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"Sun Tracking Hybrid Solar Inverter"

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ABSTRACT

Solar panel has been used increasingly in recent years to convert solar energy to electrical energy. The solar panel can be used either as a stand-alone system or as a large solar system that is connected to the electrici0155ty grids. The earth receives 84 Terawatts of power and our world consumes about 12 Terawatts of power per day. We are trying to consume more energy from the sun using solar panel. In order to maximize the conversion from solar to electrical energy, the solar panels have to be positioned perpendicular to the sun. Thus the tracking of the sun's location and positioning of the solar panel are important. The goal of this project is to design an automatic tracking system, which can locate position of the sun. The tracking system will move the solar panel so that it is positioned perpendicular to the sun for maximum energy conversion at all time. Photoresistors will be used as sensors in this system. The system will consist of light sensing system, microcontroller, gear motor system, and a solar panel. Our system will output up to 40% more energy than solar panels without tracking systems , the design of Solar Inverter which is required to run AC loads which is mostly used as consumable purpose. The power output of the designed inverter is 100W, input voltage is 12V ,Output is 220 V, 50Hz square wave output.

KEYWORDS: Solar Energy, Microcontroller, Solar tracking mechanism, Inverter.

INTRODUCTION

The system consists of light sensing, tracking, charging, processing, controlling, converting and display units**.** It consists of solar tracking mechanism which allows more energy absorb solar panel and the corresponding energy production is more because the solar panel movement is almost normal to the sun light**.** Rotation of the solar panel is done by DC servo motor The Automatic Sun Tracking System **(**ASTS**)** was made as a prototype to solve the problem, mentioned above**.** It is completely automatic and keeps the panel in front of sun until that is visible**.** In case the sun gets invisible e.g**.** in cloudy weather, then without tracking the sun the ASTS keeps rotating the solar panel in opposite direction to the rotation of earth**.** But its speed of rotation is same as that of earth**'**s rotation**.** Due to this property when after some time e.g**.** half an hour when the sun again gets visible, the solar panel is exactly in front of sun and its

rotation is controlled by using processing and control units based on the light sensing unit**.** The absorb solar power is stored in a battery and to convert dc power

supply to ac supply by using inverter **.** The need of running AC Loads on solar energy leads us to the design of Solar Power Inverter**..** Since the majority of modern conveniences all run on **220** volts AC, the Power Inverter will be the heart of the Solar Energy System**.** It not only converts the low voltage **12** volts DC to the **220** volts AC that runs most appliances, but also can charge the batteries if connected to the utility grid as in the case of a totally independent stand-alone solar power system**.**An inverter is an electrical device that converts direct current **(**DC**)** to alternating current

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(AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits. Solid-state inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high voltage direct current applications that transport bulk power. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries.

Types of Tracking Systems:

Solar trackers may be active or passive and may be single axis or dual axis. Single axis trackers usually use a polar mount for maximum solar efficiency. Single axis trackers will usually have a manual elevation (axis tilt) adjustment on a second axis which is adjusted on regular intervals throughout the year. Compared to a fixed mount, a single axis tracker increases annual output by approximately 30%, and a dual axis tracker an additional 6%.

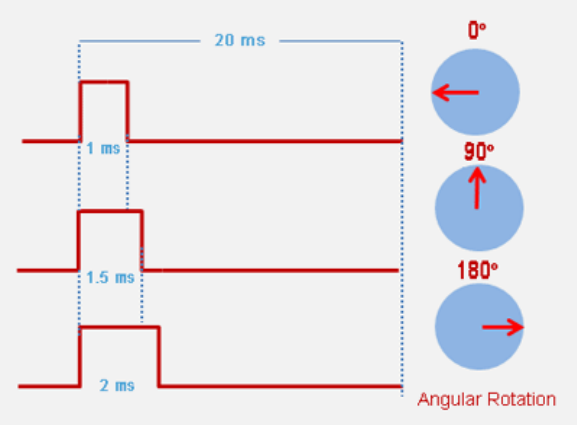
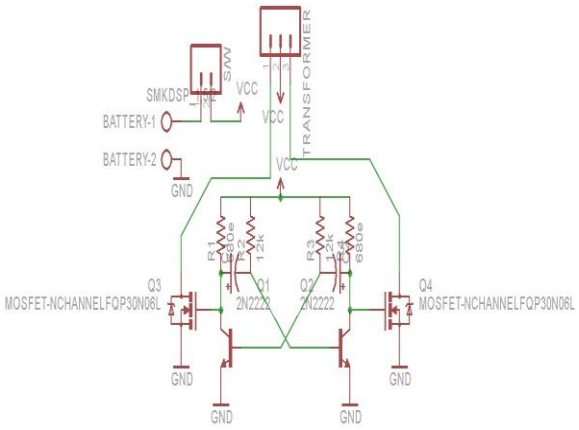


