SMART AUTOMATED MONITORING &CONTROLLING OF SOLAR PANEL USING IOT.

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ABSTRACT:Using the Internet Of Things Technology for supervising solar photovoltaic power generation can greatly enhance the performance, monitoring and maintenance of the plant. With advancement of technologies the cost of renewable energy equipments is going down globally encouraging large scale solar photovoltaic installations. In this project the development of a smart automated monitoring & controlling system for the solar panel is described, the core idea is based on IoT.The measurements of data are made using sensors, block management data acquisition modules, and a software system. Then, all the real-time data collection of the electrical output parameters of the PV plant such as voltage, current and generated electricity is displayed and stored in the block management. The proposed system is smart enough to control MPPT and boosting voltage if the panel is not working properly, to display errors, to remind about maintenance of the system through IOT. The advantages of the system are the performance of the solar panel system which can be monitored and analyzed.

I INTRODUCTION

The Internet of Things is an expansive term that covers any number of web-connected technologies. While many available platforms

Fig.1.1 IOT technology

The PV is one of the promising renewable alternatives that increasingly integrated in the distribution networks. Given the fact that nearly 90% of all the public grid disturbances are happening in the distribution network [2], the move towards the PV integration has to focus on how to enhance grid reliability and quality of the distribution network. In spite of the many advantages of PV resources there are few challenges making them difficult to spread widely. The power source intermittency is one of the complex challenges facing the integrating of the PV sources.

To achieve a good controlling, the controller has to take the input and output power disturbance into account when a PV distributed source connected to a public grid. Normally, the two stage power conversion systems are implemented between the PV source and the public grid to convert and control the power and voltage [4]. The first stage is the DC DC converter which step up the voltage and track the maximum power point, the second stage is the DC AC inverter which synchronizes the PV source with the public grid and control the active and reactive power exported to the grid, all the aforementioned considerations have to take in to account when implement a power conversion system.

II RELATED AND EXISTING WORKS

In this project presents an optimized controller for non-isolated DC-DC CUK converter for constant voltage applications. CUK converter has inverted voltage polarity at the output, however, it operates on the principle of capacitive energy transfer and uses inductors on both sides of the switch to reduce current ripple. MOSFETs are used as a switching device in low power and high frequency switching applications.

The Cuk converter is a type of DC/DC converter that has an output voltage magnitude that is either greater than or less than the input voltage magnitude. It is essentially a boost converter followed by a buck converter with a capacitor to couple the energy.

Compared to buck–boost converter with inverting topology, the output voltage of non-isolated Cuk is typically of the same polarity of the input, and can be lower or higher than the input. It uses a capacitor as its main energy-storage component, unlike most other types of converters which use an inductor.

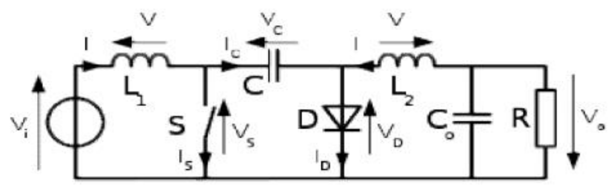


Fig.2.1Non-Isolated Cuk Converter

A non-isolated Cuk converter comprises two inductors, two capacitors, a switch (usually a transistor),anda diode. Its schematic can be seen in figure 2.1. It is an inverting converter, so the output voltage is negative with respect to the input voltage.

The capacitor C is used to transfer energy and is connected alternately to the input and to the output of the converter *via* the commutation of the transistor and the diode.

The two inductors L_1 and L_2 are used to convert respectively the input voltage source (V_i) and the output voltage source (C_o) into current sources. At a short time scale an inductor can be considered as a current source as it maintains a constant current. This conversion is necessary because if the capacitor were connected directly to the voltage source, the current would be limited only by the parasitic resistance, resulting in high energy loss. Charging a capacitor with a current source (the inductor) prevents resistive current limiting and its associated energy loss.

As with other converters (buck converter, boost converter, buck–boost converter) the Cuk converter can either operate in continuous or discontinuous current mode. However, unlike these converters, it can also operate in discontinuous voltage mode (the voltage across the capacitor drops to zero during the commutation cycle).

