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# Evaluation of Fuzzy Logic Controller Performance in A PV Application System

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**ABSTRACT:** In this work we have compared how the output voltage is when the irradiation of the PV panel is changed in a PV system. The main problem with PV based system is the produced output voltages will be fluctuating due to the change in weather and climatic conditions. By using the controllers, we will have near constant voltage and thus improving the efficiency of the system. Here we have simulated a PV system and used different controllers namely FLC Controller and analysed the outputs at different irradiations. The simulations are performed under MATLAB and SIMULINK.

**KEYWORDS:** FLC Controller, Solar PV System, Grid, Battery.

## I. INTRODUCTION

It's certainly clear that fossil fuels are damaging the climate and that the status quo is unsustainable. There is now a broad scientific consensus that the world needs to reduce greenhouse gas emissions more than 25 percent by 2020 and more than 80 percent by 2050. The idea of harnessing the sun's power has been around for ages. The basic process is simple. Solar collectors concentrate the sunlight that falls on them and convert it to energy. Solar power is a feasible way to supplement power in cities. In rural areas, where the cost of running power lines increases. Solar power, a clean renewable resource with zero emission, has got tremendous potential of energy which can be harnessed using a variety of devices. With recent developments, solar energy systems are easily available for industrial and domestic use with the added advantage of minimum maintenance. Solar energy could be made financially viable with government tax incentives and rebates. An exclusive solar generation system of capacity 250KWh per month would cost around Rs.20 lakhs, according to pricing and taxes in 2013. A state-wise analysis reveals that the installed capacities in case of wind and biomass respond strongly to the power tariff for industries while the relationship with the benchmark tariffs is weak though positive. Most of the developed countries are switching over to solar energy as one of the prime renewable energy sources.

## II. TOOLS AND METHODS

### 1. Methodology

In this we first simulated the PV array and then the controllers namely FLC, IC and ANFIS. The FLC has three steps fuzzification, fuzzy interface system and de-fuzzification. We applied the rule base for FLC which we took based on varying irradiation as the PV curve will have multiple local peaks. This is then kept in a PV system and simulated it. The ANFIS and IC controllers are then simulated one after the other and analysed their output. Then we connected the ANFIS controller to Grid connected PV system and analysed the system performance. The block diagram of the system is as shown in Fig.1.

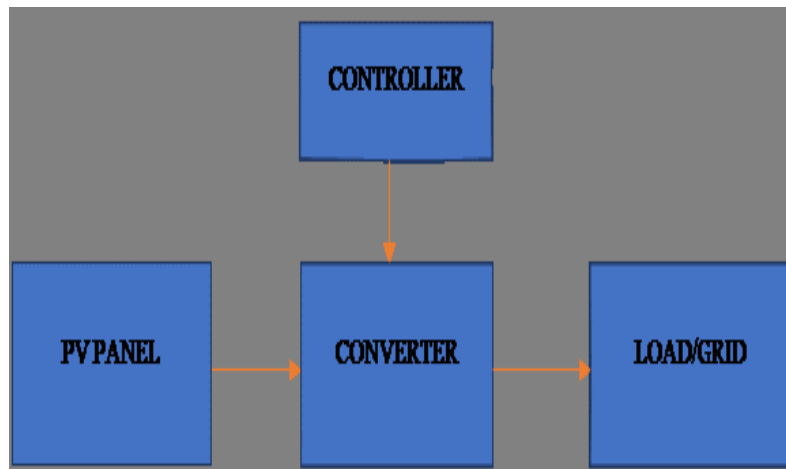


Fig.1. Block diagram of simulation model.

## 2. Tools

In this we used MATLAB-SIMULINK as it is a software highly used for methodological computing. It is easy environment where we can express the known mathematical notations in an easy way.

## III. CIRCUIT DIAGRAM

The circuit diagram for FLC controller is as in Fig.2.

