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SUN TRACKING SOLAR PANELS IN DUAL AXIS BASED ON SENSORS

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ABSTRACT: Now a days, solar energy has become a prominent renewable energy resource. With solar tracking, it will become possible to generate more energy since the solar panel can maintain a perpendicular profile to the rays of the sun. Even though the initial cost of setting up the tracking system is considerably high, there are cheaper options that have been proposed over time. This paper presents the design and construction of a prototype for solar tracking system that has a dual axis of freedom. Light Dependent Resistors (LDRs) are used for sunlight detection. This paper focuses on the new approach development which controls the solar panel movement. The objective of this paper is to implement& simulate the controlalgorithm which is most suitable and efficient on the solar tracker dual-axis which can rotate in directions of both azimuth and elevation. This paper mainly aims the solar energy optimization harnessing with solar panels sun tracking dual axis using LDR.

KEYWORDS: Solar Tracking, Solar Panels, Light Dependent Resistor (LDR).

I. INTRODUCTION

Solar energy is widely used everywhere and it is clean. Solar technology is developed using the sun for heat, light and electricity provision. With the depletion of fossil fuels, it has become necessity to invest in renewable energy sources that can power the future sufficiently. The solar efficiency of the varies from 10 to 20 percent showing that there is a chance for further improvement[1]. This project aims at solar panels efficiency improving, solar tracking is used.

There is necessity for energy demand from sources as solar, wind, ocean tidal waves and geothermal for the sustainable power provision. PV panels convert directly from the sun,radiation into electrical energy. The manufacturing of solar panels use silicon semiconductor materials.

SOLAR TRACKERS: A device for collection of solar energy is solar tracker emitted by the sun. With respect to sun, solar tracking means changing position of panel. On the performance basis, coast respectively. Solar trackers are classified. Using system of tracking, 40-50% more efficiency can be achieved. The Dual axis provides 48%increased efficiency. Solar Tracking System is shown below

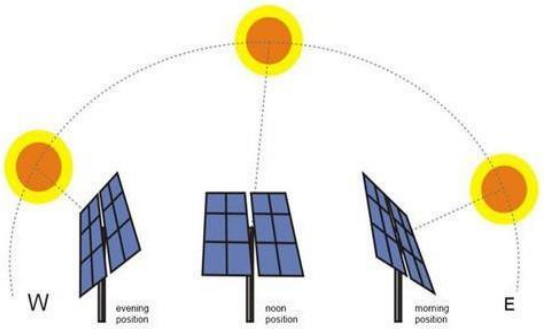

Fig 1 Solar Tracking System

Types of solar tracking system: 1.Single axis solar tracking system. Dual axis solar tracking system based on an ATMega328P

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microcontroller,the control circuit is designed. To detect sunlight via the LDRs,it was programmedto position the solar panel before actuating the servo. Where it is able to receive maximum light,the solar panel is positioned. Torque at high speedcan be maintained by servo motors and more efficient with 80-90%. efficiencies in the range[3] produced an efficiency of 20% for the first time in 1985 is produced by the Silicon solar cells.It was found that most panels operate at40% less . There are types of solar cells with relatively higher efficiencies but they tend to be very costly.

To increase the efficiency of solar panels, one of the ways while reducing costs is to use tracking. Through tracking, there will be increased exposure of the panel to the sun, making it have increased power output. The trackers can either be dual or single axis trackers. More efficient are Dual trackers as they track sunlight from both axes.

Hardware requirements:

The main components are Light Dependent Resistors (LDR), Servo motors, solar panels and Arduino as main controller.

II. IMPLEMENTATION

The solar tracking system principle is done by LDR. Connected to Arduino analog pin AO toA4are four LDR's which are inputs. The LDR analog value to digitalis converted by A/D converter . LDR analog value, Arduino as the controller and the output is DC motor are the inputs . Four LDRs acts as pair .If one gets more light intensity of the LDR in a pair than the other, on node voltages, a difference will occur which is sent to the respective channel of Arduino to take action.