III PROPOSED SYSTEM

In this paper, proposes a simple, cost-effective, and efficient brushless dc (BLDC) motor drive for solar photovoltaic (SPV) array-fed water pumping system. A zeta converter is utilized to extract the maximum available power from the SPV array. The proposed control algorithm eliminates phase current sensors and adapts a fundamental frequency switching of the voltage source inverter (VSI), thus avoiding the power losses due to high frequency switching. No additional control or circuitry is used for speed control of the BLDC motor. The speed is controlled through a variable dc link voltage of VSI. An appropriate control of zeta converter through the incremental conductance maximum power point tracking (INC-MPPT) algorithm offers soft starting of the BLDC motor. The proposed water pumping system is designed and modelled such that the performance is not affected under dynamic conditions.

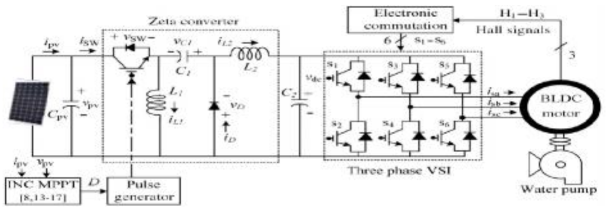
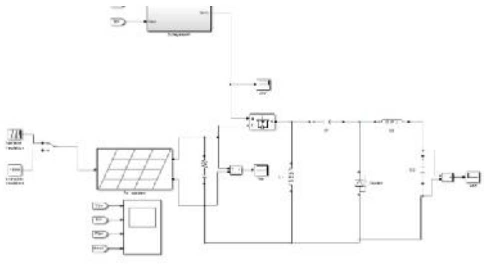


Fig. 3.1 SPV-zeta converter-fed BLDC motor drive for water pump.

The SPV array generates the electrical power demanded by the motor-pump. This electrical power is fed to the motor pump via a zeta converter and a VSI. The SPV array appears as a power source for the zeta converter as shown in Figure 3.1. Ideally, the same amount of power is transferred at the output of zeta converter which appears as an input source for the VSI. In practice, due to the various losses associated with a dc– dc converter, slightly less amount of power is transferred to feed the VSI. The pulse generator generates, through INCMPPT algorithm, switching pulses for insulated gate bipolar transistor (IGBT) switch of the zeta converter. The INC-MPPT algorithm uses voltage and current as feedback from SPV array and



generates an optimum value of duty cycle. Further, it generates actual switching pulse by comparing the duty cycle with a high-frequency carrier wave. In this way, the maximum power extraction and hence the efficiency optimization of the SPV array is accomplished. The VSI, converting dc output from a zeta converter into ac, feeds the BLDC motor to drive a water pump coupled to its shaft. The VSI is operated

Fig. 3.2 Total topology

in fundamental frequency switching through an electronic commutatio n of BLDC motor assisted by its built-in encoder. The high frequency switching losses are thereby eliminated, contributing in an increased efficiency of proposed water pumping system.

The SPV array-zeta converter-fed VSI–BLDC motor-pump has been proposed and its suitability has been demonstrated through simulated results and experimental validation. The proposed system has been designed and modelled appropriately to accomplish the desired objectives and validated to examine various performances under starting, dynamic, and steady-state conditions. The performance evaluation has justified the combination of zeta converter and BLDC motor for SPV array based water pumping. The system under study has shown various desired functions such as maximum power extraction of the SPV array, soft starting of BLDC motor, fundamental frequency switching of VSI resulting in a reduced switching losses, speed control of BLDC motor without any additional control, and an elimination of phase current and dc-link voltage sensing, resulting in the reduced cost and complexity. The proposed system has operated successfully even under minimum solar irradiance.

IV SIMULATION RESULTS

In this section, the simulation results are shown. Where the output schematics are simulated by the MATLAB 2013 Ra and network simulator tool.

