Positioning Space Telescope To Determine Sun's Direction Using Sun Tracking Solar Panel

Rucha Bachal[1], Shweta Bajpai[2], Anushri Bhoyar[3], Anvita Bamboriya[4], Prof. Bhakti Ratnaparkhi[5]
[1, 2, 3, 4, 5] Dept of Information Technology
[1, 2, 3, 4, 5] Pimpri Chinchwad College of Engineering.

Abstract- *Solar power is being used as a clean source of energy nowadays. But for the efficient absorption of solar radiation, the solar panels have to be placed in a position such that they are continuously facing toward the sun. If the earth's surface is tilted and its surface is curved, the sun cannot be always directly overhead. Therefore, a solar panel should rotate continuously concerning the sun's position for an effective amount of energy absorption. Sun tracking solar panels will increase the efficiency of solar panels by rotating the solar panel towards the high intensity of light.*

We need to position space telescopes at an angle relative to sun so that they can determine the direction of sun and rotate towards higher intensity. Using sun tracking solar panel mechanism, we can adjust the direction of solar panel according to sun's position in the sky. When solar panel is perpendicular to sun more amount of light strikes the panel therefore high energy gets absorbed and less light gets reflected.

Keywords- Sun tracking Solar Panel, Arduino UNO,high intensity.

I. INTRODUCTION

As non-renewable energy sources dwindle, the use of renewable energy sources in electricity generation is increasing. Solar panels are becoming more and more popular every day for electricity generation. Solar panels are devices that are used to absorb solar radiation and convert it into electricity or heat.

This power is then used whenever needed. But for the efficient absorption of solar radiation, the solar panels have to be placed in a position such that they are continuously facing toward the sun If the earth's surface is tilted and its surface is curved, the sun cannot be always directly overhead. Therefore, a solar panel should rotate continuously concerning the sun's position for an effective amount of energy absorption. Sun tracking solar panels will increase the efficiency of solar panels by rotating the solar panel towards the high intensity of light.

Perpendicular sun rays are essential to produce more electricity through solar panels. Arduino uses 2 Light Dependent Resistors that are separated by a wing to compare light levels on both sides and rotate a panel-connected servo toward the highly illuminated light dependent resistor until both the detectors are in equality. This solar tracker rotates the panel with one or two axes to keep it in the direct sunlight. It can add a considerable amount of electricity generation as compared to a fixed solar panel.

This is also important for focusing the collectors which work efficiently only when they are placed in direct sun rays. A focusing collector can rotate the lens or mirror to the target area. In this design, the rotating axis is directed towards the North Star. It will track the sun from east to west in a single rotation

Two Light Dependent Resistors are fixed on the rims of the solar panel. The panel is rotated by the servo motor connected to it in the direction of the sun. When light falls on the Light Dependent Resistors, they produce low resistance. The panel is placed in such a way so that the light falling on the two Light Dependent Resistors can be compared and the panel can be rotated towards the Light Dependent Resistor which has low resistance (or high intensity) as compared to the other light dependent resistor. Servo motor regulates the rotation of the panel.

If the light rays falling on the left light dependent resistors are more, then the servo motor rotates the panel towards the left i.e., towards highest intensity. And if the intensity towards the right is more, the panel moves slowly towards the right. When the intensity of light on both the panels I same, such as in the afternoon when the sun is overhead, there is no rotation of the panel, it remains constant

II. COMPONENTS AND IT'SUSAGE

Arduino UNO: -

It is a microcontroller board based on the ATmega328 Microcontroller which is an AVR family microcontroller and is based on RISC architecture. To get

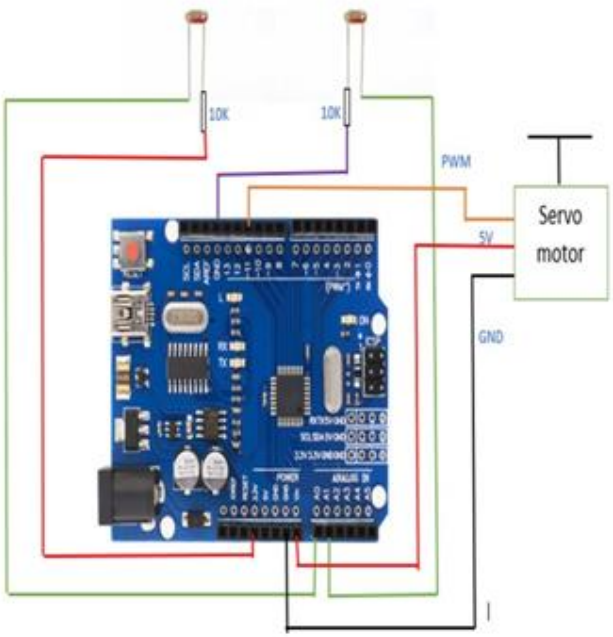
started, it can be simply connected to an AC-to-DC adapter or battery or to a computer with a USB cable. It is an 8-bit controller with 32 KB of Programmable Flash memory of which 0.5 KB is occupied by the bootloader, it also has 1 KB of EEPROM and 2KB of SRAM, and 23 programmable I/O pins. It supports features like a 16-bit single timer, dual 8-bit timer, 6-channel ADC with 10-bit resolution, etc.

