IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 10, Iss 11, 2021

IMPLEMENTATION OF SOLAR INVERTER FOR HOME, GARDEN APPLICATIONS

[1]Sandeep Neeradi,[2]Adluri Mahesh,[3]Choul Pradeep,[4]Sravanthi Kamtam
[1234]Assistant Professor
Department Of EEE
Kshatriya College of Engineering

ABSTRACT:

Solar energy is free and clean. There is enough for everyone, and we will never run out of it. Solar energy is renewable. The sun will keep making energy for millions of years.Why don't we use the sun for all our energy needs? We don't know how to yet. The hard part is capturing the sunlight. It shines all over the earth and only a little bit reaches any one place. On a cloudy day, most of the light never reaches the ground at all.Lots of people put solar collectors on their roofs. Solar collectors capture the sunlight and turn it into heat. People can heat their houses and their water using the sun's energy. Solar cells can turn light energy into electricity. Some toys and calculators use solar cells instead of batteries. Solar panels are made of many solar cells. Some people put solar panels on their home. These solar panels can make enough electricity for a house. Solar panels are good for houses and buildings without access to power lines.

We can power our house by using solar panels by placing them on the roof and then connected to the battery and the battery is connected to the inverter. a solar inverter is a piece of the solar energy puzzle. Its purpose is to change the direct current (DC) electricity that is generated from a photovoltaic panel into an alternating current (AC) that can be used by in-home appliances and the community electricity grid. Because all photovoltaic panels produce electricity in DC, an inverter is required for all solar power systems to make the electricity usable.

This project uses regulated 5V; 500mA power supply. A 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

I.INTRODUCTION

We see many people using Solar inverters these days which proves that its necessity has been increased in the current years. A Solar inverter is similar to a normal electric inverter but uses the energy of the Sun i.e. Solar energy. A solar inverter helps in converting the direct current into alternate current with the help of solar power. Direct power is that power which runs in one direction inside the circuit and helps in supplying current when there is no electricity. Direct currents are used for small appliance like mobile e phones, MP3 players, IPod etc. where there is power stored in the form of battery. In case of alternative current it is the power that runs back and forth inside the circuit. The alternate power is generally used for house hold appliances. A solar inverter helps devices that run on DC power to run in AC power so that the user makes use of the AC power. If you are thinking why to use solar inverter instead of the normal electric one then it is because the solar one makes use of the solar energy which is available in abundant from the Sun and is clean and pollution free.

Solar inverters are also called as photovoltaic solar inverters. These devices can help you save lot of money. The small-scale grid one have just two components i.e. the panels and inverter while the off grid systems are complicated and consists of batteries which allows users to use appliances during the night when there is no Sunlight available. The solar panel and the batteries that are placed on rooftops attract Sun rays and then convert the Sunlight into electricity. The batteries too grab the extra electricity so that it can then be used to run appliances at night.

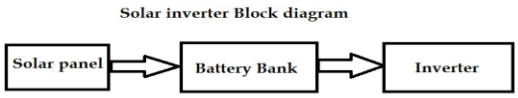
Solar energy is becoming increasingly lucrative with the increasing cost and continuous depletion of the non-renewable energy resources and the growing demand of other renewable energy sources such as solar wind, geothermal and ocean tidal wave . However, in spite of the multiple benefits of solar energy, solar panels which capture sunlight are stationary (solar array has a fixed orientation to the sky). These stationary as well as expensive solar panels are unable to extract the maximum solar energy as there is no stability of weather conditions

ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 10, Iss 11, 2021

. The power output of solar panels is maximum when it is oriented perpendicularly to the direction of sun rays as both the area of illumination of sunlight on solar panels and intensity of sun-rays is maximum in this case. It has been found out that the efficiency of solar panels improve by 30-60 percent when we use a mobile solar tracking system instead of a stationary array of solar panels. The design and implementation of a power efficient solar tracker is therefore a challenge owing to the immobility of the solar panels. The angle of inclination of sun-rays with the solar panels continuously changes due to the movement of the sun from east to west because of earth's rotation independent of the weather conditions . Moreover, during cloudy days the situation totally goes berserk. Additionally the revolution of the earth alters the distance between earth and sun which introduces change of pattern of incoming sun rays. All these factors should be kept in mind for designing the solar tracking electricity generation system to achieve maximum efficiency. In this paper, we have discussed about the solar tracking system that we have designed using some LDR's (light dependent resistances), micro-controller (AT89S52), comparator using OPAMP's, a crystal oscillator, stepper motor and stepper motor driver. The basic idea behind this work is that the intensity of light will be sensed by the LDR's separated by a certain angular distance, the comparators will compare the incident light intensity with the intensity of perpendicular incidence. The micro-controller will rotate the stepper motor by the desired angle depending on the output of the comparators via a stepper motor driver circuit to maximize the efficiency. Owing to the change in the location where the device is placed and weather conditions, the intensity of sunlight changes, for which we have made a provision of changing the threshold value by using variable resistance.

