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Design & Fabrication of Solar Tracking System

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A B S T R A C T

Amongst other natural energy sources such as sun, wind and hydro power sun main source of energy. The solar energy can be utilized by using PV cells or panels to convert the solar energy into electrical energy. For a fixed solar panel, the efficiency process is low because the solar panel output depends on the amount of sun intensity that it receives. Due to continuous change of sun position during the day and throughout year it gives us disadvantage over fixed panels to have the maximum power output they have to be aligned perpendicular to sunlight to have a maximum exposure to light intensity, this when solar trackers come in play.

This project design of multi-axis solar tracking device that has a real time monitoring system for solar panel tracking system. This system needs to improve efficiency of the solar panels. The system will use Arduino Nano as the microcontroller to communicate with LDRs (light dependent resistors) as sensors and servo motors as gears to rotate the solar tracking system. This system consists of Arduino Nano as the microcontroller, Potentiometer to control the voltage sensor as electrical measurement. At the end of the project the system was able to realign the solar panel as per the sun direction. The system results were compared to a fixed panel to analyses how the system performed to our model.

Keywords: Solar Tacker, Monitoring, Photovoltaic, Potentiometer, LDR's.

1. INTRODUCTION

Our civilization in the vein through which modern civilization running. Energy day to day is to bring the best out of humans. Each and every part of our generation is linked with various types of impediment and in this response, energy is becoming an important fact. Therefore, the source of energy should be more or endless available perpetual in order to use for the population for future. Human beings are continuously involved in changing the way we work. Since last generation we have come a long way on how the things work from time to time.

Taking a look at the present situation it is evident that renewable sources of energy such as coal, natural gas, oil, and other fossil fuels etc. are at the edge of extinction. Being in mortal combat with time itself to fulfil every demand for energy the demand for these resources for energy has escalated to its zenith. The conventional use of energies due to the burning of fossil fuels like coal, oil and natural gas, the whole environment is getting polluted. The present project, therefore, with components like LDR module, Servo Motor, Solar array etc. according to which while the functioning of renewable energies as they would not emit any kind pollution and in turn act as a reservoir of energy from sun. No other energy is as great as the solar energy as per as its availability and freeness are concerned, utilization of which, compounded with rest of the fact of its conversion into electrical energy. Though it is improbable still it is not impossible as per as tracking of the mother energy is concerned in furtherance to which attempt has been taken through this project to confine every drop of energy from being left out. The servo motor adjacent with the system with the help of LDR's by measuring the intensity of the sun rays fixed on the solar panel will help the solar panel to rotate around sun.
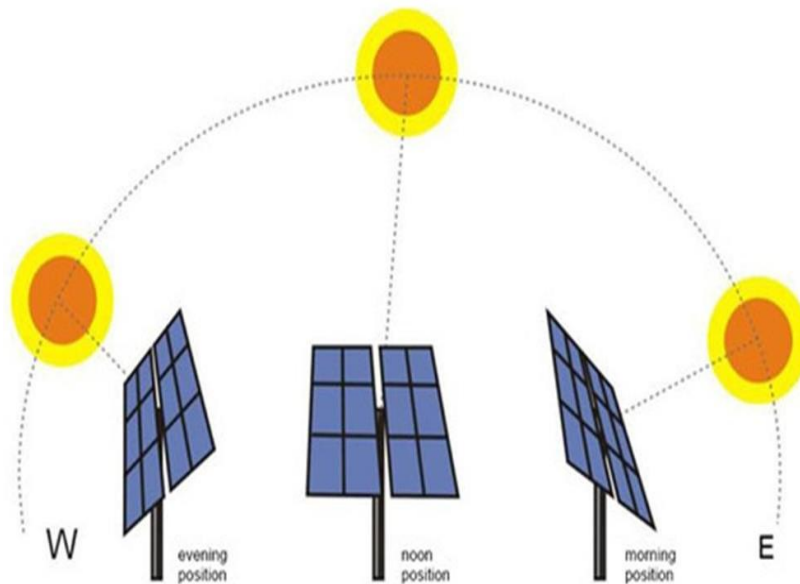
Fig. 1.1 Solar Tracking System

Sun itself in order to grab and store the maximum amount of energy as it can and this energy is freely available in nature. In pursuance of such objectivity, this project comes forth into existence.

When heat is the source of every creation, Sun produces the biggest ever energy in this solar system to produce and life from one organism to the other. In this response, the project called "Solar Tracking System" serves the purpose of utilizing the maximum amount of energy taken from the Sun and to convert such energy into some other production such as powering lights, bulbs, street lights, solar cooker, solar water heating, Powering mobile phones, agricultures purpose. This system is a time production, produced to create the best of its kind according to the sun energy. In a stretch, it could be signified that this project which is an extension of solar energy, is a renewable source of energy, never-ending phenomena. It's only 20 to 30 per cent of the solar cells that are being used commercially out of which the best potential of the cells gets reflected and therefore scope for better use of the solar cells exist.

In the world of pollution, this system is an eco-friendly alternative, hence a valuable asset. When the ocean of pollution is encumbering every corner of life, this system would be able to create ripples of hope in the midst of this bustling civilization. The survivability of this system lies upon its workability. In the trend of, it could be a trailblazer.

2. COMPONENTS

Electrical Components:
1.) Solar Panel 20W
2.) Servo Motor 180 degree
3.) Servo Motor 360 degree
4.) Arduino Nano
5.) LDR's
6.) Current Sensor
7.) Battery 12v 9amps
8.) 2X radial bearings(608zz)
9.) Switch
10.) 5v Power Supply
11.) Connecting Wires
12.) PCB
13.) Solar controller

3D Printed Parts:
    1.)   Horizontal Gear
    2.)   Vertical Gear
    3.)   Shaft
    4.)   Base
    5.)   Solar panel mount

3. WORKING AND PROCEDURE

1.) Start by assembly of the model is done by placing the horizontal servo in base of 3D printed part.

