IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SOLAR BASED INVERTER USING MICROCONTROLLER

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING, KALABURAGI
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Rashmi (3PD18EC059)
Shraddha (3PD18EC076)
Soundarya (3PD18EC090)
Sushma (3PD18EC096)

Prof. Ganesh Manasali
Department of Electronics and Communication Engineering

ABSTRACT

Solar based inverter using microcontroller is a project model designed that uses the solar energy. This paper presents the design and the implementation of a microcontroller-based solar inverter. The aim of the project is to convert DC voltage to AC voltage using inverter at high efficiency and low cost. Solar and wind powered electricity generation are being favoured nowadays as the world increasingly focuses on environmental concerns. However, there are many challenges in using the solar energy. In this paper, a framework of how solar based inverter can be used and its applications are represented.

Keywords : ATmega 328, DC Motor, Solar Panel.

INTRODUCTION

Solar energy systems have emerged as a viable source of renewable energy over the past two or three decades, and are now widely used for a variety of industrial and domestic applications. Such systems are based on a solar collector, designed to collect the sun's energy and to convert it into either electrical power or thermal energy. In general, the power developed in such applications depends fundamentally upon the amount of solar energy captured by the collector, and thus the problem of developing tracking schemes capable of following the trajectory of the sun throughout the course of the day on a year-round basis has received significant coverage in this project.

In Aden city (Yemen), the improvement in the performance of a solar cooker during summer was found to be as much as 40% for higher elevation angle and 70% for lower elevation angle,

based on the developed tracking algorithms. Moreover, it was shown that the amount of solar energy captured by a tilted collector could be increased by more than 40% by adjusting the tilt angle on a seasonal basis.

This project is designed with MCU. Two LDRs are used to monitor the solar light condition. These LDR output is interfaced to Microcontroller through transistor. The controller continuously checks the voltage level of the LDRs and operates the motor to face the panel to maximum level of intensity. The day / night condition is also monitored by these two LDRs to disable the tracking in night condition. The motor is driven by Motor driver. The microcontroller will rotate the DC motor according to the sun light. To drive the DC motor we have used L293D motor driver circuit. The Microcontroller used is programmed using Embedded 'C' language.

PROBLEM DEFINITION

- Energy needs to be conserved to cut the costs and to preserve the resources for longer use.

- Conventional energy sources pollute the environment by emitting harmful gases into the atmosphere.

- Conventional energy sources are limited and might expire one day. We, therefore, have a responsibility to conserve and save energy as much we can to make it available for our future generations and protect our environment from further degradation.

- The effects of greenhouse gases and pollution are of a major concern and these have led to the new developments using the renewable energy resources such as solar, wind, and geothermal. Therefore, we are using the solar panels that uses solar energy which is the renewable energy source, with a motor for the rotation of the panels.

METHODOLOGY

The fig 1 shows the block diagram of the solar based inverter using microcontroller, which consists of solar panels to absorb the solar energy. Photons in sunlight hit the solar panel and are absorbed by semi conducting materials, such as silicon. An array of solar panels converts solar energy into a usable amount of direct current (DC) electricity.

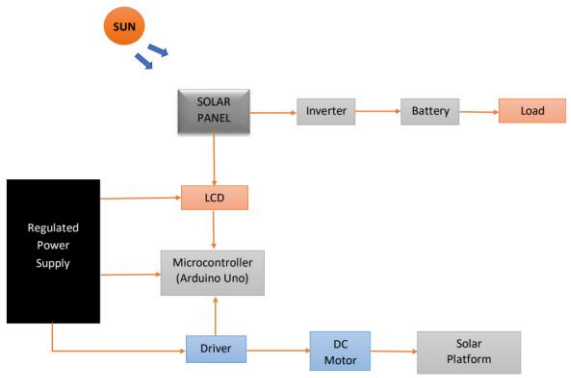


Fig 1 : Block Diagram of Solar based inverter using microcontroller

Solar panels are further connected to LDR. Light Dependent Resistors or LDRs are the resistors whose resistance values depend on intensity of the light. As the intensity of light falling on the LDR increases, resistance value decreases. In dark, LDR will have maximum resistance. The resistors are connected to the LDRs which restricts the flow of current when maximum power is generated by the solar panels.

The output of the solar panels is connected to an inverter. The inverter circuit is used to convert the DC signal which is the output of the solar panel into AC signal. The transformer in this circuit is used to step-up the fluctuating voltage. This conversion is done because the home appliances run on 230 AC mains. Further the output of the inverter is connected to the battery.

Every embedded system requires DC voltage and that will be 5V DC supply. So, the battery voltage, in this case which is of 12V needs to be converted to 5V DC. This is done with the help of regulated power supply (RPS). The rectifier used in the RPS helps in protecting the circuit from battery polarity reversal. Each embedded circuit requires power supply to run, hence RPS does this job by providing 5V DC voltage to these circuits.

The microcontroller used here is ATmega 328 MC. It consists of 28 pins in which 13 pins are general I/O pins and 6 ADC pins. The program used in the microcontroller is given to the driver. The driver used is of the model L293, which works on 12V DC power supply. In our project model, we have used two DC motors. Motor 1 is used to rotate the panel in 180 degrees and motor 2 is used to rotate the panel in 360 degrees. As the DC motor works on 12V DC power supply to rotate the solar panel in dual axis direction, hence this requires driver to control the motors and give the power to DC motors.