II. LITERATURE REVIEW

As it name suggests solar inveter is used to convert solar dc power into AC power. Solar panel energy is store in batteries using solar charge controller**.** Dc power stored in batteries is converted into AC power using inverter. Inverter is power electronics dc to ac converter. There are many applications of inverters in power system, industrial and domestic usage. Block diagram of solar inverter is shown below. Block diagram of solar inverter given below is self explainatory. But if you have still any question about it, you are welcome to write it in comments.



Electronic devices run on AC power, however, batteries and some forms of power generation produce a DC voltage so it is necessary to convert the voltage into a source that devices can use. Hence a need for power rating inverter to smoothly operate electrical and electronic appliances. Most of the commercially available inverters are actually square wave or quasi square wave inverters. Electronic devices run by this inverter will damage due to harmonic contents [1]. Available sine wave inverters are expensive and their output is not so good. For getting pure sine wave we've to apply sinusoidal pulse width modulation (SPWM) technique. This technique has been the main choice in power electronics because of its simplicity and it is the mostly used method in inverter application [2]. To generate this signal, triangular wave is used as a carrier signal is compared with sinusoidal wave at desired frequency. Advances in microcontroller technology have made it possible to perform functions that were previously done by analog electronic components. With multitasking capability, microcontrollers today are able to perform functions like comparator, analog to digital conversion (ADC), setting input/output (I/O), counters/timer, among others replacing dedicated analog components for each specified tasks, greatly reducing number of component in circuit and thus, lowering component production cost. Flexibility in the design has also been introduced by using microcontroller with capability of flash programming/reprogramming of tasks [3].

III. DESIGN OF HARDWARE

This chapter briefly explains about the Hardware implementation of authentication of Solar inverter for home applications. It discuss the circuit diagram of each module in detail.

ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 10, Iss 11, 2021

3.1.ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode.Arduino board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Fig: ARDUINO UNO

3.2. POWER SUPPLY

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

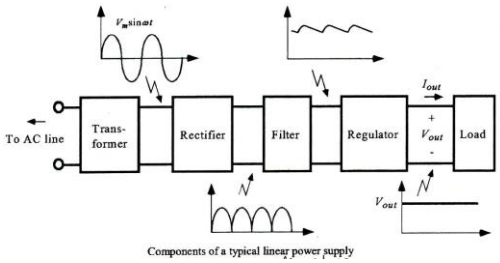
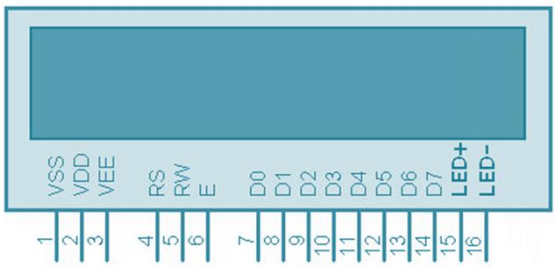


Fig:Power Supply

3.3 LCD

Liquid Crystal Display also called as LCD is very helpful in providing user interface as well as for debugging purpose. The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. The most commonly used LCDs found in the market today are 1 Line, 2 Line or 4 Line LCDs which have only 1 controller and support at most of 80 characters, whereas LCDs supporting more than 80 characters make use of 2 HD44780 controllers



3.4RELAYS

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also

ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 10, Iss 11, 2021

other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination.

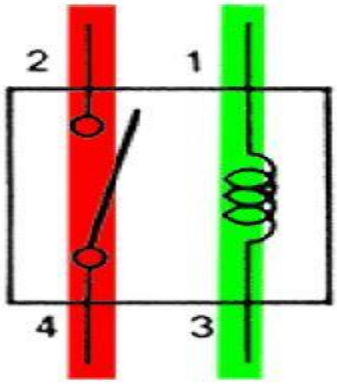


Fig: relay

3.5 IR SENSOR

Infrared is a energy radiation with a frequency below our eyes sensitivity, so we cannot see it Even that we can not "see" sound frequencies, we know that it exist, we can listen them.