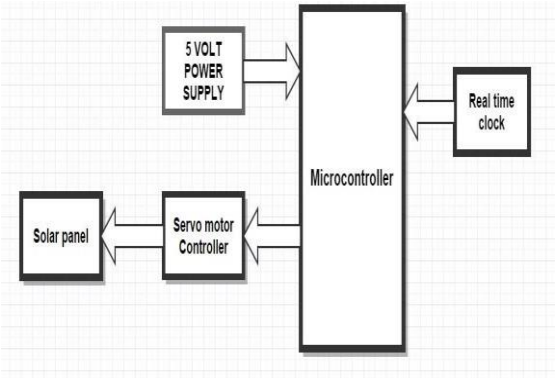

Figure 2: Block Diagram

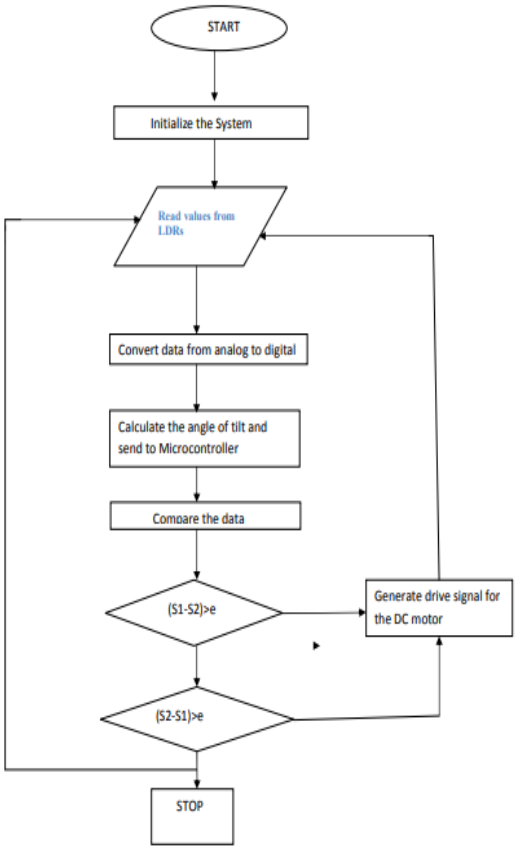

Figure 3: Flowchart

III. RESULTS AND DISCUSSION

The dual axis solar tracker is device which senses the light and positions towards the maximum intensity of light. It is made in such away to track the light coming from any direction. To simulate the general scenario of the Sun's movement, the total coverage of the movement of the tracker is considered as120˚in both the directions. The initial positions of both the servo motors are chosen at 90˚i.e, for east-west

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servo motor as well as for north-south servo motor. The position of the tracker ascends or descends only when the threshold value is above the tolerance limit.

Relation between solar panel misalignment and direct power loss is shown below in Fig 4.

(a)

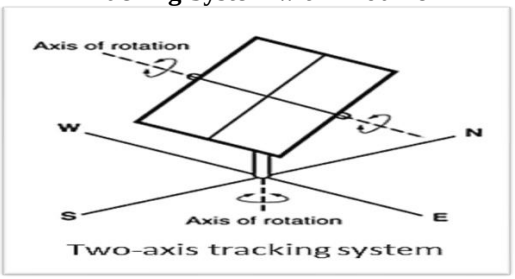
(b)

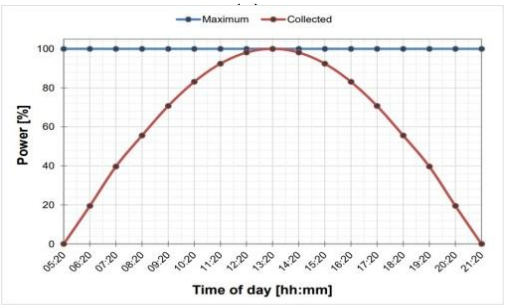
Figure 4(a) & (b): Single-Axis Solar Tracking System with Arduino

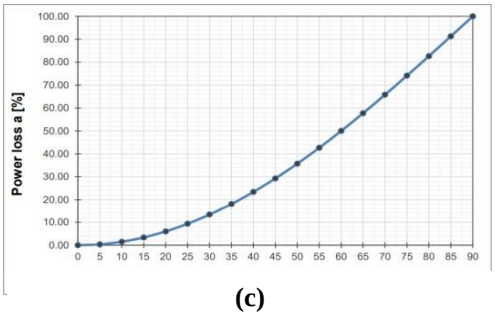
(a)

(b)

Figure 5(a) & (b): Dual-Axis Solar Tracking System with Arduino







(c)

Figure 6(a), (b) & (c): Relation between solar panel misalignment and direct power loss

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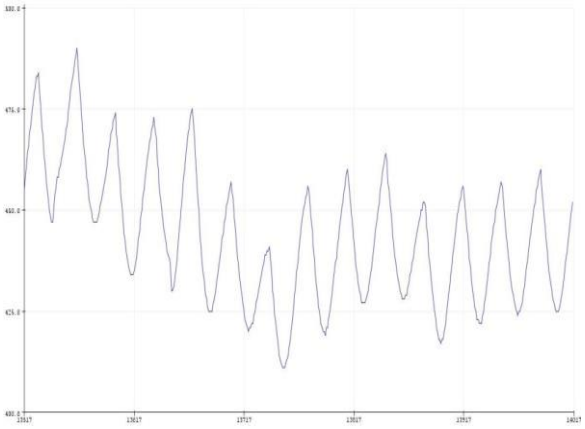
LDR Program and Graph

```
Void setup()
{
Serial.begin(9600);
}
void loop()
{
int sensorValue =
analogRead(A0);
Serial.println(sensorValue);
delay(10);
}
```



IV. CONCLUSION

Both use of LDR and RTC sensor makes it easy to track the sun path. When there is no obstruction between solar panels and the sun LDR is used and the light intensity decides the solar panels position because LDR sensor reacts to the light intensity and when there is cloudy weather the RTC sensors comes in to action, programmed RTC sensor positions the solar panel as the path of sun is stored in the program and microcontroller controls the sensors. Ease of solar panels rotation is achieved by Dual axis.

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