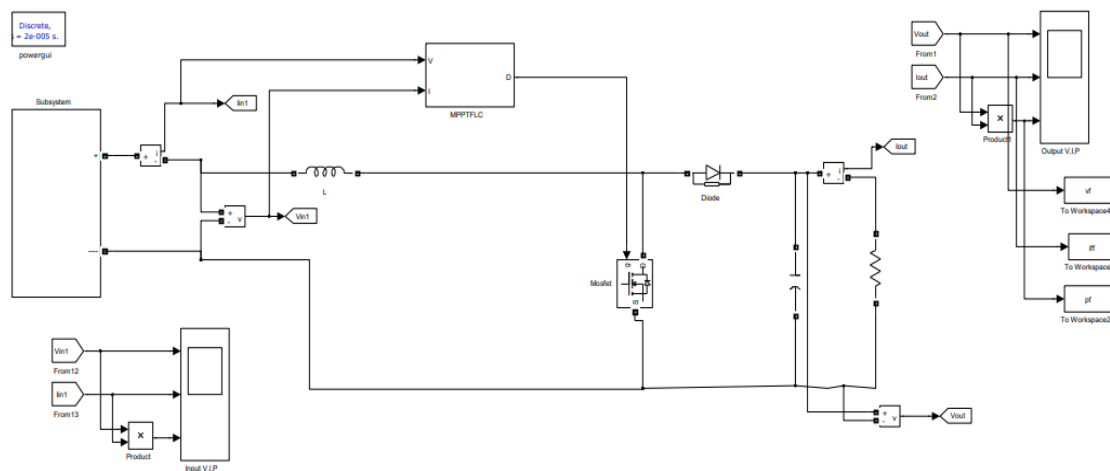


Fig.2. MATLAB/Simulink model of FLC based MPPT controller.

## IV. RESULTS

The circuit is analyzed using MATLAB and the outcomes at different irradiances such as  $800 \text{ W/m}^2$ ,  $900 \frac{\text{W}}{\text{m}^2}$ ,  $1000 \text{ W/m}^2$ . The results of FLC based PV system are as shown in Fig.3, Fig.4 and Fig.5 respectively.