Fig1- Rotation of servo motor

SERVO MOTOR is controlled by PWM (Pulse with Modulation) which is provided by the control wires. There is a minimum pulse, a maximum pulse and a repetition rate. Servo motor can turn 90 degree from either direction form its neutral position. The servo motor expects to see a pulse every 20 milliseconds (ms) and the length of the pulse will determine how far the motor turns. For example, a 1.5ms pulse will make the motor turn to the 90° position, such as if pulse is shorter than 1.5ms shaft moves to 0° and if it is longer than 1.5ms than it will turn the servo to 180°

INVERTER

An INVERTER is an electrical device which convert direct current (DC) to alternating current (AC) by using RC PHASE SHIFT OSCILLATOR and MOSFET.



WORKING PRINCIPLE:

In this project various hardware units are used for different purposes such as sensing of sunlight, data acquisition, controlling of entire system using DC servo motor and its driving circuitry, storage and converting DC to AC. The proposed system is a closed loop system, where the output is fed back based on the outputs from the two sensors. The diagram showing different units from sensing unit to application SOLAR MMC in single axis solar tracking system.

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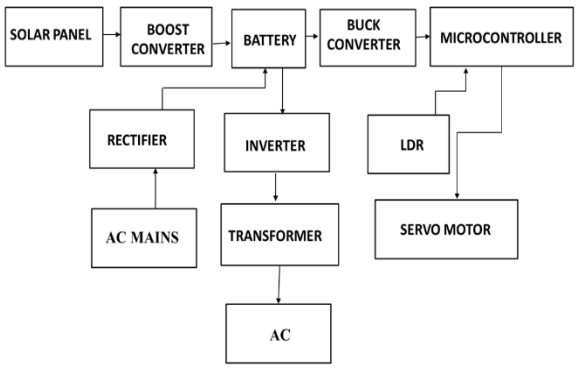
BLOCK DIAGRAM



A system is being switched on, the microcontroller will initialize all setting for servo motor, LDR, LCD panel, voltage sensing of solar panel and battery.

Considering day time, the solar panel will start converting solar energy to electrical energy and its best position will be governor by combination of 2 LDR and Servo motor.

Microcontroller will adjust solar panel position in such way that it can harvest solar power as much as it can.

Now sunsets and solar panel's voltage starts decreasing during night time then solar panel come to its initial position.

During solar energy harvesting, the energy will be stored in battery to be used later or as required.

This battery's power now feed to inverter to power up home appliances while can work on 220V ac.

Now, considering cloudy condition, this time voltage of panel may be below battery charging voltage, this time we will use grids energy to charge the battery.

METHODS AND MATERIAL

Working principle of "Sun tracking hybrid solar inverter" is it has panels mounted in a particular arrangement at an in such a way that it can receive solar radiation with high intensity easily from the sun. These solar panels convert solar energy into electrical energy. This electrical energy is stored in batteries by using a solar charger. The main function of the solar charger is to increase the current from the panels while batteries are charging, it also disconnects the solar panels from the batteries when they are fully charged and also connects to the panels when the charging in batteries is low. This battery's power now feed to inverter to power up home appliances while can work on 220V ac.Now, considering cloudy condition, this time voltage of panel may be below battery charging voltage, this time we will use ac mains to charge the battery

Sr No	Components	Rating
1	Solar panel	15w,18v,0.75A
2	Battery	18v,4.5A
3	Boost converter	8v to15v
4	Buck converter	14.5v to 5v
5	Capacitor	2.5µf, 100µf, 1000µf
6	Resistor	12k, 10k, 680
7	Transformer	12v to 220v,3A 220v to 18v,1A
8	Transistor	2N2222
9	Servo motor	5v,2.9kg

RESULTS AND DISCUSSION

The verification of the solar System is done for the usefulness of the system. The voltage, current and power measurements of developed system, obtained at different time intervals for both fixed panel and single axis solar tracking system are shown in Table.

POWER	6.47W
VOLTAGE	14.86V
CURRENT	0.45A

Table no1. Typical Power Ratings of the Solar Panel in Morning Position.

POWER	8.442W
VOLTAGE	18.76V
CURRENT	0.46A

Table no2. Typical power ratings of the solar panel in Noon position.

