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RESEARCH ARTICLE OPEN ACCESS

Performance Analysis of Solar Tree Based Power Supply

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Abstract:

A solar tree is a structure incorporating solar energy on a single pillar, like a tree trunk. It may be a solar network or a functional power generator. Solar Tree could be the best one for us. We can also use the Technique called "SPIRALLING PHYLLATAXY" to improve the efficiency of the plant. It is much better than traditional solar PV system in area point of view and also more efficient. This solar tree is connected to an inverter that will enable the inversion of a DC power source to an AC power source that will be either used to supply a load or connected directly to the utility grid. The controller will be implemented using arduino. This programmed arduino will be able to automatically control the whole power system operation without the need of any user intervention.

Keywords -– **PV system, Solar Tree, Phyllotaxy pattern, PV system, Solar panel**

I. INTRODUCTION

Renewable energy is a socially and politically defined category of energy sources. Renewable energy resources are easily available in nature and they can be used again and again such as sunlight, wind, rain, tides, waves and geothermal heat. These energy resources are mostly used in electricity generation.

Solar energy is a radiant light and heat energy from the sun is commonly used in various technologies such as solar heating, solar photovoltaic, solar thermal electricity, solar architecture and artificial photosynthesis. Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favourable thermal mass or light dispersing properties, and designing spaces that naturally circulate air [1]. "Solar power" is the common name of sunlight converted into electricity using PV cells. A photovoltaic cell (PV) is a device that converts light into electric current using the photoelectric effect.[2]

The "Solar Tree" is a combination of artistic and technological effort which exists as a form of solar artwork. An inverter that will enable the inversion of a DC power source, supplied by Photovoltaic (PV) Cells, to an AC power source that will be either used to supply a load or connected directly to the utility grid. The controller will be implemented using arduino.

II. DESCRIPTION

2.1 Solar tree:

Solar Tree is a light fixture combining an innovative design with the technical performances of LED lighting systems using solar energy supplied from a photovoltaic system. This project aims to combine the reduced environmental impact, especially deriving from a low absorption of fossil fuel-based energy, with the need to ensure constant operation and expected light performances.[5]

2.2 Inverter:

Solar inverters convert DC voltage of solar modules into AC voltage regulated amount and frequency, timed with network voltage. Inverters that used for connection of PV modules with network are divided into voltage inverters and electrical inverter, and based on regulation, are divided on current controlled and voltage regulated

inverters. The gate pulse is given through arduino. [5]

2.2.1 Arduino processor:

Arduino is a microprocessor board which are equipped with sets of digital and analog input/output pins. The arduino can be programmed with c or c++ language.

III. SIMULATION RESULTS

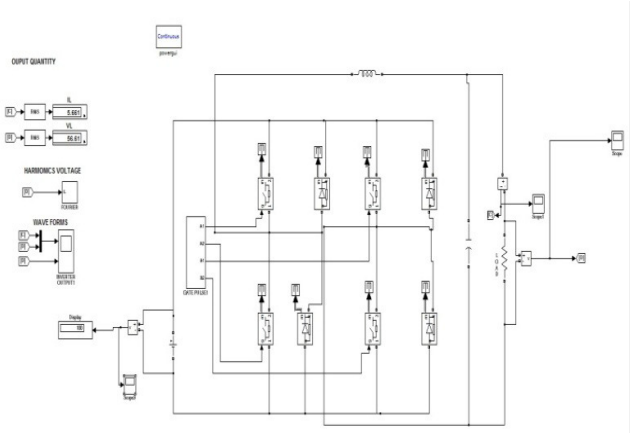

Fig.3.1 SPWM inverter model

Fig.2 shows the MATLAB model for SPWM inverter using arduino. An external pulse is given for IGBT using arduino processor.