2.) Attach the Horizontal gear to the motor.

3.) Fix the screw for horizontal gear

4.) Place two 608zz bearing in the 3D printed part for smooth movement gear.

5.) Place the shaft to hold the vertical mount.

6.) Place the vertical servo and fix them using two screws.

7.) Place the small vertical servo gear to the motor.

8.)Attach the Solar mount and place it on the vertical gear.

9.) Fix the mount using 3D printed Shaft or M6 screw.

10.) Attach or glue to Solar panel on the mount.

11.) Here, half of the assembly of the model is done.

12.) Now, Comes the assembly of the wiring.

13.) Place the switch and Arduino Nano and make the circuit.

14.) In this circuit, attach the servo motor to their designated connection.

15.) Place the solar controller on the board with the help of screws

16.) First, connect the solar panel wire to the first point of the solar controller.

17.) Connect the battery to the second point on the solar controller.

18.) LDR's are placed on the solar panel.

19.) This LDR's are divided by the 3D printed part

20.) Connection to this LDR's are given to the Nano.

21.) Assembly of the model is completed.

22.) Turn on the model by switch on the switch on the PCB.

23.) Place the light and test the solar panel movement.

24.) Working of the machine is done.

Fig 3.1 Top View of The Model

Fig 3.2 Front View of The Model

Fig 3.3 Side View of The Model

4. ANALYSIS OF THE MODEL

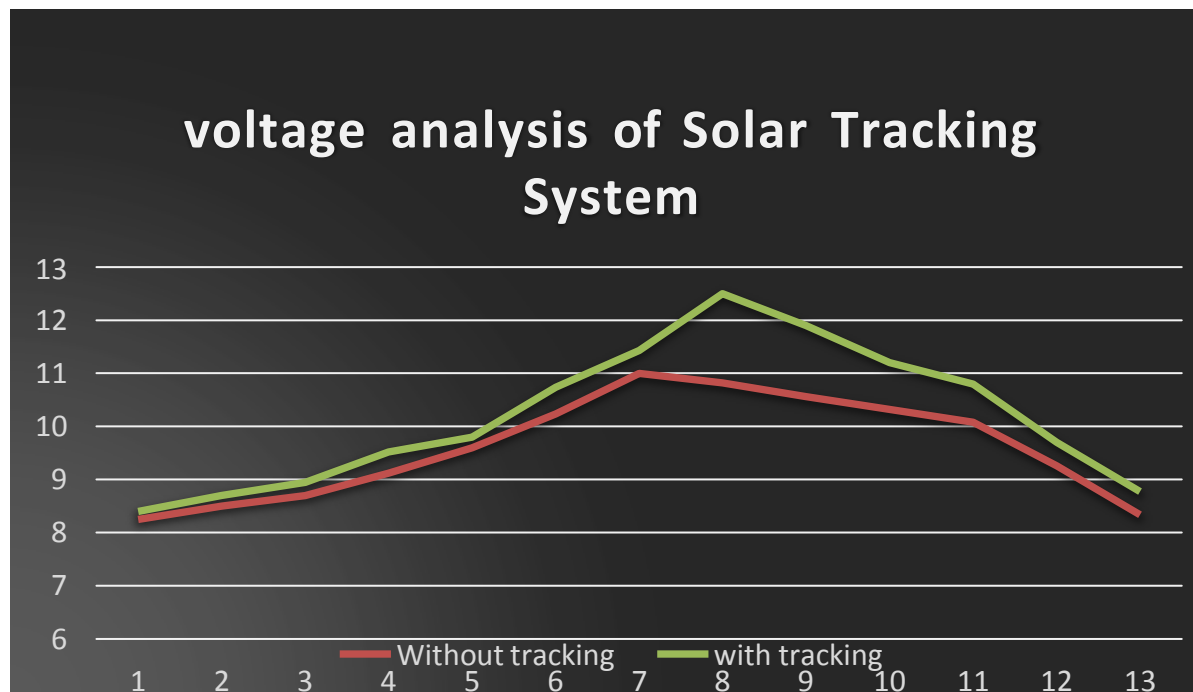| Time	without tracking	with tracking
1	8.25	8.4
2	8.5	8.7
3	8.7	8.95
4	9.12	9.52
5	9.6	9.8
6	10.24	10.74
7	11	11.43
8	10.82	12.5
9	10.56	11.9
10	10.32	11.2
11	10.08	10.8
12	9.26	9.7
13	8.34	8.77

Fig. 4.1 Graph analysis of static and movable model

5. FUTURE SCOPE

1.) Improving the load carrying capacity of the system.

2.) Reducing the cost of mechanical structure.

3.) Stopping the motors while there is no need of movements.

4.) Improving the mechanical structure.

5.) Adjust the gear ratio to decrease energy loss.

6.) It can bring lot of energy saving methods for future and generation.

7.) Since, Solar energy is free and renewable energy, this project helps everyone to take up measure to save earth.

6. CONCLUSION

The main moto of our project is to design multi axis system in which it senses the incident solar light on the panel and moves the panel according to the solar light incident. From this above study of solar tracking system, the main conclusion is,

1.) This system is low cost and compact as compared to other tracking system for same applications.
2.) It is very easy and efficient and program and modify because Arduino based.
3.) Hence, it is very light weight and this system provides better efficiency of the solar panel.

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