NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT]
ISSN: 2394-3696
VOLUME 3, ISSUE 12, Dec.-2016

A CRITICAL REVIEW- PHOTOVOLTAIC MAXIMUM POWER POINT TRACKING CONTROL SYSTEM USING P&O TECHNIQUE

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ABSTRACT
Maximum point tracking system, is used in photovoltaic system for the maximizing output for the PV array, irrespective of the temperature radiation and the environmental conditions or electrical load characteristics. This paper is a critical review of different implemented techniques for MPPT using fuzzy and perturbation and observation (P & O). Various techniques have been implemented for maximizing output of PV array. One of the new and very effective technique is can be implemented by using the algorithms based on PIC controller and tracking and maximizing effectiveness of the system. In some of the papers its been found that the implementation of perturbation and observation in conjunction of the incremental conductance is been used and its gaining popularity day by day.

KEYWORDS: Maximum power point tracking (MPPT), Perturbation and observation (P & O), PV array etc.

INTRODUCTION
PV systems are gaining popularity day by day for various household applications and electrical power generation. As it is clean source of energy and available free of cost. But researchers are facing problem areas of high fabrication cost and low conversion efficiency of the solar systems. If this problem gets solved we will have pollution free electricity and most of the area in India and across the globe will have solar panel for every application. Another problem researchers are dealing with that is PV energy is much more costly than the energy from the state electricity board or the utility grid. To overcome the conversion efficiency of the solar system researcher are approaching the same system in a different way for the maximizing efficiency, which is termed as a Maximum Power Point Tracking (MPPT) system. For these researchers are looking at different perspectives of the modern techniques like fuzzy control system, P & O algorithms and various other modern control system techniques.

BASIL M. HAMED, MOHAMMED S. EL-MOGHANY
Every PV cell has operating point which has designed for giving maximum power. And to get that maximum power from solar cell we must install maximum power point controller (MPPT) needs to install for improvement of conversion efficiency. In this paper MPPT controller has been installed with FPGA for controlling ON/OFFF time of MOSFET switch of a buck converter. Author has implemented system by using MATLAB/ SIMULINK using

GUI interface. Now a day's photo voltaic systems are expanding rapidly and will be the biggest contributor in electricity generation across the globe. As day by day semiconductor cost is reducing, it will also reduce the cost of PV cell and it will become user friendly very soon. There are few major approaches for maximizing power conversion from solar efficiency to be list, sun tracking or maximum power point tracking. But for implementing the MPPT intelligent controllers are required such as fuzzy logic controller, conventional controller and PID controller.

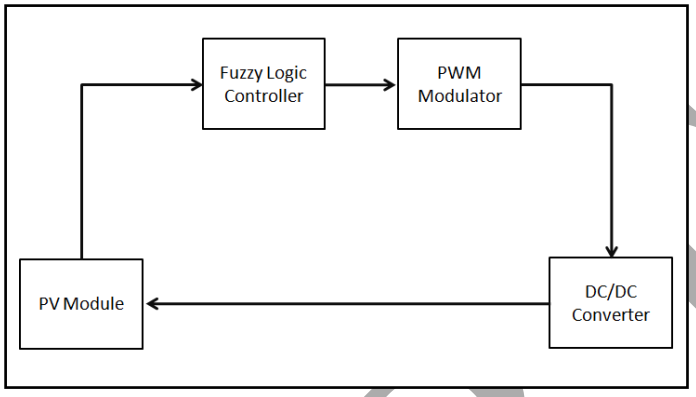

Fig. 1. Block diagram of implemented system.

