IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Sun Tracking Solar Panel Using ESP32

[1]Nisha D Borade, [2]Sushma P Lawande, [3]Diksha V Satpute, [4]Ashwini B Mane, [5]V.A. Upadhye

[1]Student, [2]Student, [3]Student, [4]Student, [5]Lecturer

[1 2 3 4 5] Department of Computer Technology,

[1 2 3 4 5] Bharati Vidyapeeth's Jawaharlal Nehru Institute of Technology (Poly), Pune, Maharashtra, India

Abstract: This paper introduces a groundbreaking solar panel system equipped with a novel 180-degree sun-tracking feature and an integrated automatic cleaning mechanism. The sun tracking innovation employs a precise, responsive system that enables the solar panels to rotate 180 degrees, ensuring optimal alignment with the sun throughout the day. This maximizes the absorption of solar energy by maintaining perpendicular incidence, significantly improving the efficiency of solar energy capture compared to traditional fixed or limited-movement tracking systems.

In addition, the system incorporates an innovative auto-cleaning mechanism that maintains the panels at peak operational condition by removing dust, debris, and other accumulative materials. The cleaning mechanism is designed to function with minimal water usage and without compromising the tracking functionality. Experimental results demonstrate a considerable increase in energy output and efficiency due to the combined effect of full-range tracking and sustained cleanliness of the panels.

This research marks a substantial advancement in solar panel technology, offering a sustainable, high-efficiency solution for solar energy generation, and paving the way for more advanced applications in renewable energy systems.

Index Terms **– Sun-tracking, Solar panel, automatic cleaning,**

I. INTRODUCTION

In recent years, the demand for renewable energy sources has surged, with solar power emerging as a leading solution due to its sustainability and environmental benefits. However, the efficiency of solar energy systems remains a critical area for improvement. Traditional stationary solar panels often fall short in harnessing the sun's energy optimally, leading to a significant loss in potential electricity generation. Additionally, the accumulation of dust and debris on solar panels can further decrease their efficiency. To address these challenges, this paper introduces an innovative solar panel system equipped with two key advancements: a 180-degree sun tracking mechanism and an integrated auto-cleaning feature.

The 180-degree sun tracking system represents a significant leap forward from conventional fixed or limited-movement solar trackers. By enabling the panels to rotate a full 180 degrees, this system ensures that the panels maintain an optimal angle relative to the sun's position throughout the day, thereby maximizing solar irradiance capture and significantly boosting energy output.

Complementing this, the auto-cleaning mechanism plays a vital role in maintaining the panels' efficiency. Dust, debris, and other substances that accumulate on the surface of solar panels can obstruct sunlight, reducing their effectiveness. The auto-cleaning system is designed to operate efficiently and autonomously, ensuring that the panels remain clean and perform at their highest potential without manual intervention.

Demand for renewable energy sources, particularly solar power, has increased due to its sustainability and environmental benefits. However, traditional solar panels often struggle to harness the sun's energy optimally, resulting in significant loss in electricity generation. To address this, an innovative solar panel system is introduced with a 180-degree sun tracking mechanism and an integrated auto-cleaning feature.

This system allows panels to rotate 180 degrees, maximizing solar irradiance capture and boosting energy output. The auto-cleaning mechanism ensures panels remain clean and perform at their highest potential without manual intervention. The combination of these features positions this solar panel system as a cutting-edge solution in solar technology, promising to increase efficiency and output while enhancing the practicality and economic viability of solar power.
The paper explores the design, implementation, and performance evaluation of this novel solar panel system, demonstrating its potential to revolutionize solar energy generation.

II. LITERATURE SURVEY

This literature review reveals the detailed work that has been carried out till date on the content of solar shadowing.

1) Mrunal Dhulap, Advay Dhule, Adityaraje Dhumal, Ajinkya Dhumal, Gayatri Dhumal, Girish Dhurve have designed a single axis sun tracking system with the help of LDR detectors, Arduino nano, LEDs, Servo Motor SG90.
The ideal of this exploration is to design and construct the automatic single axis solar for maximum solar energy utilisation. Arduino nano regulator has been used and it's programmed in ‘C’ language. LDR are used to track the position of the sun and to start the shadowing operation.The design helps in enhancing the effectiveness of solar panels and therefore the maximum quantum of energy can be attained without loss. also, the design shows the working of software for maximizing the affair by situating the panel at maximum intensity. tone- conforming solar panels are proven useful as we just need to place them in ample sun and rest it works efficiently.

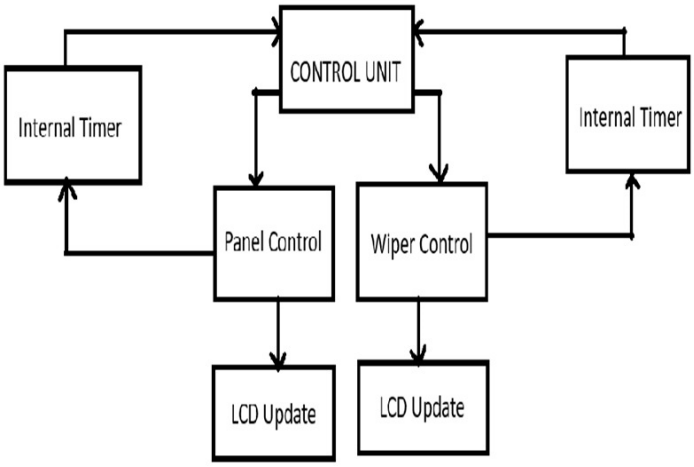
2) N. Othman, M.I.A. Manan, Z. Othman, S.A.M. Al Junid have designed a two- axis sun tracking system with the use of five LDRs and an Arduino UNO regulator.
The ideal of this exploration is to design and construct the automatic binary axis solar for maximum sun energy application. The only point to note in this system is that this system should consume energy as minimum as possible so that the difference between power conversion and power consumption would increase and it'll help in adding net profit of the system. Arduino UNO regulator has been used in this system and it's programmed in ‘C’ language. LDRs are used to descry the maximum sun position in the sky and the program written performs computations that can drive the servo motors to make PV panels vertical to the sun. The sun not only travels from east to west but also in north to south direction also. So the north and south directions should also be taken care of while changing. Only Binary axis trackers can do that. These trackers track the sun on a vertical and perpendicular axis. Because of this operating capability the binary axis trackers produce further affair power than the single axis trackers.

