IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 1, October 2023

An ANFIS based Global Maximum Power Point Tracking Approach for PV Modules under Partial Shading Condition

Dr. S. Lakshmikanthan Bharathi[1], Dr. A. Manjula[2], Ms. Thillainayagi[3], Mrs. P. Sujidha[4], Mrs. P. Radha[5]
Associate Professor, Department of Electrical and Electronics Engineering[1,2]
Assistant Professor, Department of Electrical and Electronics Engineering[2,3,4]
Mohamed Sathak Engineering College, Kilakarai, India

Abstract: *In This work proposes an ANFIS-based global maximum power point tracking (GMPPT) technique designed for photovoltaic (PV) systems which experience partial shading conditions (PSC). However, when photovoltaic (PV) array is subject to partial shading conditions (PSC), several local maxima appear on the P-V characteristics curve of the PV array which are due to the use of the bypass diodes to avoid hot spots effect. The appearance of these multiple peaks on the characteristics of PV array makes the tracking more difficult under these conditions and requires the integration of a more efficient power control system which is able to discriminate between local and global maxima to harvest the maximum possible energy and therefore increase the efficiency of overall system. In conventional method, the P&O method is utilized under uniform irradiation conditions, where it tracks the unique MPP. Whereas, when partial shading occurs, the FireWorks Algorithm is used to determine the GMPP, following which the P&O tracker compensating for varying environmental variations. In addition to implementing a global maximum power point tracking strategies, the mismatch losses associated to the shading effect can further be reduced by using alternative configuration such as FireWorks Algorithm. For this purpose, the main aim of this paper is to design an intelligent MPPT controller that allows predicting and extracting the global maximum power point (GMPP) from PV array under partial shading conditions (PSC) whatever is the used configuration or its size. This intelligent MPPT controller is based on adaptive neuro-fuzzy inference system (ANFIS). Furthermore, the ANFIS network uses a hybrid learning algorithm that combines the least-squares estimator and the gradient method. Simulation and experimental results verify the effectiveness of the proposed GMPPT method.*

Keywords: GMPPT, ANFIS, Photovoltaic systems

REFERENCES

[1]. X. Weng, Z. M. Zhao, F. B. He, L. Q. Yuan, T. Lu, "Comparison of several MPPT methods for PV arrays under partially shaded conditions," Intl. Conf. Renewable Power Generation (RPG 2015), pp. 1-6, Oct. 2015.

[2]. H. H. Tumbelaka, M. Miyatake, "Simple integration of three-phase shunt active power filter and photovoltaic generation system with Fibonacci-search-based MPPT," IEEE Symp. Ind. Electron. AndApplications, DOI: 10.1109/ISIEA.2010.5679490, pp. 94-99, Oct. 2010.

[3]. Y. H. Liu, S. C. Huang, J. W. Huang and W. C. Liang, "A particle swarm optimization-based maximum power point tracking algorithm for PV systems operating under partially shaded conditions," IEEE Trans.Energy Convers., vol. 27, no. 4, pp. 1027–1035, Dec. 2012.

[4]. K. Ishaque, Z. Salam, M. Amjad, and S. Mekhilef, "An improved particle swarm optimization (PSO)—based MPPT for PV with reduced steady state oscillation," IEEE Trans. Power Electron., vol. 27, no. 8, pp. 3627–3638, Aug. 2012.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 1, October 2023

[5]. S. Lyden, M. E. Haque, "A simulated annealing global maximum power point tracking approach for PV modules under partial shading condition," IEEE Trans. Power Electron., vol. 31, no. 6, pp. 4171-4181, Aug. 2015.

[6]. S. Mohanty, B. Subudhi, P. K. Ray, "A new MPPT design using grey wolf optimization technique for photovoltaic system under partial shading conditions," IEEE Trans. Sust. Energy, vol. 7, no. 1, pp. 181- 188, Jan. 2016.

[7]. K. L. Lian, J. H. Jhang, and I. S. Tian, "A maximum power point tracking method based on Perturb-and-Observe combined with Particle Swarm Optimization," IEEE J. Photov., vol. 4, no. 2, pp. 626-633, Mar. 2014.

[8]. M. Seyedmahmoudian, R. Rahmani, S. Mekhilef, A. M. Than Oo, A. Stojcevski, T. Kok Soon, and A. S. Ghandhari, "Simulation and hardware implementation of new maximum power point tracking technique for partially shaded PV system using hybrid DEPSO method," IEEE Trans. Sust. Energy, vol. 6, no. 3, pp. 850–862, July 2015.

[9]. Y. Tan and Y. Zhu, "Fireworks algorithm for optimization," Advances inSwarm Intelligence, pp. 355–364, 2010.

[10]. S. Zheng, A. Janecek, and Y. Tan, "Enhanced fireworks algorithm," in IEEE Congress on Evolutionary Computation (CEC) (IEEE, 2013), pp. 2069–2077.

[11]. B. Zhang, Y.J. Zheng, M.X. Zhang and S.Y. Chen, "Firework Algorithm with Enhanced Fireworks Interaction," IEEE/ACM Trans.Computational Biology and Bioinformatics, DOI: 10.1109/TCBB.2015.2446487, Jun. 2015.

[12]. S. Zheng, J. Li, A. Janecek and Y. Tan, "A cooperative framework for fireworks algorithm," Accepted for publication in IEEE/ACM Trans.Computational Biology and Bioinformatics, DOI: 10.1109/TCBB.2015.2497227, Nov. 2015.