MATLAB RESULT

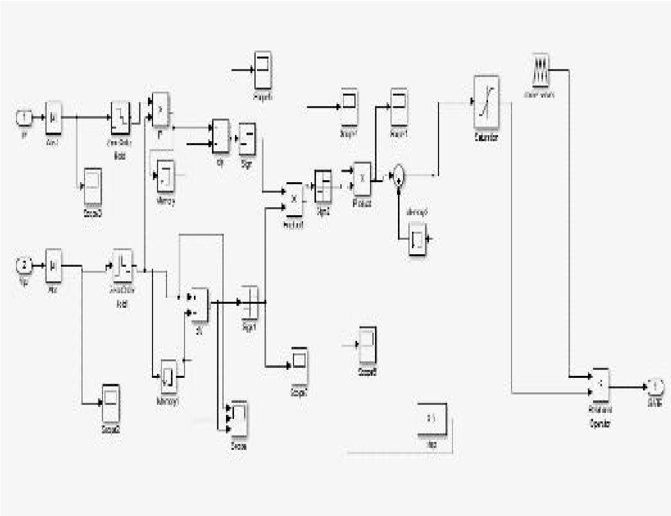


Fig.4.1 Matlab Simulink Model

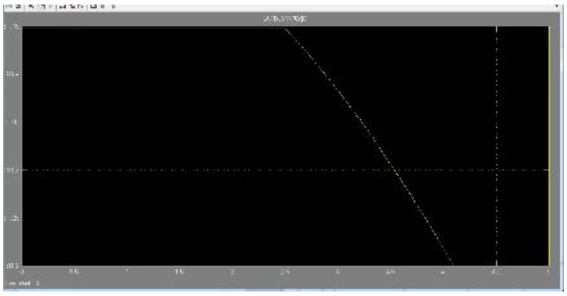


Fig.4.2 Input Voltage

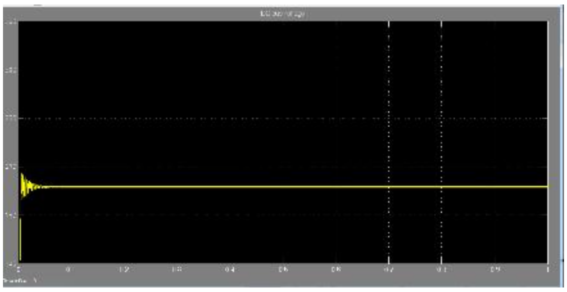


Fig. 4.3 Output Voltage

Network Simulator

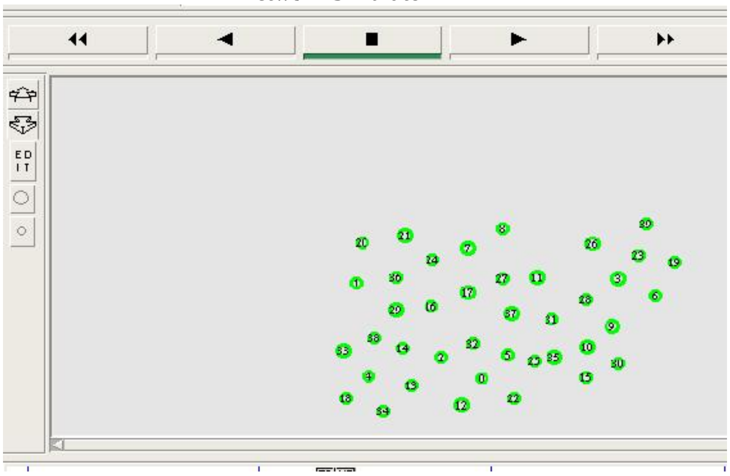


Fig.4.4Node Creation

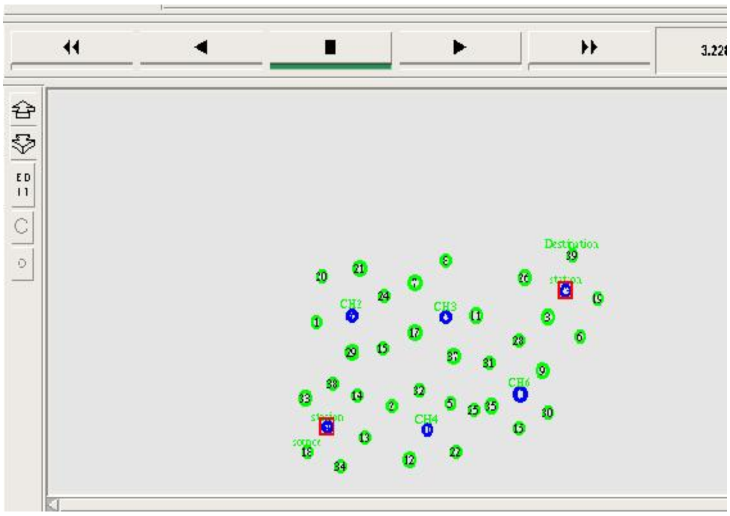


Fig.4.5 Proposed Topology Communication

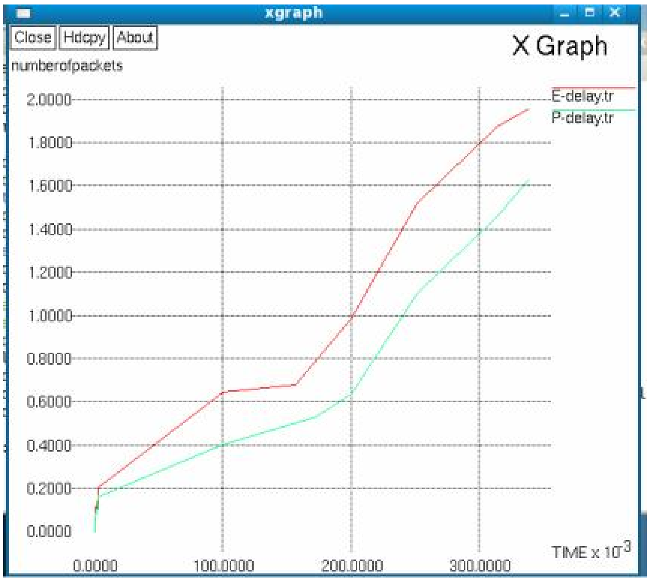


Fig.4.6Existing and proposed loss comparison

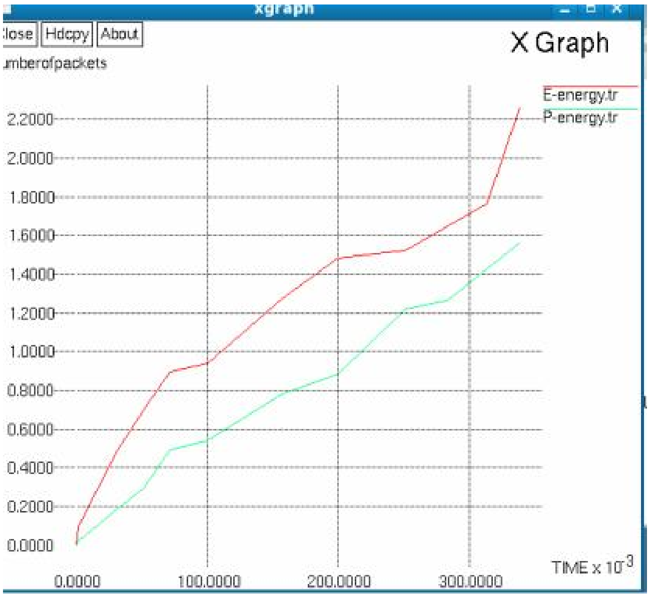


Fig.4.7 Comparison Chart For Throughput

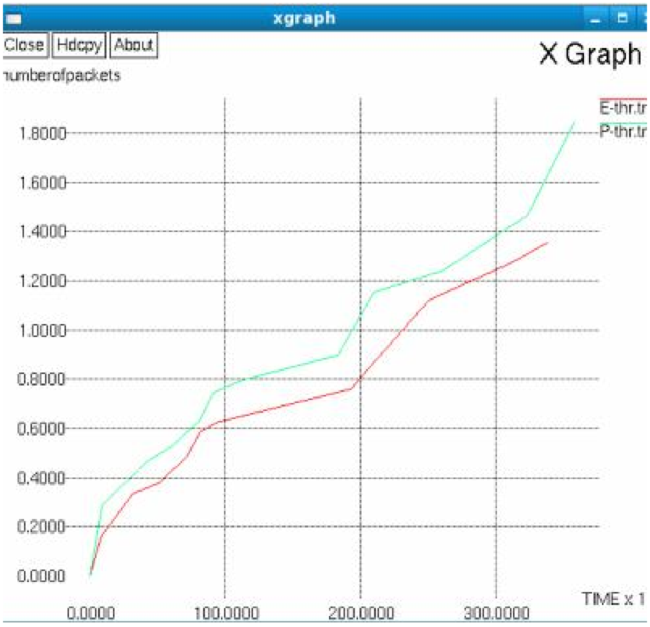


Fig.4.8 Comparison chart for delay

V CONCLUSION

The Internet of Things has a vision in which the internet extends into the real world embracing everyday objects. The IoT allows objects to be sensed and/or controlled remotely over existingnetwork infrastructure, creating opportunities for pure integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. This technology has many applications like Solar cities, Smart villages, Micro grids and Solar Street lights and so on. As Renewable energy grew at a rate faster than any other time in history during this period. The proposed system refers to the online display of the power usage of solar energy as a renewable energy. This helps the user to analysis of energy usage. Analysis impacts on the renewable energy usage and electricity issues.

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