Even that we can not see or hear infrared, we can feel it at our skin temperature sensors. When you approach your hand to fire or warm element, you will "feel" the heat, but you can't see it. You can see the fire because it emits other types of radiation, visible to your eyes, but it also emits lots of infrared that you can only feel in your skin.

3.6Photovoltaic cell and array modeling

A PV cell is a simple p-n junction diode that converts the irradiation into electricity. Fig.3.2 illustrates a simple equivalent circuit diagram of a PV cell. This model consists of a current source which represents the generated current from PV cell, a diode in parallel with the current source, a shunt resistance, and a series resistance.

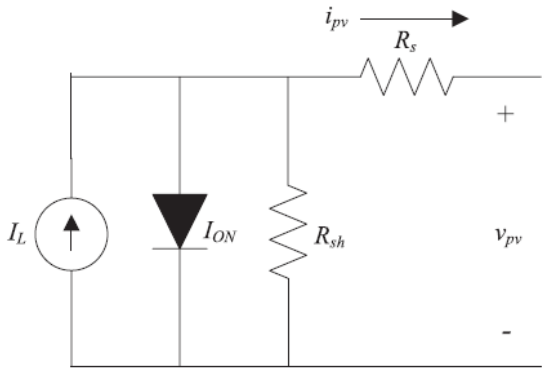
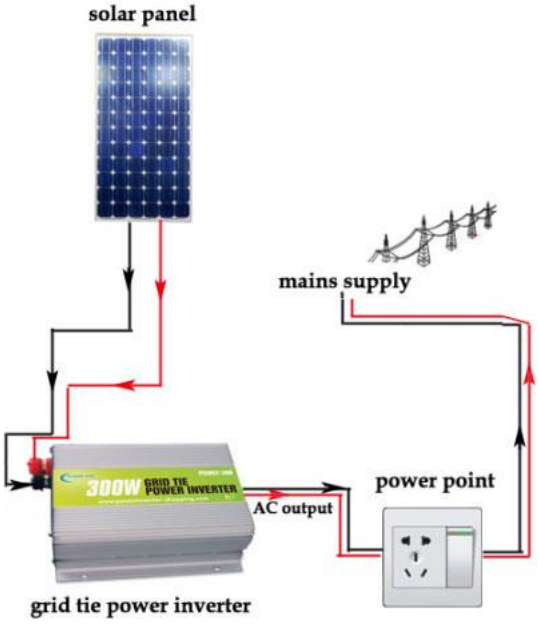


Fig. Equivalent circuit diagram of the PV cell

3.7 INVERTER

The energy derived from Sun is a renewable one and is totally free of cost. We have learnt how the solar inverter helps in providing electricity and now we shall learn how a solar inverter is made. A solar panel is capable enough to convert the heat or energy of the Sun into direct current.



IV. PROJECT DESCRIPTION

4.1. BLOCK DIAGRAM:

ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 10, Iss 11, 2021

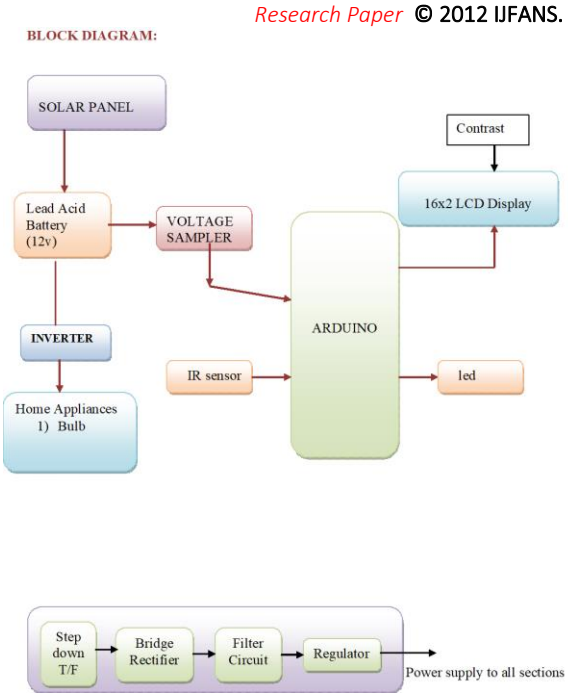


Fig : block diagram

WORKING:

Now after knowing what a solar inverter is, let's talk about its working. Solar panels produce direct electricity with the help of electrons that are moving from negative to positive direction. Most of the appliances that we use at home work on alternative current. This AC is created by the constant back and forth of the electrons from negative to positive. In AC electricity the voltage can be adjusted according to the use of the appliance. As solar panels only produce Direct current the solar inverter is used to convert the DC to AC.