In this paper fuzzy controller is used and rules are decided by the fuzzy sets, in fuzzy sets linguistic rules are used for getting MPPT. Linguistic variable possesses an advantage of fast processing, another major advantage of implementing fuzzy logic is, it doesn't require any mathematical model for implementing the system. In this paper implemented MPPT uses an fuzzy control and it is made by fuzzy control by using FPGA card (Spartan-3AN, Xilinx Company, 2009) for improving the energy generation efficiency of the solar cells. The implemented method MPPT uses an fuzzy logic controller and by using DC-DC converter for keeping the maximum output of PV cell. This system is simulated using MATLAB and results and compared with perturbation and observation method of the same system. Its been found from the comparison that fuzzy logic controller is better than response and don't need of knowing any values related to PV panel. The information required as a input to fuzzy controller is only generated power, and hence hardware becomes simple and also it is cost effective.

MITULKUMAR R. DAVE, K.C.DAVE

In this paper author explained about the boost converter and control algorithm for reduction harmonics for improving the efficiency of the boost converter there are various methods for improving the functionality of the boost converter. As there are various methods available for controlling the output, author has considered a PI controller for maximizing the efficiency. PI controller used in a voltage mode control path. In this paper discussion on the boost converter also the transfer function of the boost converter has been given in a great detail. The most important thing in this paper is zeigler-nichols method and loop sharing method is used for finding the PI controller values. According to the author and survey in most of the countries have adopted generation, transmission and distribution of the electrical power in AC. However most of the system now a day uses a DC supply as it more convenient and requires lower power. For converting AC to DC we all need semiconductor or power electronic devices for carrying out rectification process. Moreover, sometimes it becomes essential to increase the DC voltage level, for such kind of application boost converter is used. For

obtaining more voltage output level than input we need to keep constant adjustment of the amount of energy absorbed from the source and that is injected in to the load.
In this paper for the simulation purpose following systems parameters were used
Input Voltage (ac) : 24 volt
Output Voltage (dc) : 48 volt
Boost Inductor (L) : 100 mH
Rated Power : 16 W
Switching Frequency : 1 kHz
In general case, duty cycle for boost converter is considered as between 0.5 to 1. While selecting the duty cycle for operation the supply voltage and output voltage is been considered. While using an boost converter without PI controller it will give steady state error of 25%. To reduce steady state error author has used the boost converter. And for finding the proportional gain and integral gain zeiglar – Nicholas and loop sharing methods are used. The major conclusion can be drawn from this paper are

1. Boost converter without PI controller, produces a steady state error of 25%.
2. Once we apply a ziegler – nicholos method nullifiessteady state error after 2.5sec , but it gives high rise in oscillation that is 9 times more than predecessor, making it undesirable for operation.
3. Using loop sharing method we cal nullify steady state error also it won't produce any oscillation or damping in the system.

Author has made an conclusion, for finding proportional and integral gain usage of loop sharing method is more suitable for proposed system in this paper.

T.CHAITANYA, CH. SAIBABU, J. SURYA KUMARI

The renewable energy will have greater importance on a part of new generations. PV systems produce DC electricity which uses an sunlight. As the sunlight falls on the PV array light energy converted into the electrical energy, PV array requires less maintenance and absolutely no noise system. In this modern world electricity demand is increasing at a high rate. No researchers have started focusing on the renewable energy sources as it will help in global warming effect as it doesn't harm the environment. A DC-DC converter which is capable of MPPT is used while implementing the system stated here. Photovoltaic systems will give maximum power if we use MPPT. The validity of the photo voltaic module with per tube & Observe method allows better performance of MPPT due to variation of both power and voltage. In this paper work is implemented in MATLAB/SIMULINK environment.

