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Fuzzy Logic MPPT Techniques in Solar Photovoltaic System

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Abstract: ***This paper presents the comparative analysis of most commonly used Maximum Power Point Tracking (MPPT) techniques viz Open Circuit Voltage (OCV), Perturb and Observe (PnO) and Incremental Conductance (INC) methods that are capable of extracting maximum power from the PV generation system. The OCV technique is an indirect MPPT method that tracks the Maximum Power Point (MPP) using empirical data or mathematical expressions with numerical corrections and approximations. To operate PV panels at that point (MPP) there are many MPPT method in literature, FLC MPPT method was preferred in this study because, its rapid response to changing environmental conditions and not affecting by change of circuit parameters. The accuracy of FLC MPPT method used in this system to find MPP changes, from 94.8% to 99.4%. To charge a battery there are two traditional methods which are constant current (CC), and constant voltage (CV) methods. For fast charging with low loss constant current and voltage source is a need. One of the methods providing constant is PI control which used in this study.***

Keywords: FLC (Fuzzy Logic Controller), CV, CC, Simulink, MPPT

I. INTRODUCTION

Greatest Power Point Tracking (MPPT) strategies are utilized in photovoltaic (PV) frameworks to ceaselessly expand the PV cluster yield control which by and large relies upon sunlight based radiation and cell temperature. MPPT techniques can be generally ordered into two classes: there are traditional strategies, similar to the Perturbation and Observation (P&O) strategy and the Incremental Conductance (IncCond) technique and propelled strategies, for example, fluffy rationale (FL) based MPPT technique. This paper exhibits an overview of these techniques so as to examine, mimic, and assess a PV power supply framework under differing meteorological conditions. Recreation results, got utilizing MATLAB/Simulink, demonstrate that static and dynamic exhibitions of fluffy MPPT controller are superior to those of regular strategies based controller. The use of vitality is expanding step by step and it is for the most part provided by customary wellsprings of vitality. The customary sources are constrained and will be depleted when, so they are ending up increasingly costly and furthermore an explanation behind an Earth-wide temperature boost. This is the principle motivation to development the distinctive innovation dependent on non traditional wellsprings of vitality. Sun oriented is consistently enduring, clean vitality sources, no potential harm to natural. It very well may change over sun based type of vitality to electrical structure straightforwardly with photovoltaic (PV) cell. Various kinds of association of these PV cells from various modules. PV clusters have a non straight voltage and current trademark which relies upon the temperature and irradiance on the board. Exhibit can remain solitary or it can likewise be associated with the network. PV cluster has a one of a kind point where the most extreme power can be created.

Temperature and irradiance changes amid the day and it likewise changes in various periods of the year. It is imperative to follow the MPP precisely under every single imaginable condition so most extreme accessible power is constantly gotten. As productivity of PV cell lies between 10-19% just, its expense of creation is high. Principle motivation to follow MPP is to build productivity and to lessen the expense of creation of age control. A few strategies and calculations have been accounted for MPPT. Diverse MPPT calculations are Hill climbing strategy Perturbation and Observation (P&O) and Incremental conductance technique, Fractional open circuit voltage, Fractional short out current, Fuzzy rationale control, Differential Evaluation (DE) calculation, Genetic calculation.

Despite the fact that the Solar PV sources are the best answer for remote territory applications, they have two noteworthy downsides viz., the power created from PV cells relies upon climate conditions and the change proficiency of PV framework is low. In any case, the non straight yield attributes of the PV board display a special working time when most extreme power is separated. One normal technique for expanding the effectiveness of the PV framework is to build up a MPPT controller which constantly tracks the MPP of the PV boards at all illuminations and temperatures.

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II. PROPOSED SYSTEM

PV systems consist of PV panels and DC-DC converters such as boost converter, buck converter buck-boost converter SEPIC converter. MPPT algorithms get voltage and current from polarity of PV panels and regulate the duty cycle of PWM (Pulse width Modulation) which applied to switch (MOSFET, IGBT.etc) of DC-DC converters to regulate voltage and current of converter. The proposed system is schematized in Fig. below.

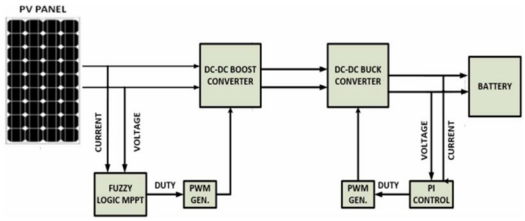

Fig.1. PV system Fuzzy logic MPPT algorithm and PI control charge circuit.

