ADVANCE SOLAR TRACKING SYSTEM

A Report submitted in partial fulfillment of the requirements to complete Term Work &Practical work of Project Based Learning (PBL) in the department of

ENGINEERING SCIENCES DEPARTMENT

As prescribed by

SAVITRIBAI PHULE PUNE UNIVERSITY

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Certificate

This is to certify that, following students,

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has completed all the Term Work & Practical Work in the subject **Project Based Learning (PBL)** satisfactorily in the department of First Year Engineering as prescribed by Savitribai Phule Pune University, in the academic year 2021 - 2022.

• ABSTRACT

All of the life that is on the earth can survive because of the sun. Every day, the energy given from the sun's rays sustains life. It provides us with heat, light, health benefits and various other applications, like the widely used and known solar energy. Without the sun, the earth would be just a ball of rock without any life forms. The importance of solar energy in our daily life is more significant than any other thing in your life — besides water and food. Solar energy has been growing as a renewable and alternative energy source. That's why it's necessary to understand the importance of the sun's power because, if you don't already, you could very well be reliant on the sun for your daily energy needs. So keeping that though in mind and to attribute to the Mission-ATMA Nirbhar bharat we have presented SOLAR SUNFLOWER system which is working of solar tracker and to design the same. Solar panel has been used increasingly in recent years to convert solar energy to electrical energy. The panels can be utilized either as a large solar system that is connected to the electricity grids or as a stand-alone system.We are trying to munch additional energy from the sun via solar panel. In order to maximize the conversion from solar to electrical energy, the solar panels need to be placed at right angle to the sun. 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

- **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.

• LITERATURE SURVEY

Solar energy has emerged as one of the most promising renewable energy sources due to its abundance, cleanliness, and sustainability. To maximize its utility, solar tracking systems have gained considerable attention. These systems adjust the orientation of solar panels to follow the sun's path, thereby enhancing energy capture throughout the day.

Tomson [1] proposed a discrete two-positional tracking system that demonstrated improved energy capture over fixed systems. His method emphasized mechanical simplicity while ensuring sufficient solar exposure. Similarly, Rizk and Chaiko [2] introduced an efficient solar tracking system, showcasing how dynamic alignment with the sun's position can significantly boost energy conversion efficiency.

Sallaberry et al. [3] analyzed the tracking error in single-axis systems, stressing the need for precision in movement and control algorithms to maintain optimal panel orientation. Their study provided insight into the technical limitations and performance trade-offs in practical solar trackers.

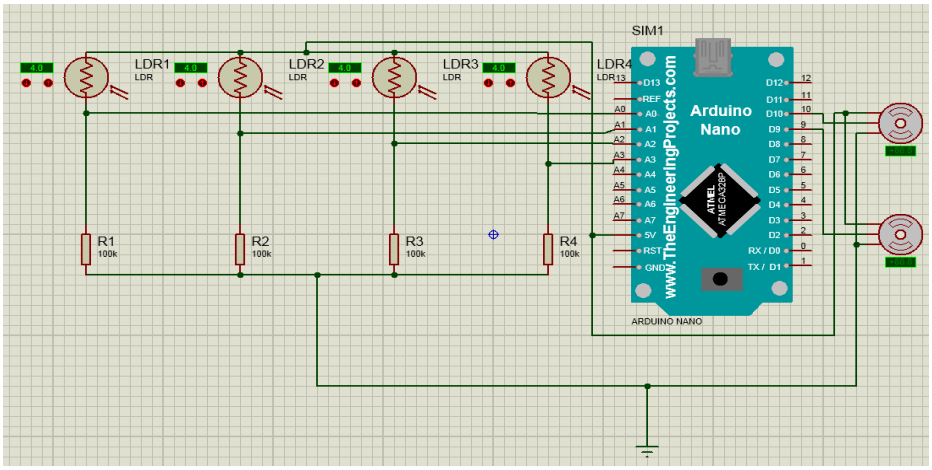
Henault et al. [4] developed an innovative method for evaluating solar concentrators using a backward gazing technique with multiple cameras. This work contributed to improved calibration and alignment accuracy in solar systems, enhancing the performance of solar trackers.

