transport, installation and use (in particular against hail impact, wind and snow loads). This is especially important for wafer-based silicon cells which are brittle.

IV.MULTILEVEL INVERTER

An inverter is an electrical device that converts direct current to alternating current. The converted AC can be at any required voltage and frequency with the use of appropriate transformers, Switching and control circuits.

Static inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries.The electrical inverter is a high-power electronic oscillator. It is so named because early mechanical AC to DC converters were made to work in reverse, and thus were "inverted", to convert DC to AC.

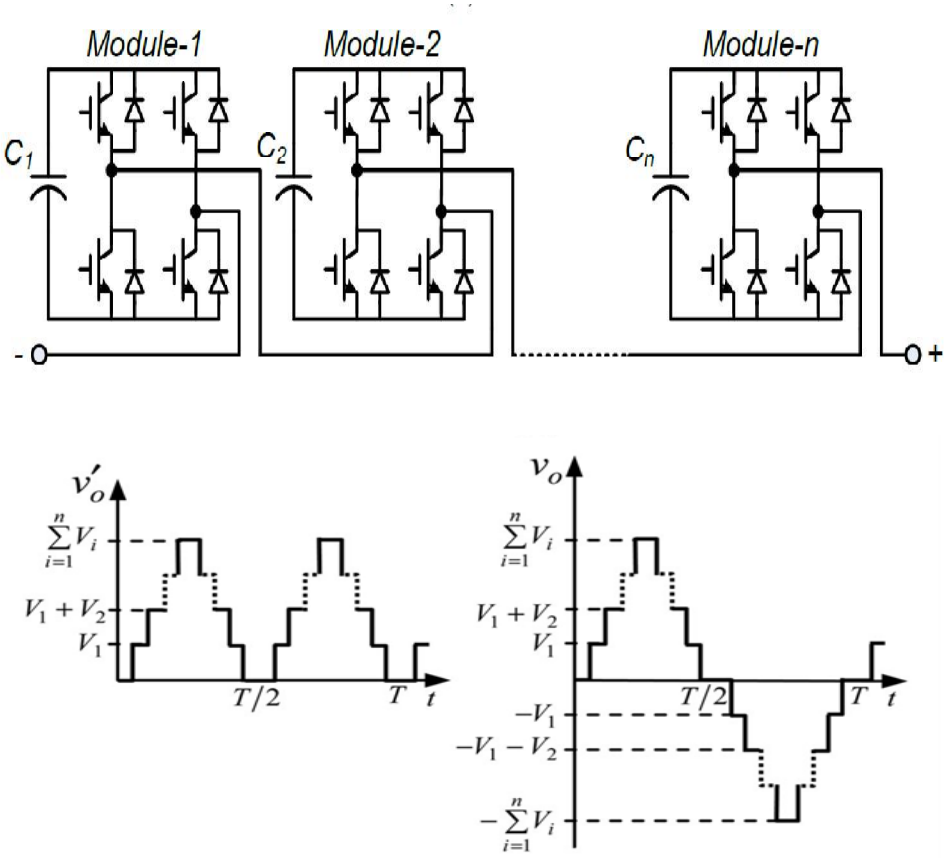

Fig.2 Multilevel inverter

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V.MATLAB/SIMULATION RESULITS

MATLAB is a multiparadigm numerical computing environment. Simulink is a graphical extension to MATLAB for modelling and simulation of system. These are collections of m-files that have been developed for specialized applications. There is also a specialized application of Simulink, which is useful in modular construction and real time simulation of dynamical systems .The AC input voltage is first filtered. Then the output of the isolated converter is fed to the multiple winding transformer, the multiple output is rectified and filtered into four levels of voltage i.e.,+12V,+5V,+3.3V and -12V.

