Retraction

Retraction: Dual Axis Solar Tracking System using LDR Sensors (J. Phys.: Conf. Ser. 1916 012128)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Dual Axis Solar Tracking System using LDR Sensors

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Abstract. At present, the dual axis solar system is not being used properly. A single axis of solar energy system is more compact and more widely used than a double axis. However, a single axis tracking system is less effective but more efficient due to its economic viability. Therefore, we are analysing a double axis tracking system preferred to single axis tracking system. We use an independent method using a dummy solar tracker to check whether the sun's rays reflected on the solar panel at a specific point at any given time based on the elevation calculations and azimuth angles of sunrays. To simulate the processes a simulation using the Borland C++ builder is created. Here, azimuth-elevation angles are calculated accurately and precisely in any location and time.

Keywords: Solar panel, twin tracking, LDR sensor, servo motor, Arduino UNO, Cooling system

1. Introduction

Power shortages have become a major problem these days. Solar energy is used extensively to overcome this because of its abundance and sustainability, and it has absolutely no cost. Photovoltaic is solid-state devices which produces electricity from solar light, without repairs, contamination and important exhaustion of resources. It is expensive to mount but over time it can save a lot of energy and lower costs [1]. The solar tracker is a tool that directs the load towards the primary source of light, the sun. The loads are generally panels, Fresnel displays, lenses and mirrors. The panel generates a lot of energy as it absorbs more sunlight. Focusing on the use of solar cells, it requires high correctness to make sure that intense sunlight is focused exactly at the powered device. A small amount of solar light to one side which is the movement of elevation from one side to the other by turning the arrangement along the vertical axis is only captured by using single solar axis tracker. The electricity yield is increased by the use of a single axis up to 27% to 32%, but more solar energy in both altitude and azimuth movements can be utilized by using a double solar tracker and at the similar moment can achieve complete ability of illuminance. This shows that tracking dual axis increases the flow of electricity by up to 35% to 40%. An electro-mechanical device called solar tracker which converts solar radiation into electrical energy. Single-axis variations appear to be less expensive than other dual-axis alternatives, specially for small PV power plants [2]. The board should be kept at right angles to the light source to get the maximum light intensity and the 0 (zero) voltage difference (error degree). By using the Single Axis system all year round, they can’t preserve the power of the output. The location of the sun is constantly changing from the solar tracker set up location and makes the panel not at right angles to the sun affecting the power of output.
The change of the solar panel is forever maintained at right angles to the sun by dual-axis solar tracking systems. The tracker tracks the sun all over the year and maintains the output power generated by the solar panel. A customized geared DC motor uses electrical energy to generate involuntary power. Electric current makes the DC medium to rotate. Components emotionally involved to the motor makes another kind of movement with this rotating action. In a gearbox, the attractive current shifts the mechanism from the gear reduction unit or to the integrated gearbox. Another shaft is linked to these gears. Gear head is worn in the solar tracker which produces high torque. The output of the comparative circuit detects which sensor receives the highest amount of light and enables the driver path which in turn empowers the vehicle and changes track [3]. This makes the solar board to be at right angles with the sun. This document shows the creation of a virtual sculpture of a double axis tracking system. The function of the Programmed Arduino (ATmega328p) controller is managing the rotary motion in DC vehicles and provided in terms of differences in voltage from LDR depending on strength of sun’s light [4-7]

1.1 Solar Panel

Solar panel is a device which converts sunlight into electrical energy through photovoltaic cell. These cells are arranged in a surface of solar panels. Traction system operates based on the performance of LDR as shown in Figure 1.

![Figure 1 LDR (Light Dependent Resistor)](image1)

1.2 Servo Motor

Solar power usage is increased due to its clean and pollution free advantage. Solar panels were static and remained in one position for the entire duration of the day in earlier days. General Science dictates that the sun is not always in the same direction and according to that Solar panel will change. This clearly shows that we are not completely using the Sun’s power but we adjust the position of angle of movement of panel so that, we could get full efficiency. The angle control is critical and achievable by a servomotor. This is another application of servo in which as represented in Figure 2.

