

Dear ICIC Express Letters Editor,

Thank you for considering our paper entitled by ‘Adaptive Neuro-Fuzzy Inference System based Optimal Power Point of PV Modules’, Reference No.: ICICIC2019-005 with Author(s): Syafaruddin ., Gassing ., Faizal Arya Samman and Satriani Latief in the publication of *ICIC-Express Letters Part B: Applications (ICIC-ELB)*.

We would like to thank to reviewers for the beneficial comments and suggestions in order to improve the quality of the paper. We have revised our paper according to the ICIC-ELB template and answered the following the reviewer comments as shown in the bold font as follows:

Best regards,

Syafaruddin

Universitas Hasanuddin, Indonesia

The paper has been accepted been accepted for oral presentation in the 14th International Conference on Innovative Computing, Information and Control (ICICIC2019), to be held in Seoul, Korea, August 26-29, 2019.

In addition, we are pleased to let you know that your paper will be recommended for possible publication in either a Scopus, or an Ei indexed journal (subject to meeting indexing standard), after significant modifications and re-review, after ICICIC2019.

**Thank you for your beneficial comments and suggestion to improve the quality of our paper.**

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**Answer for Reviewer Comments:**

- 1) In Introduction, much basic background introduction is conducted, while the study motivations and innovation of the current study are not highlighted. Much more closely related studies should be referred to.

**The motivation of this study and the correlation with other studies have been added in the first section of the article which is presented as follows.**

**There were several previous researches with more focused on the application of ANFIS network in PV system application. Photovoltaic modules have non-linearity nature characteristics output where they are highly dependent on the geographical location and weather conditions by means of sunlight intensity, ambient temperature and shading problems. The modelling and simulation of PV generation system is presented with ANFIS network in order to overcome the variation of input parameters and to find the best PV modelling and configuration [7]. Due to the unpredictable input parameters, the complexity in tracking mechanism is unavoidable to extract the maximum available power and energy of PV panels. In this case, it is important to have the control mechanism which is accurate and fast**

response to the variation of input parameters and the ANFIS network has been successfully utilized to model the PV panel and to determine the maximum power point by the optimal tuning of DC-DC converter duty ratio [8]. The ANFIS control network has been also used to solve the problems of partial shading where the multiple peaks occur that makes the conventional control is unable to distinguish between the global and local maximum points [9]. Another research attempts to improve performance of ANFIS control network in determining the optimal duty of DC-DC converter with the hybrid combination of conventional the hill-climbing control method for the purpose of enhancing the tracking speed, tracking accuracy and energy gain factor [10]. In addition, the ANFIS-reference model controller combined with other conventional controller has more efficient and better dynamic response with using Field Programmable Gate Array (FPGA) board design [11]. From these previous researches, the ANFIS performance is identified with excellent reliability and good prediction accuracy compared to other types of artificial neural network under dynamic and non-linear input parameters.

#### References:

- [7] Adel Mellit, Soteris A.Kalogirou, ANFIS-based modelling for photovoltaic power supply system: A case study, *Renewable Energy*, Vol. 36, No. 1, pp 250-258, January 2011
- [8] Ravinder Kumar Kharb, S.L.Shimi, S.Chatterji, Md. Fahim Ansari, Modeling of solar PV module and maximum power point tracking using ANFIS, *Renewable and Sustainable Energy Reviews*, Vol. 33, pp. 602-612, May 2014
- [9] Faiza Belhachat, Cherif Larbes, Global maximum power point tracking based on ANFIS approach for PV array configurations under partial shading conditions, *Renewable and Sustainable Energy Reviews* Vol. 77, pp. 875-889, September 2017
- [10] Mohamed Lasheen, Mazen Abdel-Salam, Maximum power point tracking using Hill Climbing and ANFIS techniques for PV applications: A review and a novel hybrid approach, *Energy Conversion and Management*, Vol. 171, pp.1002-1019, 1 September 2018
- [11] Ammar A.Aldair, Adel A.Obed, Ali F.Halih, Design and implementation of ANFIS-reference model controller based MPPT using FPGA for photovoltaic system, *Renewable and Sustainable Energy Reviews*, Vol. 82, Part 3, pp. 2202-2217, February 2018

- 2) The 2nd and third keywords can't be found in the manuscript. Please reconsider them as keywords.

**All keywords have been connected and addressed in the body of the article.**

- 3) "Of course the data used for validation is different from the data used for validation" in the last paragraph of Introduction is not understandable.

**Thank you for this correction. We have corrected this part as shown in the paragraph as 'Of course, the data used for training process is different from the data used for validation process.**

- 4) There is no need to define acronyms like "ANFIS" every time they appear in the manuscript.

**This part has been corrected in all parts of the article by just mention ANFIS without definition.**

- 5) More discussion should be added on the Matlab Code of ANFIS network in Section 3.

**Explanation of matlab code is presented in Table 1 as follows**

**Table 1. Description of matlab code**

Lines	Description
1-11	The input-output data of PV modules loading from text files including the normalization process for neural network training data preparation.
12-29	The ANFIS network training process, taking the number of simulation time of 50, number of training data of 150, utilizing the 'gbellmf' as an activation function and plotting the training results by the input-output data combination.
30-55	The ANFIS network testing process under clear sky condition with the number of testing data of 139 (the remained data number that is not used for training process), the normalization of input-output data testing and plotting the testing results by the input-output data combination.
56-81	The ANFIS network testing process under cloudy sky condition with the number of testing data of 289, the normalization of input-output data testing and plotting the testing results by the input-output data combination.

- 6) It is better not to use color to differentiate different elements. Please improve Figure 2 and Figure 3. Please also recheck the lower figure of Figure 2, in which the “target” line is not shown.

**These figures have been improved by not to use color and the difference between parameters are clearly shown.**

- 7) Types of photovoltaic modules should be introduced briefly in Section 5.

**The types of PV modules have been clearly explained in section 4. It is important to measure the performance of ANFIS network in different technology of PV modules. For this reason, there are four typical of solar modules technology that has been tested in this study, i.e. ASE-50-ATF/17, Kyocera KC-80, BP Solar BP585 and AstroPower AP-8225. The first two PV modules are the multi-crystalline Silicon solar cell technologies. The ASE-50-ATF/17 implements the octagon technology based edge defined film-fed growth (EFG) to enable the number of material and consumed energy during manufacture can be reduced. Meanwhile, the Kyocera KC-80 is the Silicon wafer solar cell technology as a part of innovation and development of solar cell to increase the efficiency energy conversion. In comparison, the BP Solar BP 585 is the single-crystalline Silicon technology that is potentially suitable for application for limited space with expecting maximum output energy. The last type of PV modules is AstroPower AP-8225 with thin-film Silicon solar cell technology with the target to obtain the trade-off performance of multi- and single crystalline modules utilizing the process of subtraction of serial multi crystal Silicon with low cost.**

- 8) There exist many linguistic errors in the manuscript. For example, the 2nd sentence in Introduction is ill-formed. “Each note of produces the firing strength...” in Layer 3 is

grammatically wrong. Please thoroughly check the whole manuscript to correct all the presentation defects.

**Thank you for the language correction. We have completely checked and corrected the English in the manuscript.**

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