After boost converter, current and voltage change constantly due to changing environmental conditions and the characteristics of the circuit elements used. To charge a battery there some methods which are constant current and constant voltage methods. To charge battery quickly and reduce losses its need constant current and appropriate voltage while charging and also charging battery quickly lead to increase life cycle of battery. To provide constant current and appropriate voltage for battery, PI controller applied buck converter after boost converter. The reason why the PI controller is preferred in this study is that it is easy to implement and gives excellent results for this study.

III. SIMULATION RESULTS

The simulation results are presented in this section the system is operated in four levels

1) Level 1: 1000 W/m2 and 25`C
2) Level 2: 700 W/m2 and 25`C
3) Level 3: 1000 W/m2 and 60`C
4) Level 4: 1000 W/m2 and 60 `C

Table 1
Voltage of buck converter, power at MPP, power of PV and accuracy of MPPT

Levels	Vbuck	Ibuck	Pmpp	Ppv
Level 1	15.11	2.896	84W	81.1
Level 2	15.10	2.895	66W	64.2
Level 3	15.11	2.896	71.1W	67.4
Level 4	15.11	2.895	51.3W	51.5

The proposed system constructed in MATLAB/ Simulink is shown in fig.2.

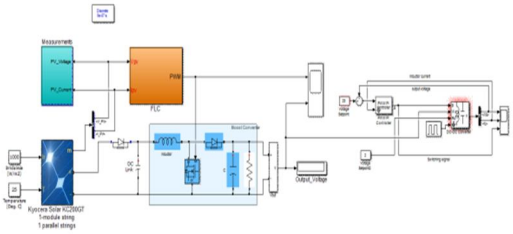

Fig.2. simulation diagram

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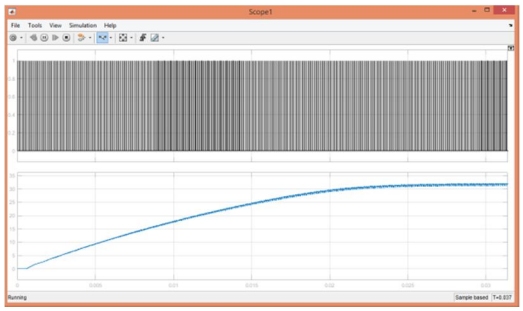

Fig.3. graph showing output of simulation

IV. CONCLUSION

The system is study under four different conditions. By changing temperature and radiation responses of system observe. the efficiency of solar panel observe. the efficiency of solar panel increases more than last one. The load voltage and current of step down converter not change until end time of system(2.896, 15.11V) PI controller more effectively regulate the output voltage and current of step down converter. This system getting maximum efficiency from the solar panel, to reduce the cost and to charge the battery constant current and constant voltage voltage level to reduce losses, fast charge and increase life cycle of battery. This system is used in real life application to increase the efficiency of solar panels and charging the battery load in less time**.**

REFERENCES

[1] Gurpinder Singh, Amanpreet Kaur International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 4, Issue 10, October 2015 Copyright to IJAREEIE DOI: 10.15662/IJAREEIE.2015.041021 8196 Survey on MPPT Techniques in Photovoltaic Solar Energy Systems

[2] Pooja Jaiswal, Dr.Amita Mahor, “REVIEW ON MPPT TECHNIQUES IN SOLAR PHOTOVOLTAIC SYSTEM”, International Journal of Advanced Technology in Engineering and Science Volume No.02, Issue No. 07, July 2014

[3] Bendib, B., Belmili, H., & Krim, F. A survey of the most used MPPT methods: Conventional and advanced algorithms applied for photovoltaic systems. Renewable and Sustainable Energy Reviews, 45, 637–648.doi:10.1016/j.rser.2015.02.009

[4] Rawat, R., & Chandel, S. S. Review of Maximum-Power-Point Tracking Techniques for Solar-Photovoltaic Systems, Energy Technology, 1(8), 438–448.doi:10.1002/ente.201300053

[5] Gupta, A. K., & Saxena, R. (2016). Review on widely-used MPPT techniques for PV applications. 2016 International Conference on Innovation and Challenges in Cyber Security (ICICCS-INBUSH).doi:10.1109/iciccs.2016.7542321

[6] Mohammad Faridun Naim Tajuddin, Shahrin Md Ayob, Zainal Salam and Mohd Sazli Saad, “Evolutionary based maximum power point tracking technique using differential evolution algorithm” Elsevier Energy and Building Volume 67 pp 245 – 252 December 2013

[7] Kashif Ishaque and Zainal Salam “A Deterministic Particle Swarm Optimization Maximum Power Point Tracker for Photovoltaic System Under Partial Shading Condition”, IEEE

