Retraction

Retraction: Modified Zeta Converter Based On ANFIS Controller Using MPPT PV System (J. Phys.: Conf. Ser. 1916 012126)

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problemati Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Modified Zeta Converter Based On ANFIS Controller Using MPPT PV System

Venkatesh Jonnalagadda1, K R Sugavanam2, K Mohanasundaram3, Kuppuswamy C L4, Ramu Bhukya1 and Kalyan Sagar Kadali1

1Assistant Professor, Department of EEE, Shri Vishnu Engineering College For Women (A), Bhimavaram, A.P, India.
2Research Scholar, Jaya College of Engineering and Technology (Anna University), Chennai
3Professor/EEE, KPR Institute of Engineering and Technology, Coimbatore
4DGM- Electrical, Saipem India, Chennai
venkatesheee@svecw.edu.in

Abstract. In this paper, the photovoltaic (PV) renewable energy is fed to load demand using Modified ZETA converter with ANFIS logic controller. Nowadays, renewables have become a blooming market. These are the main sources of energy that exist in the natural environment. It is a clean alternative to fossil fuels. Therefore the application of power electronics to the wind power generation region has become critical. Converters and inverters are the primary method used to produce such renewable resources, quickly and effectively implemented. The ANFIS controller for the SEPIC converter that interfaced between inverter and source, keeps constant voltage during variable load situation and depicted in a small steady error and a small overflow. The design and analysis of PV based modified ZETA converter is explained and the results are verified using MATLAB/Simulink.

1. Introduction
Because of climate change and the energy crisis, investors and researchers have been paying close attention to renewable energy technologies. Nowadays, PV systems are gaining popularity among renewable energy sources, because they are environmentally friendly, safe, noise-free and need less maintenance [1,2]. The key problems of PV panels, however, it is poor energy less efficiency. The explanation for this is the nonlinear PV array's I-V nature, which is subject to changing conditions and is weather dependent. Due to the scarcity of traditional energy sources, the photovoltaic (PV) system has advanced significantly over the last ten years among all renewable energy sources. [3]. The transfiguration competency is constrained by the PV modules nonlinear voltage. To optimise the tracked output, a Maximum Power Point Tracking (MPPT) system is needed. Artificial intelligence-based FLC and ANN-based MPPT approaches are ideal for unpredictably changing weather conditions. Due to the necessity of large training data, the ANN method fails. Keep multiple DC-DC converters for MPPT by using right membership functions, on the other hand, to maximise PV effectiveness [4,5]. In comparison to current devices, the SEPIC buck-boost converter used in this study has a high monitoring capability and low ripple [6-9]
Finally, in this paper proposed the ANFIS control system based on high efficiency and enhanced voltage or potential gain ZETA converter (DC-DC converter). The MPPT technique is used to extract renewable solar energy from PV modules in order to increase the DC bus voltage as an input for a single phase inverter and provide duty cycle to the power switch [10,11]. The ANFIS-based MPPT controller sends duty cycles to the gate signal.

2. PROPOSED SYSTEM:
Figure 1 shows that demonstrate the block diagram view of the Photo Voltaic system (PV) based Modified ZETA converter. A Zeta converter with ANFIS is introduced, which is operated by an MPPT process. This ZETA converter is located between the load and solar modules, and it is used to perform impedance balancing. The converter output is fed to the R-load along with single phase inverter using the ANFIS control proposed methodology.

In this proposed system, The MPPT technique with a DC-DC Zeta converter is used to extract the generated energy from the solar modules. The ANFIS architecture is used in the controller design to control the single phase inverter as well as the DC connection voltage.

![Figure 1. Proposed Block Diagram](image)

3. Photo voltaic & Maximum Power point tracking
The analogous model of a PV cell in solar systems consists of series/parallel resistances, a diode, and a current source. a photovoltaic cell model is shown in Figure 2.

![Figure 2. single diode PV system](image)

The mathematical equation of given circuit PV system can be derived as

$$I_{out} = I_{phot} - I_{diode} = I_{phot} - I_{RSC} \left[ \exp \left( \frac{V_{out}}{V_{Thm}} \right) - 1 \right]$$  \hspace{1cm} (1)

Where photocurrent is termed as Iphot, the reversed saturating current is IRSC , thermal voltage is derived as Vthm. PV cell temperature (Tcell) and Photon current as follows:
4. Proposed Modified ZETA converter

In this system, the DC power is supplied by the PV system. The supply voltage will be increased with the help of a ZETA converter powered by the PV system. When compared to the source voltage, the load voltage would be higher. The regulator’s main function is to provide voltage above or below the load from the input source or supply voltage. The modified ZETA converter which represented in Figure 3 also needs coupling inductors, two capacitors, inductors and a series capacitor, sometimes called a flying capacitor. Similarly, a MOSFET power switch is used in the modified zeta converter. The ZETA converter, which is similar to a low-cost wall wart, is another way to handle an unregulated input-power supply. The proposed modified Zeta converter shown in a circuit diagram figure 2. S is the power MOSFET. Ds and Dp are the diodes of the Boost and Zeta cells converters, respectively. Primarily, the coupled inductor, are named as Lm and N1. Where Lm is magnetizing inductance and the coupled inductor secondary side is N2 . Cz is the buffer capacitor and the yield capacitors of Boost as well as Zeta cells converters are Cob and Coz.