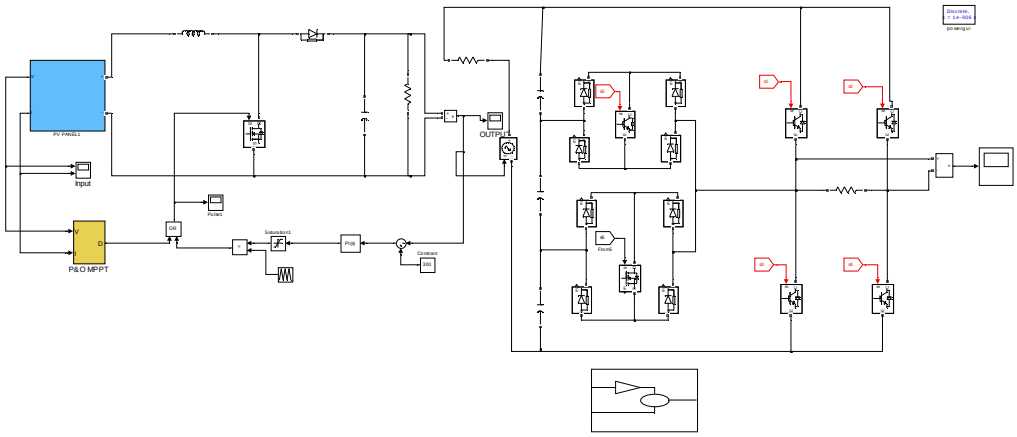

Fig.3 Matlab/simulation of PV output

SIMULATION OUTPUTS

PV voltage and current

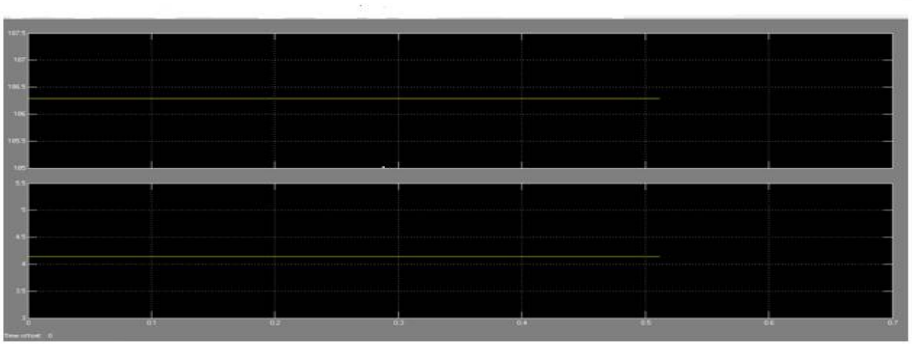

Fig.4 simulation waveform of PV output voltage and current

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Converter output voltage (DC-DC)

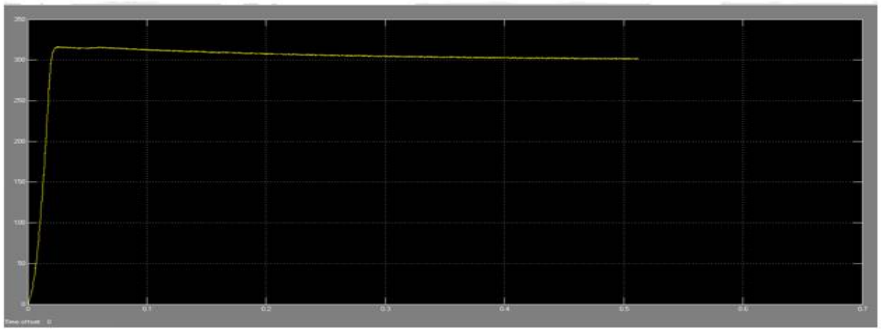

Fig.5 converter output

Ac output

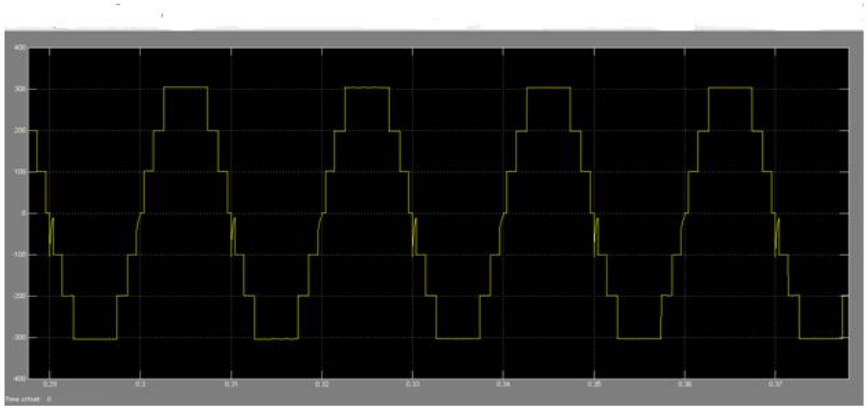

Fig.6 simulation waveform of AC output voltage

VI.CONCLUSION

A high-performance active power control scheme by limiting the maximum feed-in power of PV systems has been proposed in this letter. The proposed solution can ensure a stable constant power generation operation. Compared to the traditional methods, the proposed control strategy forces the PV systems to operate at the left side of the maximum power point, and thus it can achieve a stable operation as well as smooth transitions. Experiments have verified the effectiveness of the proposed control solution in terms of reduced overshoots, minimized power losses, and fast dynamics. Notably, for single-stage PV systems, the same CPG concept is also applicable. However, in that case, the PV voltage operating range is limited and minor changes in the algorithms are necessary to ensure a stable operation.

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