ISSN (O) 2321-2004, ISSN (P) 2321-5526

IJIREEICE

International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 8, August 2021

DOI 10.17148/IJIREEICE.2021.9810

An Experimental Study for Dual Axis Solar Tracking System

Shobhit U. Yewale[1], Ashwin M. Pande[2], Shivam S. Kolhe[3], Nitesh R. Chimurkar[4], Janshi Kumari[5], Prof. Rushikesh Bankar[6]

Final Year, Department of Electronics and Telecommunication, NIT Polytechnic, Nagpur, India[1,2,3,4,5]

Lecturer, Department of Electronics and Telecommunication, NIT Polytechnic, Nagpur, India [6]

Abstract: In last ten years, many of residentials around the world used electric solar system as a sub power at their houses. This is because solar energy is an unlimited energy resource, set to become increasingly important in the longer term, for providing electricity and heat energy to the user. Solar energy also has the potential to be the major energy supply in the future. Solar tracker is an automated solar panel that actually follows the Sun to increase the power. The sun's position in the sky varies both with equipment over any fixed position. One well-known type of solar tracker is the heliostat, a movable mirror that reflects the moving sun to a fixed location, but many other approaches are used as well. Active trackers use motors and gear trains to direct the tracker as commanded by a controller responding to the solar direction. The solar tracker can be used for several application such as solar cells, solar day-lighting system and solar thermal arrays.Thus the tracing of the sun's position and positioning of the solar panels is a significant task. The goal of this project is to make an automatic tracing system, which can trace location of the sun. The tracing device will move the solar panel so that it is positioned perpendicular to the sun for maximum energy conversion at all time. LDR's are 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 30% more energy than solar panels without tracking systems.

Keywords: Solar pannel , LDR, Microcontroller, battery,Gear Box

I. INTRODUCTION

Now a day's renewable energy solutions that is collected from renewable resources are becoming popular. Among them, one of the abundant sources is solar energy. For the past years, this application is used in household, industries, schools, colleges etc. Solar system has good efficiency and maximum output. In recent days solar panels are of fixed type, which have lower efficiency than movable type. A solar tracker follower is a gadget utilized for arranging a sun powered photovoltaic board or focal point towards the sun by utilizing the sunlight based or light-based sensors associated with the machine. The advantage of solar energy is that it is unlimited and pollution-free. The only way to increase the solar energy is to arrange the panel perpendicular to the sun. Solar tracking or sunflower is the best method, by following the sun and rearrange the solar panels perpendicular to solar irradiation gives higher efficiency. It is a photovoltaic (PV) system that has been incorporated to bring visibility to solar technology, and at the same time to enhance the landscape and architecture they complement via aesthetics. Smart flowers have been modeled like a sunflower, and they have all the individual components, including solar panels, inverters, wiring, batteries, and others to generate electricity and store it.Besides generating solar energy, another objective of installing smart flower is to create public awareness and increase the adoption of renewable energy. Photovoltaic systems like smart flowers are not typical primary sources of energy for a property, which is fulfilled by traditional rooftop solar panels. Solar flowers work as complementary to rooftop solar systems or various other green building techniques, and symbolizing the environmental benefits of renewable energy.

II. PRAPOSED METHODOLOGY

Solar power is most ubbdant resource accessible from scenery. So it is our most prominent duty to covert that available source into Electricity. So that we can give back to earth in form of polution free and carbon free enviornment. So we have design a rotating sun flower in which solar plate are open up in the morning and close up in the evening. And rotate the solar plate in the direction of sun, so that maximum energy can be converted to electricity. So to execute the work we have used different componant like LDR,Microcontroller and solar pannel and battery house.