POWER	**7.191W**
VOLTAGE	15.98V
CURRENT	0.45A

Table no3. Typical Power Rating of the solar Panel in Evening Position.

CONCLUSION

In developing countries usage of electricity increasing day by day**.** Mostly the electricity generate with using of non-renewable energy sources, and we know non renewable sources are comes to end so fastly so now we should to thinking about this**.** We should to make some enomotive, so which helps to increases the uses of renewable energy sources**.**

We should to make some innovative so which helps to increase the uses of renwable energy sources By considering this point we decide to make 'SUN TRACKING HYBRID SOLAR INVERTER' which helps to absorb more solar energy by solar panel and feed to inverter to generate electricity.

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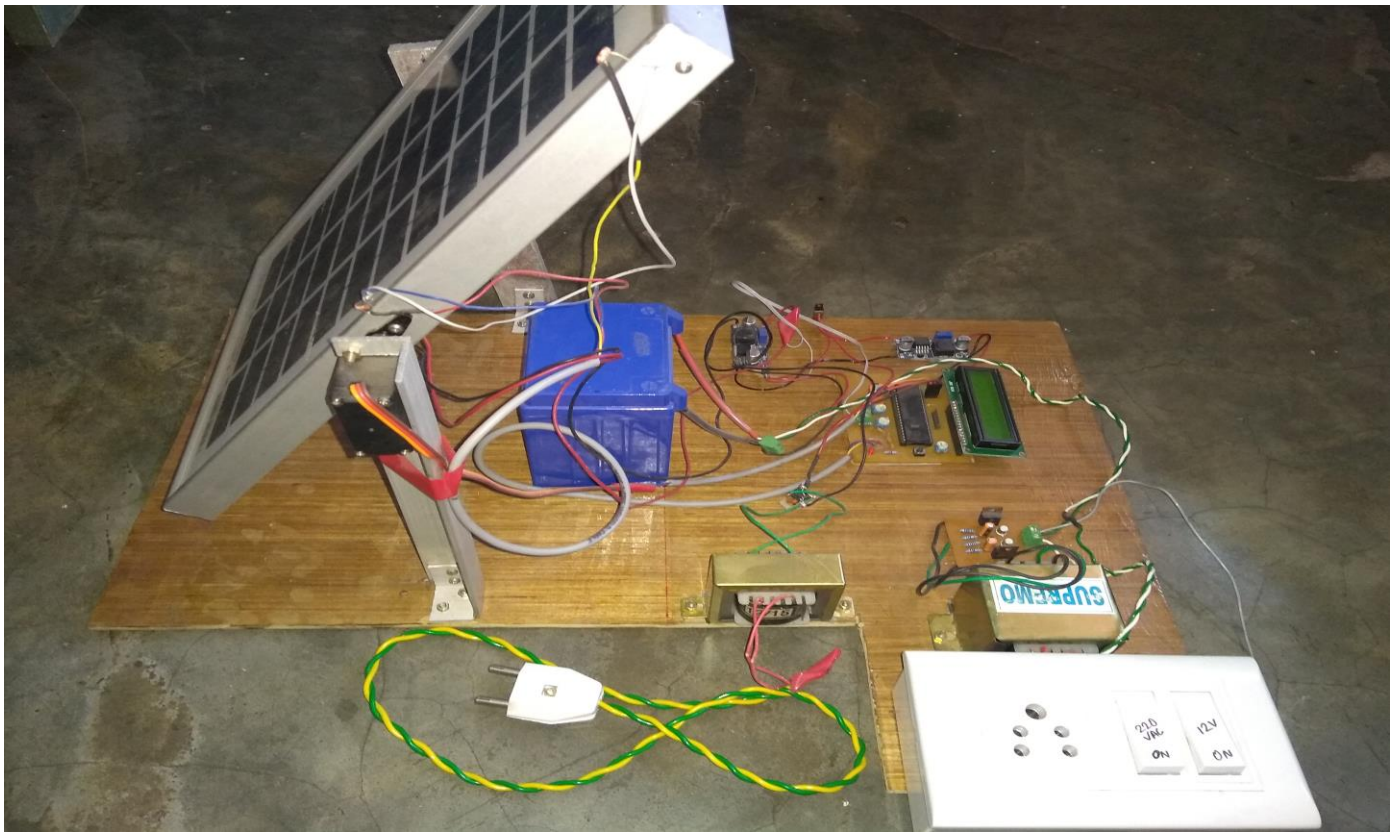

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