[8] Weidong Xiao, Zeineldin, H.H., and Peng Zhang, "Statistic and Parallel Testing Procedure for Evaluating Maximum Power Point Tracking Algorithms of Photovoltaic Power Systems," Photovoltaics, IEEE Journal of , vol.3, no.3, pp.1062,1069, July 2013

[9] M. Dahmane,J. Bosche, A. EI-Hajjaji and X. Pierre “MPPT for Photovoltaic Conversion Systems Using Genetic Algorithm and Robust Control” American Control Conference (ACC), 2013

[10] Mohammed A. Elgendy, Bashar Zahawi and David J. Atkinson “Assessment of the Incremental Conductance Maximum Power Point Tracking Algorithm”, IEEE Transl SUSTAINABLE ENERGY, VOL. 4, NO. 1, Pages 108- 117 JANUARY 2013

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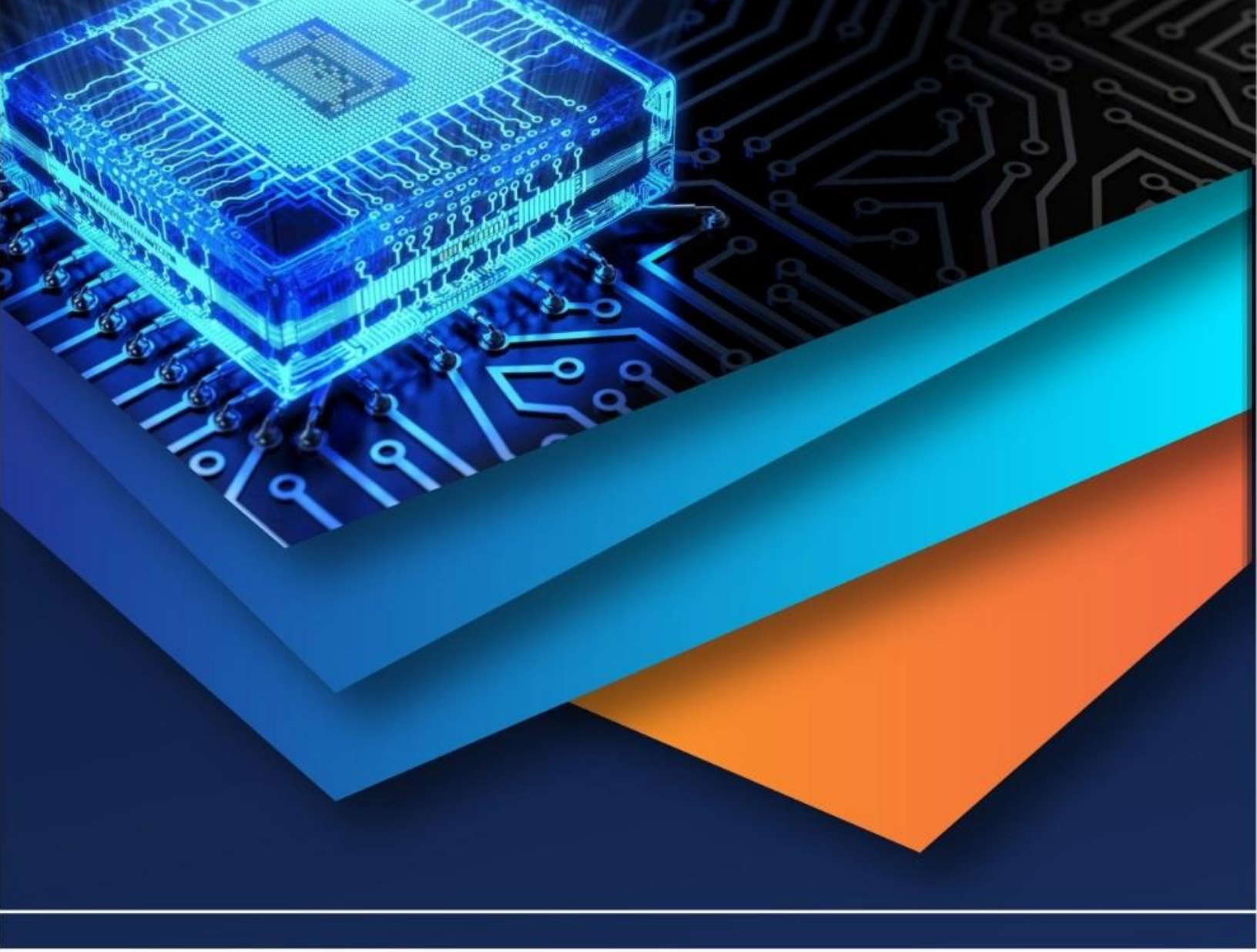

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