

# Dual Axis Solar Tracking System for Maximum Power Tracking to Analysis Output Power and Determining Component Life Cycle

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**Abstract** - The solar power tower (SPT) is an effective thermal renewable energy source aiming to absorb direct sunbeams on a central collector using thousands of electrical drive-based moved reflectors. The reflector tracking system's accuracy depends on the utilized drive system effectiveness and the used control technique robustness. The project is to design and implementation simple and cheap price solar tracker system with two axes using Light Dependent Resistor (LDR). This project is compared with fixed solar panel and the results showed that solar tracker more output power than fixed solar panel. The sun position carried out in two stages, first stage or direct sensing performed via set of LDR sensors as output tuning to trims the azimuth and altitude angles. With analysis of data generated by solar panel and determining components life cycle over internet of things. The current situation of the more mature segment of solar energy production, the Photovoltaic (PV) solar cell technology, is one in which energy production is improving. Subsequently, it is believed that solar tracking will contribute significantly in increasing the efficiency of energy collection from the PV panels. Solar energy is the most inexhaustible, renewable source of energy known to humanity. In order to increase the efficiency of solar energy systems, solar tracker is added at the expense of system's complexity and cost. The two basic categories of trackers are single axis and dual axis. Two angle sensors are used to measure the physical angles on both outlet shafts of azimuth and elevation to make sure the desired angles are reached. Integrated advance internet of commutation will be used for data analysis.

**Keywords:** solar power tower (SPT), Light Dependent Resistor (LDR), solar panel.

## I. INTRODUCTION

Solar energy is the most inexhaustible, renewable source of energy known to humanity. In order to increase the efficiency of solar energy systems, solar tracker is added at the

expense of system's complexity and cost. The two basic categories of trackers are single axis and dual axis.

The project is to design and implementation simple and cheap price solar tracker system with two axes using Light Dependent Resistor (LDR). This project is compared with fixed solar panel and the results showed that solar tracker more output power than fixed solar panel. The sun position carried out in two stages, first stage or direct sensing performed via set of LDR sensors as output tuning to trims the azimuth and altitude angles. Generated output data by solar panel and determining components life cycle are analyzed over internet of things. In this solar tracking system, LDRs (Light Dependent Resistor) as known as Photo resistors plays a major role. These are sensitive to light, so these are used in Light or Dark detector circuit.

## II. METHODOLOGY

In this solar tracking system, LDRs (Light Dependent Resistor) as known as Photo resistors plays a major role these are sensitive to light, so these are used in Light or Dark detector circuit. Two LDRs are installed and the stepper motor used to move towards solar power.

The stepper motor moves towards the LDR, which the resistance to be high i.e. towards the LDR on which the light is falling, and will continue to obey the sun. If both the LDRs had the same amount of light falling, the stepper would not rotate. This method is done by using Arduino microcontroller to interface with other components.

The main mechanism of the solar tracking system consists of the tracking device, the tracking algorithm, the control unit, the positioning system, the driving mechanism, and the sensing devices.

The tracking algorithm determines the angles which are used to determine the position of solar tracker. There are two types of algorithms-astronomical algorithms and real time light intensity algorithms.

The astronomical algorithm is a purely mathematical algorithm based on astronomical references. The real-time light intensity algorithm is based on real-time light intensity readings. The control unit performs the tracking algorithm and manages the positioning system and the driving mechanism. The positioning system operates the tracking device to face the sun at the calculated angles. The positioning system can be electrical or hydraulic. The driving mechanism is responsible for moving the tracking device to the position determined by the positioning system. The sensing devices are group of sensors and measurements that measure the ambient conditions, the light intensity in case of real-time light intensity algorithms, and the tilt angle of the tracker.

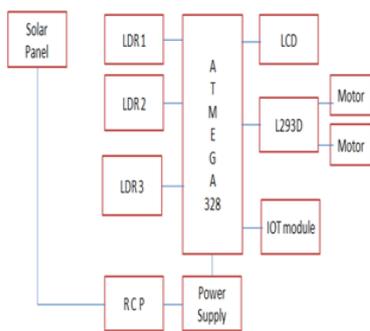


Figure 1: Block Diagram

Solar cells work to give more energy and better efficiency when they are at the right angle with the sun means solar radiation falling vertically on the solar cell that happens by using a solar tracking system that uses sensors that are detected the sunlight. The sensors are connected with an electronic circuit that receives and interprets the desired action which in turn commands the motor to move in clockwise or anticlockwise to track the sun position and keep the solar panel in directly with the sun. The electronic circuit works as a comparator to keep the mater at the ideal location as long as the solar radiation falling on the sensor is equally mean under the same level of illumination. When all the sensors are in the shade, the motor stands in a relaxed state.

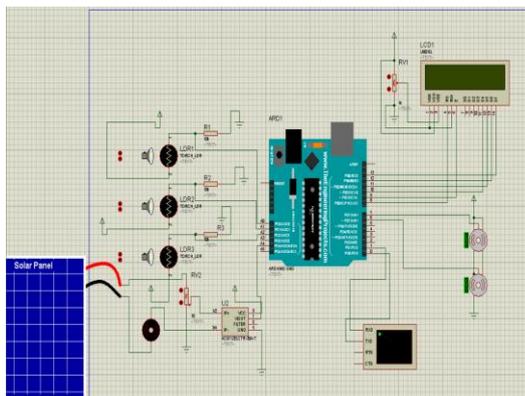


Figure 2: Circuit Diagram

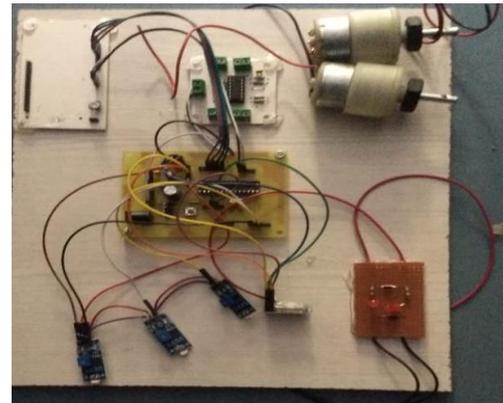


Figure 3: Hardware Implementation



Figure 4: Hardware Implementation

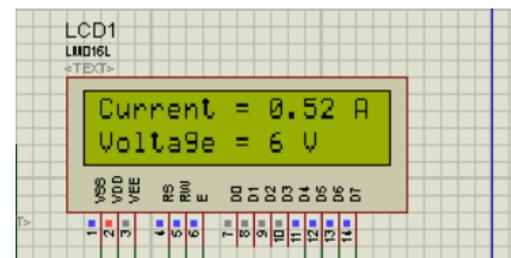
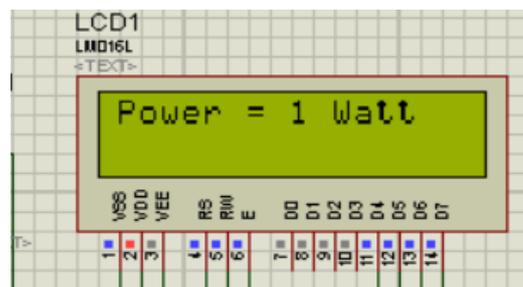


Figure 5: Output



each day of the year. System was tested with a solar panel, and the result obtained was compared with a fixed panel.

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Figure 6: Output Screens

### III. RESULTS AND CONCLUSION

This study has successfully developed a user-friendly dual axis solar tracker. The azimuth and the elevation angles of the sun were mathematically calculated on an hourly basis for

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