III. METHODOLOGY

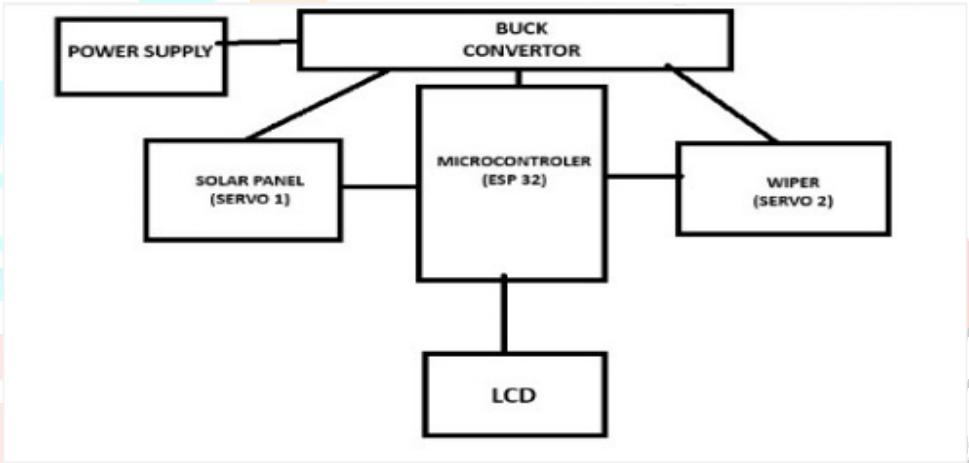
3.1 Component used:

- ESP32 Microcontroller
- Servo Motor
- Wiper Mechanism
- LCD Display
- 10 cm 40 pin Dupount cables male/male female/female male/female
- Ohm trimpont Trimmer potentionmeter
- Buck convertor
- Micro cable for microbit
- Plastic gear servo motor with CNC
- LCD Display yellow backlight
- ESP 32 Wroom- ESP 32 Devkitc core board
- Mini servo 180 degree

3.2 Block Diagram:



3.2 Circuit Diagram:



3.3 Working:

So basically, there are two objectives one is a solar panel and other is a wiper. We are using Esp32, which controls the whole system. We are using two servo's first servo is used for solar panel, which helps solar panel rotate, and another servo is used for wiper, which helps to clean solar panel when the dust is there on solar pane.

Here we are using LCD which displays the info which user wants to display for example if user want to see how much energy is captured by the solar panel and much more. One of the most important thing we are using a Buck convertor which helps to convert power supply voltage to 5 volts.

Servo helps to rotate the solar panel and thus the solar panel captures the sunrays perpendicularly.

When the sun’s rays are captured perpendicularly the solar panels produce maximum power.

For example, if the sun is in the west, then it captures the rays from the west. When the sun starts rotating, then the solar panel on other side starts rotating to capture the sun’s rays.

IV. FUTURE WORK

For future usage we can make sun tracking solar panels on a large scale for big automobile industries, factories etc. so that we can expand the use of solar energy instead of any artificial electricity production.

V. CONCLUSION

The main aim of this project is to create a working model of sun tracking solar panel which can consume maximum solar energy because of its rotating algorithm and to all this we are adding one more invention of self-cleaning system which can keep solar panel clean and tidy so that no man power is needed to do this job being on the roof top of any house/building etc.

Moreover to conclude all this we can say this whole project concept is based on sun tracking and self-cleaning solar panel which can generate maximum amount of solar energy through Sun as it is the biggest source of solar energy for this planet.

VI. ACKNOWLEDGMENT

We express our profound gratitude to all those who have contributed to the successful completion of our sun tracking solar panel project.
We would like to extend our sincere thanks to our Professor V.A. Upadhye whose expert guidance & insightful feedback helps us to complete this research.

REFERENCES

[1] Mrunal Dhulap, Advay Dhule, Adityaraje Dhumal, Ajinkya Dhumal, Gayatri Dhumal, Girish Dhurve, "Sun Tracking Solar Panel", (2023)

[2] N.Othman, M.I.A.Manan, Z.Othman, S.A.M. Al Junid, "Performance Analysis of Dual-axis Solar Tracking System",

[3] Parasnis N. V, "Automatic Solar Tracking System"

[4] Muhammad Faisal, Afzan Bin Abdul Halim, Lili Azwani, Binti Tiron, "Development of Sun Tracking Solar Panel Using
using arduino"

[5] Ophelia M. Boligor, Ramer Allen F. Montilla, Christian Laurince D. Cocon, Ydron Paul C. Amarga, Jeffrey T. Dellosa,
"Development of an Arduino-based Solar Power Tracking System"

[6] Pravin Balbudhe, Ameya Mulik, Vineet Mulik, "Arduino based Solar Tracking System."