The DC output of the solar panel can be observed on the LCD display. This is done using the voltage sensing circuit which is connected to LCD display. The LCD has 8 data pins. The code is transferred to LCD via Arduino. As the 12V battery is charged by the output of the solar panel and this energy can be utilized by connecting it to the load as bulb or charger.

ADVANTAGES AND DISADVANTAGES

Advantages :

- It is one of the methods of renewable generation.
- Constant and uninterrupted supply.
- There is no requirement of electricity and manpower to operate the device.
- It acts as a power back - up solution.
- This is an ecofriendly means of power generation.
- It can be used in distant villages where transmission cost is much high.
- Reduction in consumption from conventional sources of energy.

Disadvantages :

- Initial cost of installation is very high.
- Area required for installation is large.
- It will be less effective in rainy days.
- Protection system installment is very high.
- Cause problems to eye sight because of solar reflectors.

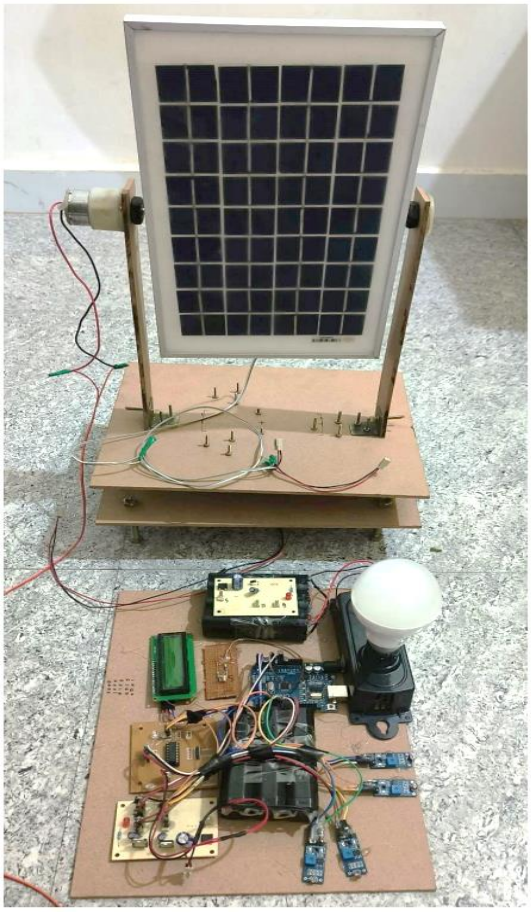
APPLICATIONS

- It can be used to power the traffic lights and streetlights.
- It can be used in home to power the appliances using solar power.
- It can be used in industries as more energy can be saved by rotating the panel.

FUTURE SCOPE

- As whole world is facing a problem of global warming and energy crisis, our project will help to reduce these problems by using solar energy to generate electricity.
- Solar energy is an infinite source of energy. Main motto of our project is to promote use of renewable energy sources. The solar inverter made by us is just a prototype for making future projects which incorporate advanced technologies like micro controlled solar tracking, charge control, etc.
- This is to show that solar inverters are very cheap and easy to install so that the energy demands are shifted on using renewable sources of energy.
- There are more advancements pending in this field which will revolutionize the energy stream and solar energy will be playing the most important role of all.

RESULT AND ANALYSIS



The project model is as shown in the figure. We have successfully completed the project model of solar based inverter using microcontroller. Using the solar energy, the electricity produced is used in the loads. The load we have used is a bulb and a mobile charger.

CONCLUSION

This paper has promising potentials, ranging from the long run economic to the important environmental benefits. This work is one of the few attempts and contributions where such projects could be implemented successfully, in the field of renewable energy. With the increasing improvements in solar cell technologies and power electronics, such projects would have more value added and should receive more attention and support.

ACKNOWLEDGEMENT

We express our deep sense of gratitude and indebtedness to the esteemed institute "Poojya Doddappa Appa College of Engineering", Kalaburagi which has provided us with an opportunity to fulfil the most cherished desire to reach our goal.

We express our foremost gratitude to our guide Prof. Ganesh Manasali for constant support and valuable guidance.

We are thankful to Dr. G.S Biradar, Professor and Head of the Department of Electronics and Communication Engineering, for giving permission to carryout this project.

REFERENCES

[1] Ruchika Thukral, Gulshan Kumar, Ankit Gupta, Nilesh kumar Verma, Shivanchal Asthana, Microcontroller Based Solar Power Inverter. International Journal of Electrical Engineering & Technology, 7(5), 2016, pp. 70– 78.

[2] INTERNATIONAL JOURNAL OF ELECTRICAL ENGINEERING & TECHNOLOGY (IJEET) ISSN 0976 – 6545(Print) ISSN 0976 – 6553(Online) Volume 4, Issue 1, January- February (2013), pp. 109-114 © IAEME

[3] A Review on Solar Tracking System and their Classification : Priti Debbarma, B.B. Bhowmik (M.Tech Student), Assistant Professor Department of Electronics and Communication Engineering Tripura University, Suryamaninagar, Agartala, India

[4] International Journal of Scientific & Engineering Research, Volume 7, Issue 4, April-2016 238 ISSN 2229- 5518 IJSER © 2016

[5] International Journal of Latest Engineering Science (IJLES) - Implementation of Solar Inverter using Microcontroller : Radha Mahajan, Harshada Lonkar, Prachi Ghormade, Rajvi Kuthe Department of Electrical Engineering, Government College of Engineering Nagpur. Student at Government College of Engineering, Nagpur.