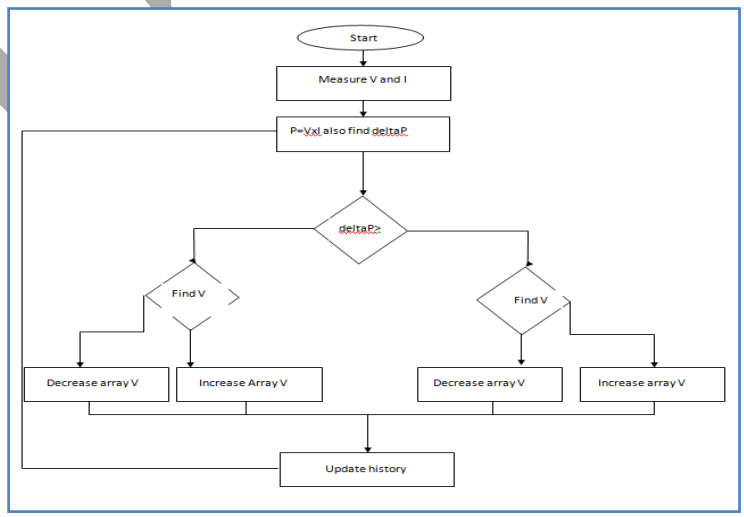

Fig. 2. Flow chart of the implemented algorithm

In this paper implemented a method based on a perturbation and observation for maximum point power tracking algorithm with a DC-DC boost converter. The mathematical modeling of PV array is discussed and the implementation of the MPPT algorithm is accomplished and explained in lucid manner in this paper. The P-V and V-I curves obtained from the simulation of the PV array designed in MATLAB environment explains its dependence on the temperature and irradiation levels. Thus, the Photovoltaic system works most of time with maximum efficiency.

UMASHANKAR PATEL, MS. DHANESHWARI SAHU, DEEPKIRAN TIRKEY:
When compared with traditional energy sources, PV system uses solar energy for production of electricity as it is freely available all over the globe. Renewable energy sources has a great potential and developing and at a very rapid rate for uses of solar power. In today's modern world, researchers have found the methods for connecting PV systems with utility grid. But major problem with PV systems are they are dependent on the atmospheric conditions (e.g. solar irradiations, weather season and temperature). To overcome these limitations researchers are working and they found out an MPPT method, which will give maximum output from PV system. Diagram shown in fig. 3. Gives an outlook of the PV system operation with MPPT.

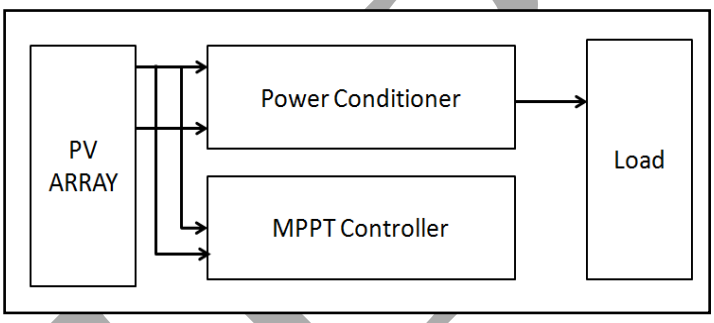

Fig.3. PV arrays with MPPT Controller

For maximizing the output from the PV arrays, continuous tracking for implementation of MPPT is very much necessary. In this paper author has compared implemented boost converter and compared it with various algorithms.

VARIOUS MPPT ALGORITHMS DISCUSSED IN THIS PAPER

1. Hill-climbing techniques
2. Perturb and Observe
3. Incremental conductance
4. Fuzzy logic
5. Neural Network
6. Fractional open circuit voltage
7. Fractional short circuit current

Author has implemented perturb and observe method for MPPT improvement. The reason behind choosing this method is, it will solve the problem of hill climbing from those caused by irradiance changing by decoupling the PV power fluctuations. In this method addition of irradiance-changing estimate process in every perturb process for measurement of amount of power change caused by atmospheric conditions are possible and it will get adjusted in perturb process.

CONCLUSION

Various different methods are discussed in this paper related to maximizing output of solar PV cell. For maximizing the conversion effiviency of solar panel source impedance must match to load impedance. This matching or equivalence can be brought by changing the system parameter. As it is a continous process various different algorithms are used for getting maximum power output of PV array. From above four discussed method author concludes that, although perturb and observe method is little bulky but it gives maximum output with less ripple.

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