ISSN (O) 2321-2004, ISSN (P) 2321-5526

IJIREEICE

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 8, August 2021

DOI 10.17148/IJIREEICE.2021.9810

III. HARDWARE ACCOMPLISHMENT AND WORKING

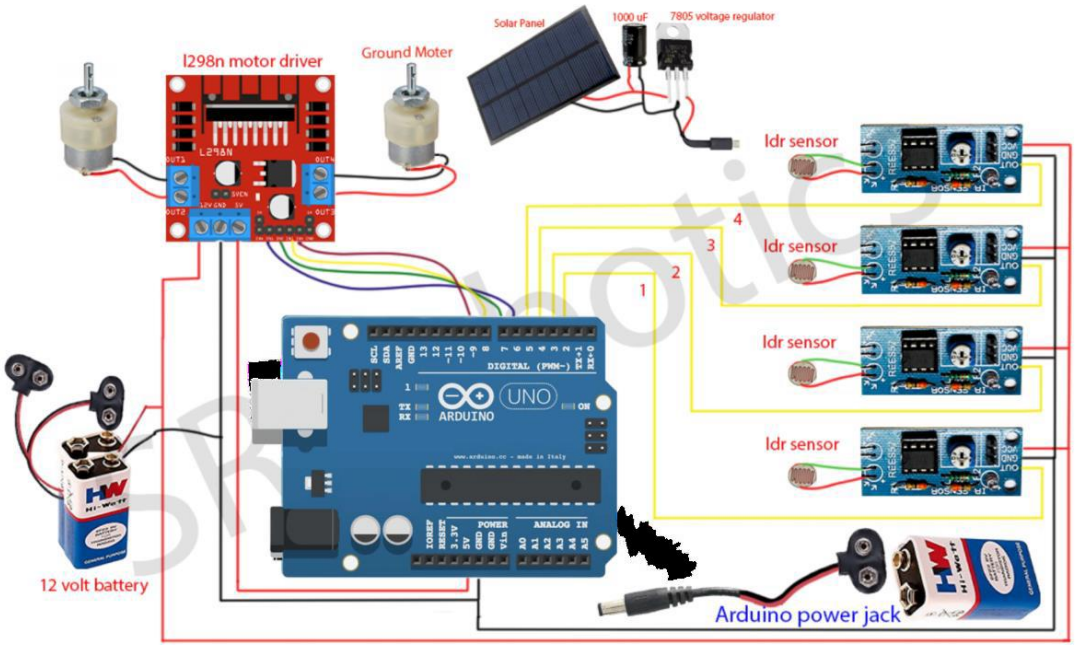

Fig. 1 Diagram of Solar Sun flower

Dual Axis Solar System is the one which follows the sun's movement throughout the day and provides uninterrupted reflection to the solar panel. The sun rays will fall on the solar panel in two ways, which is, they will fall directly on the solar panel and also the reflector will reflect the incident rays on the solar panel. Suppose at the time of sun rise the sun is in extreme east the reflector will align itself in some position by which the incident rays will fall on the solar panel. Now when the earth rotates and the sun gets shifted form in its earlier position the reflection of the incident rays will also change. Thus as a result the light will fall on the sensors kept on each side of the solar panel. The tracking circuit is so designed that when reflection falls on say the sensor attached to the right of the panel, the tracker will move towards the left, and wise-versa. Similar is the case when the reflection falls on the sensor attached at the top of the panel, circuit will make the tracker to move downwards. We here have tried to bring two simple principles together. One being, the normal principle of incidence and reflection on which our tracker works. And the other is the principle on which the solar panel works, which is on the incidence of the solar rays the photovoltaic cells, will produce electricity. This both principles are combined there and as a result of which we are able to fetch nearly double the output which the panel gives normally. Precisely speaking the tracker is liable for two kinds of rotations, on is on the vertical axis and other is on the horizontal axis. The earlier is for the right-left movement of the reflection and the later is for the up-down movement of the reflector, for aligning reflection on the panel.

IV. TECHNOLOGY APPLIED

A. Arduino UNO

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

B. LDR

Light Dependent Resistor is made of a high-resistance semiconductor. It can also be referred to as a photoconductor. If light falling on the device is of the high enough frequency, the absorbed photons by the semiconductor gives bound electrons sufficient energy to jump into the conduction band. The resulting free electron conducts electricity, thereby

ISSN (O) 2321-2004, ISSN (P) 2321-5526

IJIREEICE

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 8, August 2021

DOI 10.17148/IJIREEICE.2021.9810

lowering resistance. Hence, Light Dependent Resistors is very useful in light sensor circuits. LDR is very high resistance, sometimes as high as 10M, when they are illuminated with dramatically fall in light resistance. A LDR is a resistor that changes in value according to the light falling on it. A commonly used device, the ORP-12, has a huge resistance in the dark, and a small resistance in the light. Connecting the LDR to the microcontroller is very straight forward, but some software calibrating is required. As we know, the LDR response is non-linear, and so the readings will not fluctuate in precisely the same way as with a potentiometer. In general there is a larger resistance change at brighter light levels. This can be compensated for in the software by utilizing a lower range at darker light levels.