![Figure 2 Servo motor](image2)
1.3 Solar Tracking

The Solar Trackers continuously direct the solar panel towards the sunrays, thus providing maximum efficiency. This system increases direct exposure to the sun light efficiently by tracks sun’s position in the sky using LDR, rotates the panel towards sun position and produces more electricity than their counterparts. Solar tracker generates additional electrical energy in the similar quantity of space essential for permanent incline systems, making them perfect optimizing earth practices. Also, very necessary, it emphasizes on not only on increasing the production of electrical energy, but also ameliorates the way power output is delivered. The schematic representation of the dual axis system and its flow is represented in Figure 3.

Figure 3 Schematic representation of twin axis tracker

2. Methodology

On the mechanical structure, the solar panel is placed flat. With the help of semiconductor layers, the entire light incident is converted into electricity by the panel. In order to minimize any fluctuations in the voltage, the electrical output is stabilized and current values by the charge controller, connected directly to the panel. The battery is fed by the charge controller, which is charged to its maximum potential [8]. All the logical calculations are carried out by Arduino. In order to power the Arduino, a 7-Volt or 9-Volt battery is used which uses analog input from LDRs and provides power to the servomotors. Depending upon the location of the sun, the Arduino signals received from the LDRs are analyzed. The resistance and hence value of current flowing into the Arduino will vary depending on which of the two LDRs has lighter incident on it. This variation is then translated into the input signals for the motors. The servomotors are used to connect the shaft that has the panel mounted on it, that is responsible for dual axis movement of the panel.
2.1 Arduino UNO

In the tracker system Arduino Uno controller is recommended to control the tracking operation of the system which has been recommended. Pin connection and the system input and output pins connected systematically and are represented systematically as represented in Figure 4. It contains everything needed to support a microcontroller; simply connect it to a computer with a USB cable or by power. If a voltage higher than 12V is supplied, the board can be damaged due to overheating of the voltage regulator. The range of 7 to 12 volts is recommended. 32 KB flash memory is available in ATmega328. Also, it has 1 KB of EEPROM and 2 KB of SRAM. The Uno is different from all previous boards in since FTDIUSB is not used to make a serial driver chip. The flowchart representation of the solar tracker is shown in Figure 5.

![Arduino UNO](image)

**Figure. 4** Arduino UNO

![Flow chart for solar tracker](image)

**Figure.5** Flow chart for solar tracker

3. Cooling System
The efficiency of the solar board depends upon the quantity of solar irradiation on the PV cell. Above time dust settles on the surface of the solar board resulting in improper irradiation of the solar emission. The dropping of birds also causes improper irradiation of solar rays. The dust can be easily cleaned with the help of a brush. But the bird dropping tends to stick on to the surface of the solar panel. By using the cleaning system, the operating efficiency of the solar panel can be increased by 10 to 15%. Currently, the existing methods which are widely used is manual labour. The problem associated with the cleaning of solar panels on a large scale such as in the case of solar farms, the required manpower is very high for the cleaning purposes. But the main limitation is that it is not feasible to clean large solar farms using humans as the efficiency of the cleaning process is limited. There is some automated system available which are costly for the application on a personal level. There has been an increase in the use of solar panels on personal property. The number of solar panels is less as compared to a solar farm. Hence a feasible solution which not only limits to personal but also solves the commercial application needs to be developed.

The system works on the principle of sensing and actuation. Two thermocouples are attached to the backside of a solar panel at equidistance to one another. When the temperature of the solar board reaches above 45OC the performance of the solar board starts to deteriorate. When the solar panel reaches a temperature above 45OC a signal is sent to the Arduino which in turn sends a signal to the relay to which a solenoid valve is connected as shown in Figure 6. The double axis solar tracker systems represented in Figure 7. The performance characteristics of the planned tracker system are represented in Figure 8.

4. Experimental Model
5. Conclusion

The proposed system using Arduino is intended and effectively realized to enhance the output of the panel. The existing single axis solar tracker and fixed panel are less efficient than the dual axis solar tracker. The recommenced topology trails the sun to devour the maximum solar power with the aid of Arduino board was effectively realized. The performance rate of Arduino board for solar tracker is minimum and it is execution is easy. The experimental system evidently shows that projected system efficiently traces the solar rays in normal and extreme climatic conditions. On dissimilar occasion phase in a day measured up to through the accessible structure and effectiveness of solar panel is enhanced.

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