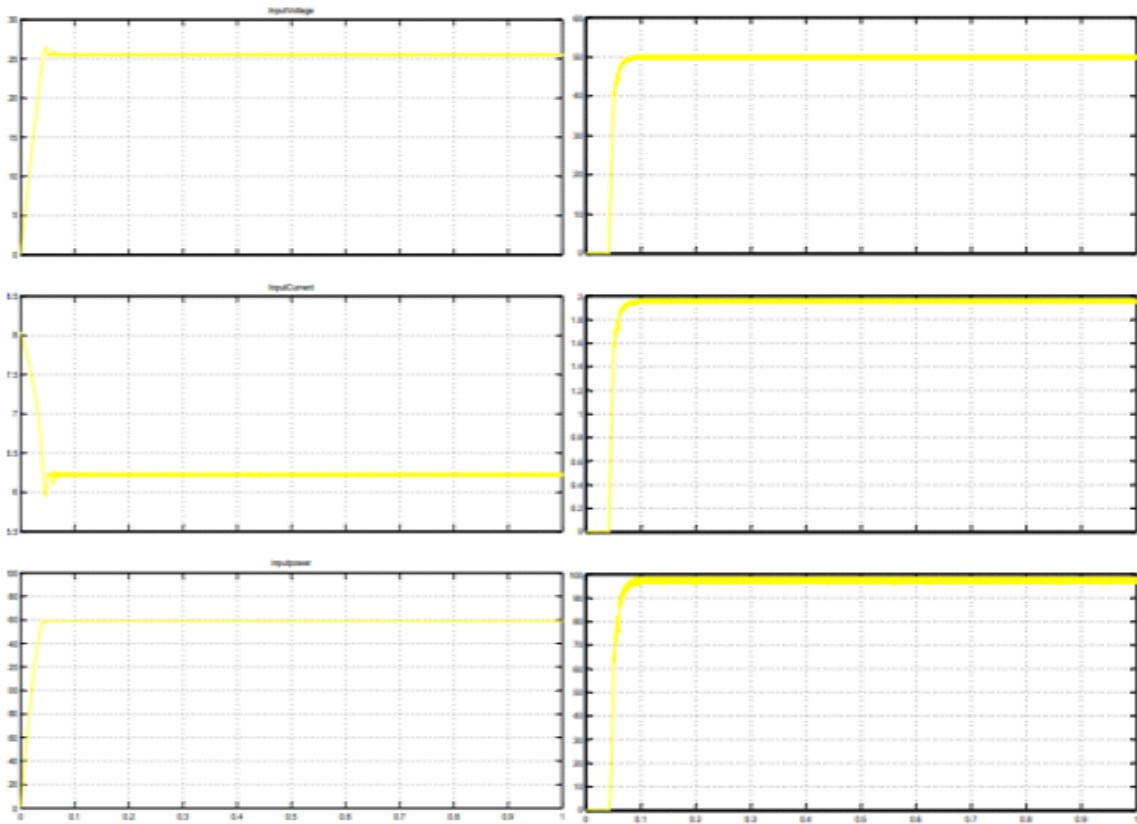


Fig.3. Waveforms of FLC based MPPT controller at irradiance of 800 W/m<sup>2</sup>.

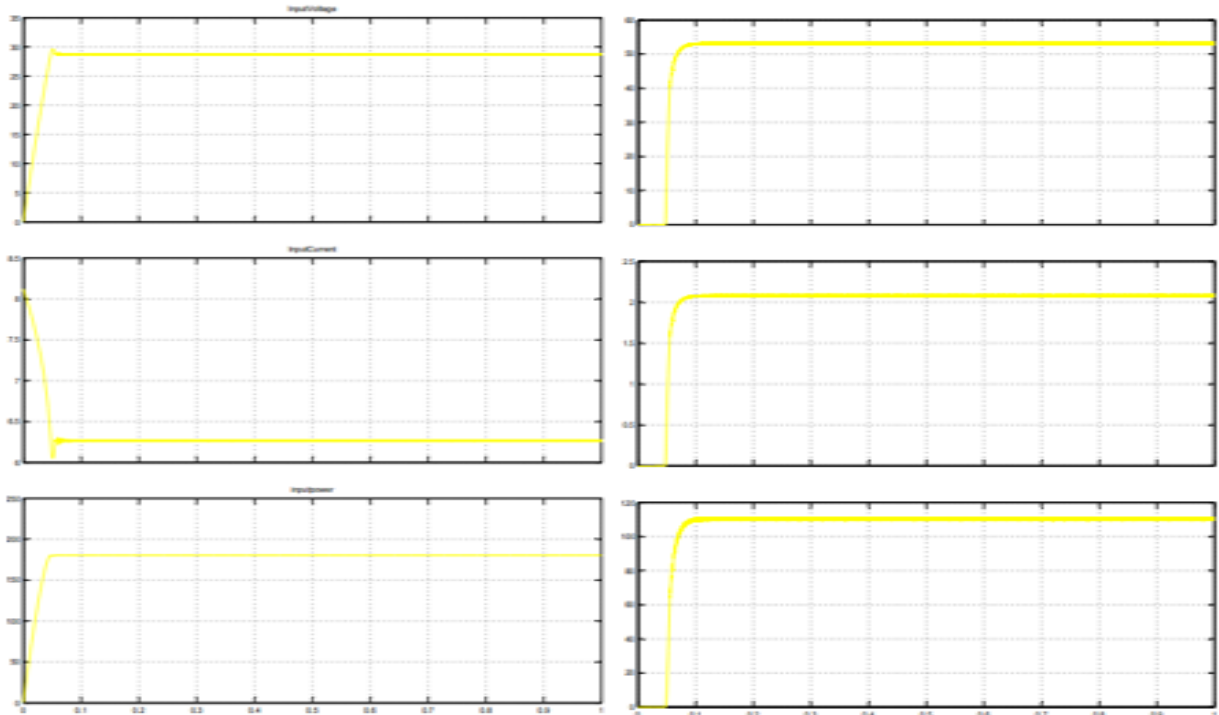


Fig.4. Waveforms of FLC based MPPT controller at irradiance of 900 W/m<sup>2</sup>.