5. Modes of operation CCM:

The current that passes through the inductor is never zero. For one switching cycle, the operation of the converter in continuous conduction mode (CCM) can be divided into three steps, and the operation processes are as follows:

5.1 Stage-1 \([t_0–t_1]\): when S is turned ON. The diodes D1 and D2 are reverse biased. Both inductors Lm and Lo are magnetizing with voltage \(V_i\) and \(NV_i\) corresponding. \(i_{Lm}\) and \(i_{Lo}\) currents are therefore increase linearly. During this stage, capacitors Cz and Cob discharge, and capacitor Coz charges up.

5.1.1 Simulink circuit

5.2 Stage-2 \([t_1–t_2]\): The switch is in OFF state. At time \(t=t_1\), and the diode Db starts to conduct. The current through the diode Db is equal to the primary current of the coupled inductor. The current through the switch S is null.

5.3 Stage-3 \([t_2–t_3]\): When the diode Dz starts conducting, at that time the potential is equal to \((Vi-Vob)\) and \(-Voz\), respectively, through inductors Lm and Lo. The energy contained in Lm is passed to the Cz capacitor and to the Cob condenser filter. Similarly, the saved energy in Lo is send to the filter capacitor Coz.
6. ANFIS Controller:
The MPPT and ANFIS controller are combined to provide high accuracy tracking. An ANFIS controller combines the benefits of both a fuzzy logic controller and a neural network (NN). An ANFIS-based MPPT controller provides greater tracking accuracy while also allowing for faster convergence.

This proposed controller is designed by using the Matlab/simulink and it is interfaced with dSPACE board in real time operation to provide duty cycles for modified ZETA converter. The optimization of controller is performed by using the neural trained data with similar fuzzy membership functions.

The tuned membership parameters are generated by a back propagation algorithm that trains the fuzzy controller's membership functions. The linguistic variables are translated into the FLC in this scheme.

MPPT based on ANFIS extracts power from the PV source without oscillation, i.e., around MPP. The functions of impedance matching, high tracking performance, and effective communication between solar modules and loads.

It has a fast dynamic response and a flexible design. Zero (ZE) and interference fuzzy decisions are represented in this proposed scheme. The proposed controller consists of major control blocks, defuzzifier, fuzzifier, and rule base. Through fuzzification blocks, error change and inputs error processed. Desired duty ratio is achieved used by the centroid method which employed for defuzzification process.

7. Simulation and Results:
The proposed control methods are based on ANFIS controller with MPPT extract power technique to operate Zeta converter effectively and the DC-AC inverter circuit is implemented using Matlab/Simulink software to validate the effectiveness and efficiency of the single phase inverter with changed Zeta converter configuration for photovoltaic device software. In Figure 4, the simulation of the proposed system is shown. The dc supply to the R-load is produced by the PV system. The energy is converted and supplied to the changed Zeta converter to increase the supply input voltage. The produced PV voltage is 30V. The DC-DC converter is controlled using by proposed MPPT with ANFIS controller to provide duty cycle for the controlled DC link voltage. The DC link capacitor is used as an input source for the single phase inverter or DC-AC converter.

![Diagram of proposed system in MATLAB/Simulink](image)

**Figure 4.** simulation of proposed system in MATLAB/Simulink
The proposed PV system is generating the output voltage of 30V to the modified zeta converter to boost up the supply voltage. The input supply voltage is shown in Figure 5.

![Figure 5, proposed system PV generated voltage](image)

The enhanced or stepped up DC link voltage is nearly 290V and it is the output voltage from the modified zeta converter as illustrated in Figure 6. The improved DC-DC Zeta converter voltage is fed to the single phase inverter that converts DC-AC form.

![Figure 6, DC link voltage](image)

The DC-AC single phase inverter output voltage is shown in Figure 7 the inverter voltage for the load around 300V and without using LC filter.
The inverter output current is nearly close to 9A and the load current is represented in figure 8.

The output voltage of the DC-AC inverter after using LC filter is 300 V and it is fed to the R-load as illustrated in figure 9. The power switches of the inverter bridge gate signals are provided by the proposed ANFIS controller along with the pulse width modulation.
8. Conclusion:
In this paper, the modified ZETA converter based on PV system is proposed using the MPPT with ANFIS controller to provide the duty cycle for the DC-DC converter to step up the input voltage. When the solar irradiation is low, the ANFIS controller is used to provide accuracy and the PV energy is monitored. The DC-AC converter is controlled by the ANFIS controller to supply the energy to the R-load. The output of the proposed system inverter voltage is 300V and is fed to the load. The verification of the proposed system results are done by using MATLAB/Simulink.

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