Cherian et al. [5] focused on automation in solar tracking, implementing a light-dependent resistor (LDR)-based system for dynamic positioning. Their design demonstrated how microcontroller-based systems can efficiently manage solar panel orientation with minimal human intervention.

Huang et al. [6] conducted a long-term field study on a one-axis, three-position tracking system. Their findings revealed significant energy gains over static panels and emphasized the importance of environmental and geographical considerations in tracker design.

These studies collectively highlight the evolution of solar tracking technologies, from simple mechanical systems to smart, sensor-based automation. The integration of microcontrollers, sensors like LDRs, and servo motors, as demonstrated in the current project, aligns well with modern trends in optimizing solar energy systems for higher output and efficiency.

• CIRCUIT DIAGRAM



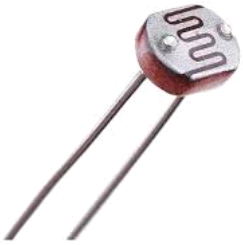
- **WORKING**

The working code of the solar sunflower is same as the rooftop solar panel but the divergence is occure interm of design aspect. The solar panel is intend in such a manner that it can open and close like flower gets bloom.We have bloom the solar panel in such a way that when light spray on panel it will open and when there is dark we can say no sunlight then it will close or we can it will shrink.We have already programmed in the arduinonano and relay, motors and solar panels are connected. So when we plug the adapter and turn ON the button then arduino will turn ON and the program will be operate and the motor will rotate anticlockwise.All the 4 motors are operated in the anticlockwise direction but it will operate slowly and all the 4 motor have a different time so that the solar panel will come one upon the other otherwise the solar panel will not operate and give the output.So while programming we have given a definite interval of time to all the 4 motors to operate. The solar panel are mounted on all the 4 motors and according to that the solar panel will open and close.We can also control the speed of the motor by PWM speed controller but according to that we also have to change the programming we just have to change the time interval. The programming is so simple and easy.So this is how the solar sunflower operate when the sunlight is falling on it but when the night comes there will be darkness at that time the solar panel will be close according to that and the load will not get supply so we can charge the battery and also operate it .

- Working of Main Components:-
- AURDINO NANO-

The AURDINO-NANO control's all the sensors. The complete boardis powered by a 9V battery which is regulated to +5V using a 7805 Voltage regulator.

•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 lowering resistance. Hence, Light Dependent Resistors is very useful in light sensor circuits

- SOLAR PLATE:-

A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect. These cells are arranged in a grid-like pattern on the surface of solar panels.

Thus, it may also be described as a set of photovoltaic modules, mounted on a structure supporting it. A photovoltaic (PV) module is a packaged and connected assembly of 6×10 solar cells.

• ADVANTAGES

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

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.

MARKETABILTY OF THE PROJECT

- Is your project benefit to society?

  Yes, our project is beneficial to the society

  – They require limited accommodation space. Therefore, you can easily install them if you have a small space for your solar system.

  – They are the best solution for generating more electricity throughout the day. The four directional rotations ensure excellent power supply irrespective of the day's timing. .

- If yes, how your project/idea benefit to society?

  –A high-capacity solar system with a dual axis tracker is efficient enough to meet your power requirements throughout the day and store extra energy for nighttime utility.

  – Since they can rotate the panels both horizontally and vertically, their efficiency is not affected even if the land is uneven.

  – The high energy production quickly balances the high investment of solar systems with dual solar trackers

- May you sell your project in market?

  Yes, but this is just a small prototype of the project, a much more advanced and large model of this project can be made avialable in the mrket.

- On the basis of above information, can you initiate the „start-up" in future?

  Probably, we can initiate the start-up in future. Solar leads among renewables and accounts for 13.22% of India's total installed power capacity and 34% of the total installed renewable capacity in Q1 2022. This is the most technologically advanced of all alternatives. No competition and strong alternative as of now.

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