Servo Motor:

It is a lightweight server motor with high output power, it can rotate 90 degrees in each direction. This motor is used to rotate the solar panels according to the intensity of the falling light rays. A PWN signal is provided to the control pin to drive the motor. Pin 11 which has PWN is connected to the control pin of the motor.

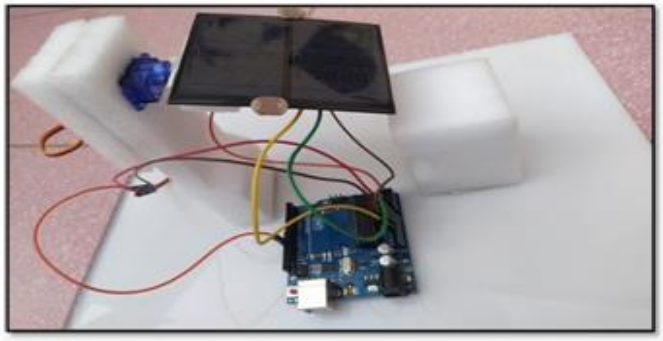
Light Dependent Resistors: -

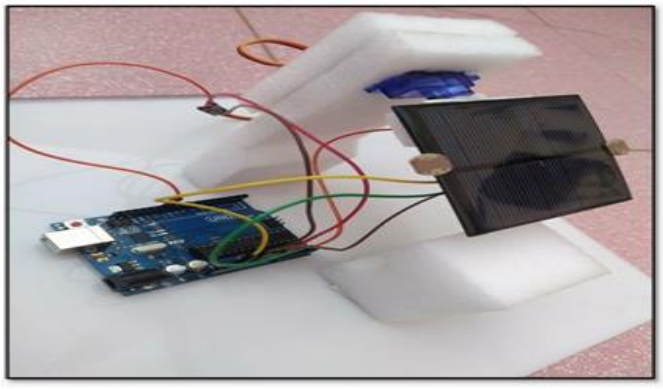
Light dependent resistors are the resistors whose value of resistance depends on the intensity of light falling on it. Resistance value increases with the decrease in the intensity of incident light and vice versa. It will have the maximum resistance in dark. It gives an analog value as output and this is converter to digital signals with the help of analog to digital converter in Arduino Uno



Jumper Wires: -

It is a group of electrical wires in a cable, with a connector or pins. It allows them to connect two points two each other without soldering





Solar Panel: -

Solar panel is made up of solar cells (photovoltaic cells) arranged in an order. Solar cells are made up of silicon. Some amount of energy is absorbed from the incident sun rays. These cells have electric fields in it that direct the electrons to create electricity.

III. WORKINGPRINCIPLE

i. Assemble all the electrical components, along with a sheet of thermocol.
ii. Take a acrylic sheet and place a double-coated tape square piece in the middle and stick the Arduino Uno on the tape.
iii. Fix the servo motor to another small rectangular piece of thermocol.
iv. Attach the solar panel to the tip rotating tip of the servo motor.
v. Connect a terminal of light dependent resistor with a 10KΩ resistor and fix it to one sideof the solar panel. Similarly, fix another light dependent resistor joined to a 10KΩ resistor on another end of the solar panel.
vi. Connect the four ends of the jumper wire with the light dependent resistor and resistor on each of both sides of the solar panel.
vii. Connect the 3 jumper wires coming from the servo motor to 11V and V1n and GND of the Arduino using male headers.
viii. Connect the two wires coming from the legs of two light dependent resistorsto 3.3V and GND and the wires coming from the two joints of the light dependent resistor and resistor to A0 and A1 of Arduino.
ix. Connect the Arduino kit to the laptop using a USB cable for programming the kit.

IV. ADVANTAGES

- Power efficiency increases by about 30-40%.
- Tracking systems orient the photovoltaic panels continuously in the direction of the sun, which helps to maximize solar energy absorption.
- Increased direct exposure to solar rays generates more electricity than the stationary ones.

V. CONCLUSION

Thus, we can comment that angle of light plays major role in solar panels power output. The tracking system aligns its solar panel in the direction of sun and helps to absorb more amount of energy. So Sun Tracking Solar Panels are more favorable than fixed panels in most of the aspects. Its applications are diverse in the field of photovoltaic systems. It has the efficiency to generate high power output, without causing environmental harm. This is very useful in the areas where more amount of sunlight is easily available, like in the desert areas, etc.

REFERENCES

[1] https://www.britannica.com/technology/solar-tracker
[2] https://robu.in/sun-tracking-solar-panel-using-arduino-project-step-by-step-guide-with-code/