C. Solar Panel

This solar panel is made of single-crystal material that performs high solar energy transformation efficiency at 25%. It has a fine resin surface and sturdy back suitable for outdoor environments. A 2mm JST connecter is attached to the penal, which makes it perfect to team up with most of our can-use-solar-power-supply boards, like Seeeduino microcontroller series,Lipo Rider charging boards seriesandXBee carrier WSN products series. The typical open circuit voltage is around 5V, depending on light intensity. In those bright summer days with clear sky and big sun, the peak OC voltage can rush up to 10V. To prevent any damage to boards that accept a narrow range of input voltage, like Lipo Rider, its recommended to check whether the OC voltage is safe before any connection.

D. Motor Driver Module (L298N)

This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional speed control.

V. HARDWARE IMPLEMENTATION

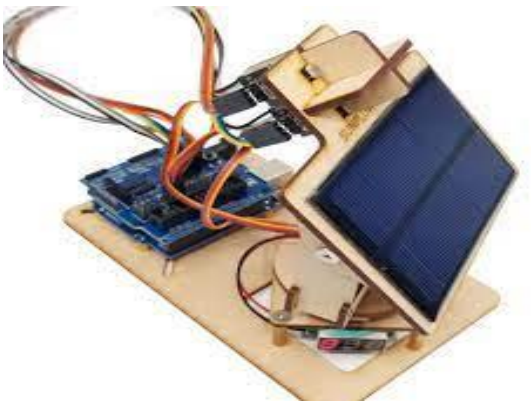

Fig. 2 Hardware implemenatation

VI. ADVANTAGES

- Low cost/simple
- Easy to operate – reliable
- End-to-end connectivity and affordability
- Notification and alert
- Easy to Install

VII. CONCLUSION

Here we have presented efficient method to convert the maximum solar energy to Electricity-Solar Sunflower. It will open and close the pannel according to sun light. Converted Engery is stored in the battery. So praposed technology defently helps to creat solar transformation in filed of renovable energy conversion.

ISSN (O) 2321-2004, ISSN (P) 2321-5526

IJIREEICE

International Journal of Innovative Research in
Electrical, Electronics, Instrumentation and Control Engineering

Vol. 9, Issue 8, August 2021

DOI 10.17148/IJIREEICE.2021.9810

REFERENCES

[1]. T. Tomson, "Discrete two-positional tracking of solar collectors," Renewable Energy, vol. 33, no. 3, pp. 400–405, 2008.
[2]. Rizk J. and Chaiko Y. "Solar Tracking System: More Efficient Use of Solar Panels," in World Academy of Science, Engineering and Technology 41 2008.
[3]. F. Sallaberry, R. Pujol-Nadal, M. Larcher, and M. H. Rittmann-Frank, "Direct tracking error characterization on a single-axis solar tracker," Energy Conversion Management, vol. 105, pp. 1281–1290, 2015.
[4]. F. Hénault, M. Coquand, P. H. Defieux, and C. Caliot, "Sun backward gazing method with multiple cameras for characterizing solar concentrators," Solar Energy, vol. 166, no. January, pp. 103–114, 2018.
[5]. Benny Cherian, Lakshmi P, Linda Joseph, Madhu PM, Minu John, "Development of Automated Solar Tracker for High Efficiency Solar Panels," in International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3, Issue 2, February 2014.
[6]. B. J. Huang, W. L. Ding, and Y. C. Huang, "Long-term field test of solar PV power generation using one-axis 3-position sun tracker," Solar Energy, vol. 85, no. 9, pp. 1935–1944, 2011.

BIOGRAPHY

Mr. Shobhit U. Yewale is final year student studing in NIT polyechnic Nagpur. Actively Participated in college activity.His area of is renovable energy conversion and its applications.

Mr. Ashwin M. Pande is final year student studing in NIT polyechnic Nagpur. Actively Participated in college activity.His area of is renovable energy conversion and its applications.

Mr. Shivam S. Kolhe is final year student studing in NIT polyechnic Nagpur. Actively Participated in college activity.His area of is renovable energy conversion and its applications.

Mr. Nitesh R. Chimurkar is final year student studing in NIT polyechnic Nagpur. Actively Participated in college activity.His area of is renovable energy conversion and its applications.

Mr. Janshi Kumari final year student studing in NIT polyechnic Nagpur.Actively Participated in college activity.His area of is renovable energy conversion and its applications.