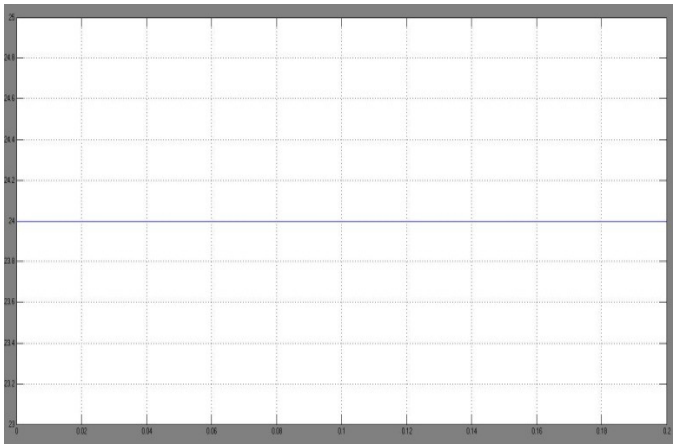

Fig.3.2 input voltage

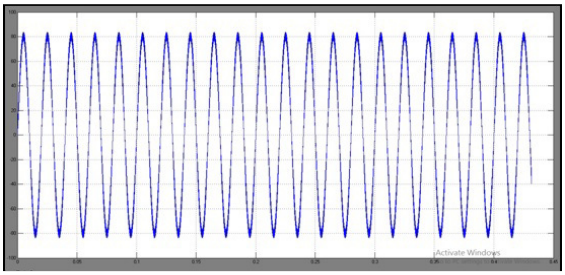

Fig.3.3 output voltage of inverter model

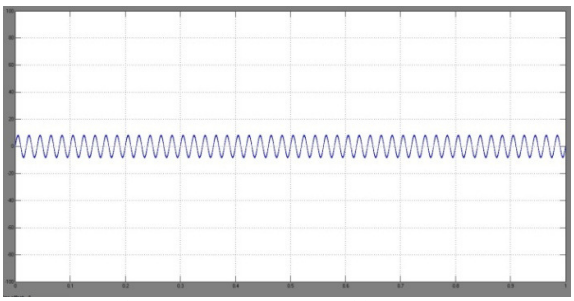

Fig.3.4 output current of inverter model

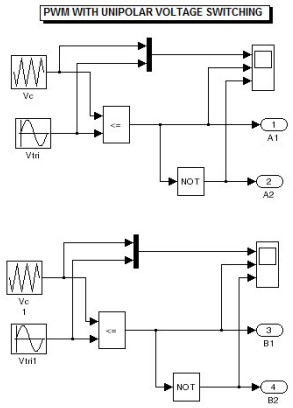

Fig.3.5 circuit diagram for gate pulse

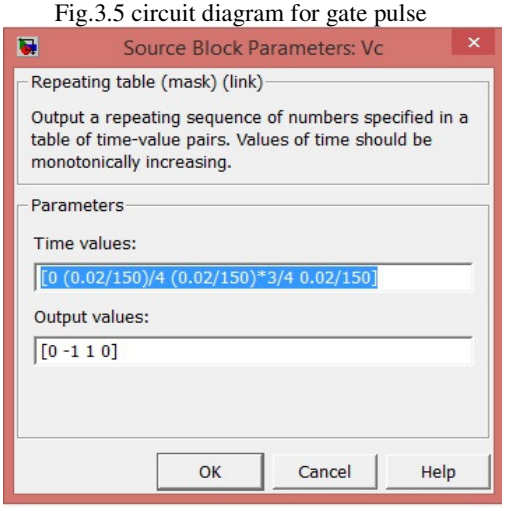

Fig.3.6 parameter values for gate pulse

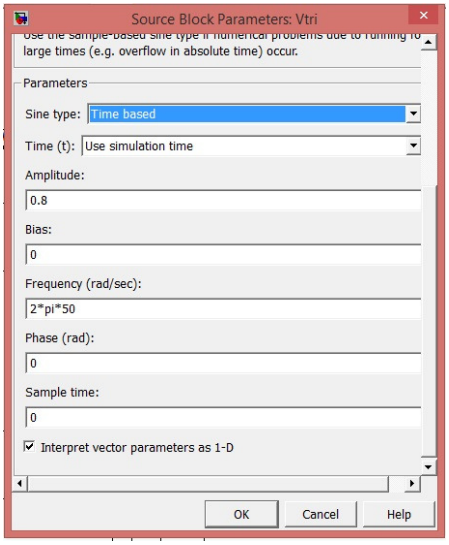

Fig. 3.7 parameter values for gate pulse

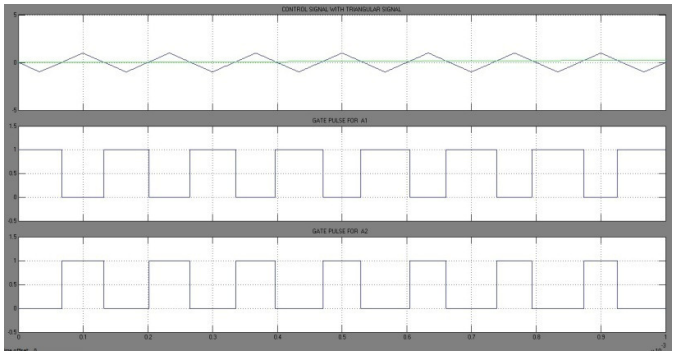

Fig. 3.9 output waveform for gate pulse

IV. CONCLUSIONS

The simulation results of the inverter circuit show that we can achieve accurate output. The solar tree sounds like the perfect solutions for our future energy needs. Solar tree is a revolutionary urban lighting concept that represents a perfect design for electricity production. The solar tree design made 50% more electricity and collecting time of sunlight was up to50% longer. It helps environment more eco-friendly, saves money and space and lasts for lifetime. This performance characteristic can be especially important in the PV cell arranged in solar tree with inverter circuit using arduino. The hardware setup is under progress.

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