An inverter produces square waves or a sine wave which can be used for running lights, televisions, lights, motors etc. However these inverters also produce harmonic distortion. Expensive inverters make use of lots of steps to produce a sine wave and thus are found in residential solar inverters. Basically inverters should be a large one so that it supplies enough power to all the necessary appliances.

An inverter s easy to buy but choosing the right solar inverter for your appliance is more important. Thus you must always consult a solar professional before buying on. We know that the energy derived from sun is solar energy which is one of the cleanest sources of energy. Also it can be used to provide lighting to houses.

You can make us of the photovoltaic tiles that attract energy from Sun and converts it into a clean form of electricity which can be used to light, houses, industries and companies. The cells of photovoltaic consist of positive and negative silicon that is placed underneath a slice of glass. When the protons of the Sunlight hit the PV cells they knock the neutrons present in the silicon. Now the negative charged neutrons get attracted to the silicon but then are held inside a magnetic field. The wires attached on the silicon catch hold of these neutrons and while connecting to the circuit, current is formed. This then gives space for direct electricity and for converting that into alternate electricity an inverter is used so that the house appliances can run. As mentioned before major of the house appliances work on alternate current hence an inverter is used to convert DC to AC.

Solar power apart from making your home appliances work can also be used to heat water and swimming pools too.

Here we were used ldr for automatic on off the lights.

V.CONCLUSION

The designed solar tracker system could track the movement of the sun with the help of microcontroller and stepper motor. This system can work properly irrespective of weather conditions and location. We can change the threshold voltage of the tracker according to our requirement. It can also initialize the starting position once the sun sets. Moreover, during night the solar panel faces the ground which in turn protects it from dust particles and increases its longevity. However, the designed prototype of the solar tracker is a miniature of the main system and so there are a number of limitations. The number of LDRs should be increased for the practical case. Moreover, we have considered one dimensional rotation of the tracker. So we aim to increase the degrees of freedom of this tracker in future course of work.

REFERENCES

[1] Arsalan, S. 2013. Sun Tracking System with Microcontroller 8051, Intl. J. Sci & Eng. Research, Vol. 4, 2998.

[2] Anuraj, A.,and Gandhi R., 2014, Solar Tracking System Using Stepper Motor, Intl. J. Electronic & Electrical Eng., Vol.7 , 561

ISSN PRINT 2319 1775 Online 2320 7876
 Journal Volume 10, Iss 11, 2021

[3] Chhatwani, P. K., and Somani, J. S., 2013, Intelligent Solar Tracker System Implemented On 8051 Microcontroller, Intl. J. Eng. Trends Technol., Vol 4, 4267.

[4] Saxena, A. K., and Dutta, V., 1990, A versatile microprocessor based controller for solar tracking, Photovolt Specialists Conf., 21st IEEE Proc.

[5] Nirmal, H. B., and Naveed, S. A., 2013, Microcontroller Based Automatic Solar Power Tracking System, Intl. J. Electrical Eng. & Technol., Vol 4, 109.

[6] Tudorache, T., and Kreindler, L., 2010, Design of a Solar Tracker System for PV Power Plants, Acta Polytech. Hung., Vol 7, 23.

[7] Barsoum, N., and Vasant, P., 2010, Simplified Solar Tracking Prototype, Global J. Technol. Optim.,Vol. 1, 38.

[8] Wang., J. M., and Lu, C. L., 2013, Design and Implementation of a Sun Tracker with a Dual-Axis Single Motor for an Optical Sensor-Based Photovoltaic System, Sensors, Vol. 13, 3157.

[9] Bingoll, O., Altintas, A., and Oner, Y., 2006 Microcontroller Based Solar-tracking System and its Implementation, J. Eng. Sci., Vol. 12, 243.