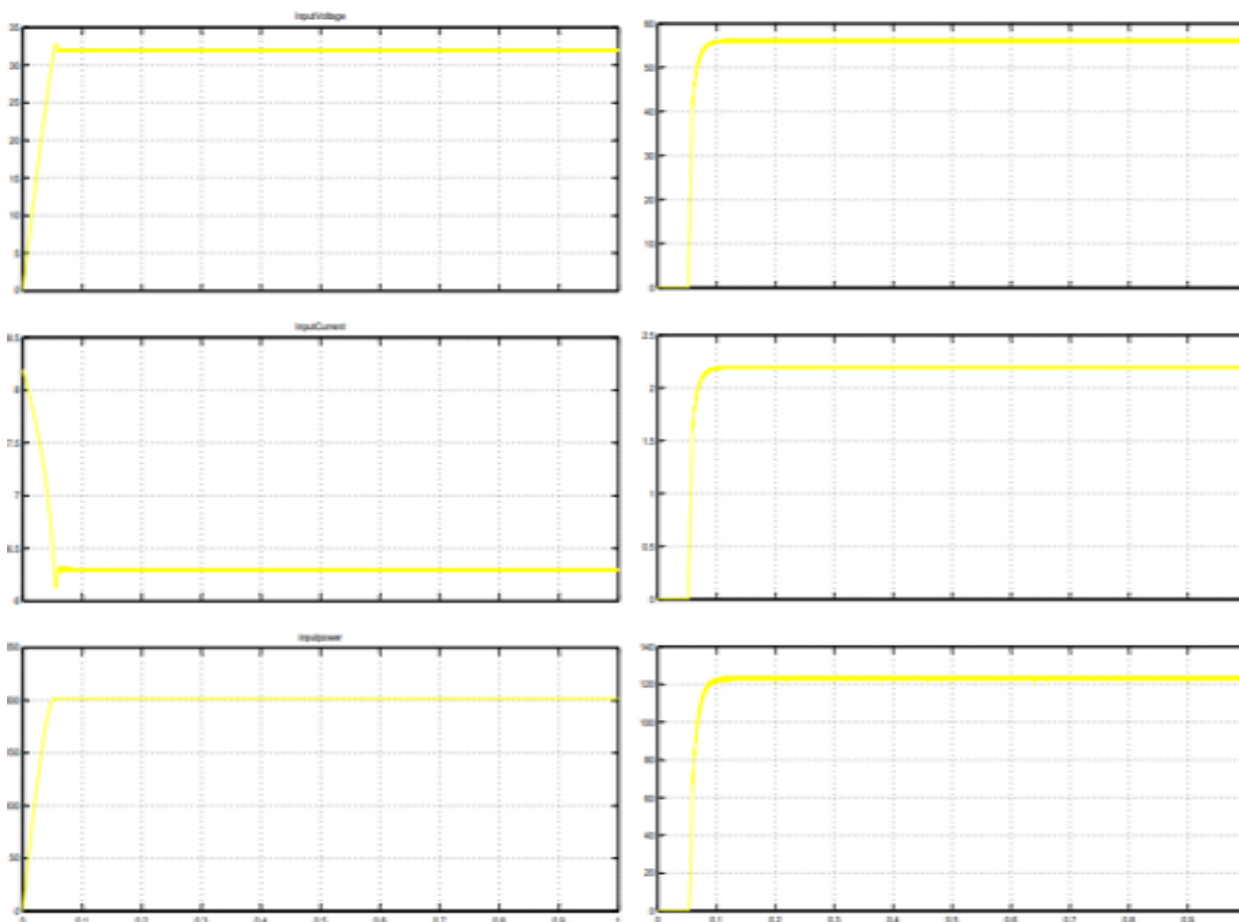


Fig.5. Waveforms of FLC based MPPT controller at irradiance of  $1000 \text{ W/m}^2$  .

## V. CONCLUSION

The performance of the PV system is evaluated in this work in MATLAB environment. The results of FLC shows that it has performed better in tracking MPPT under changing weather conditions.

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