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A Review of an Effective Solar Tracking System for High Power Outputs

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Abstract

Solar-powered power plants are critical in places where there is a lack of electricity. To solve the electricity deficit, it is critical to use cutting-edge and developing technologies such as the Internet of Things (IoT) to transform the world into smart ideas such as intelligent cars, smart power plants, and so on. The study examines a smart and efficient solar tracking system that includes manual and automated panel rotation based on light intensity.

Keywords: *Solar Energy, Electricity, Solar Tracking System, Power Output*

INTRODUCTION

Solar energy is the heat and electricity produced by extracting energy from the sun's beams. Solar energy is one of the most commonly used sources of electricity in our day-to-day lives. However, due to government negligence, some people in remote areas do not have proper access to electricity. Additionally, because of the price, it has become pricey and may be a necessary issue of pollution when using fossil fuels, so there must be another to deal with this type of limitation. As a result, in such situations, alternative energy becomes the simplest option for the people living their alternative energy, on the other hand, is clean, quiet, and dependable with low maintenance, and most importantly, its eco-friendly alternative energy resolves the electricity shortage to a large extent and covers the majority of the customer's happiness to the backward class. PV stands for photovoltaic phenomenon, which simply means that sunlight is converted into energy through the use of conductive materials that include the photovoltaic effect, which is the production of electrical currents in a material when it is exposed to light. Remote monitoring at solar energy facilities is critical for preserving the star PV system's health, and constant monitoring is required. The majority of the world's most famous photovoltaic plants are located in distant areas and are managed using current technology.

LITERATURE REVIEW

In their study "Solar Energy activity exploitation Arduino," Jumaat and Othman (2018) stated that the goal of this project is to develop a measurement of alternative energy using Arduino Board technology. During this analysis, four parameters were measured: temperature, intensity level, voltage, and current. The solar intensity was measured using a Light-Dependent Electrical Instrument (LDR) device, while the temperature was determined using a temperature device. The voltage was measured using a potential divider since the voltage created by the solar battery is too high for the Arduino to handle as a receiver. Finally, the current device module was used to detect the current generated by the solar battery. These parameters served as the Arduino's input and output, respectively, on the liquid display (LCD) screen. The temperature, sunshine intensity, voltage, and current worth are displayed on the liquid crystal display screen. The goal of Arduino is to convert the analogue input of a parameter to a digital output and display it on the liquid crystal display screen. Aside from that, this project also includes a design to ensure that the device cover is easy to carry about.

In their paper "Automated Solar Panel with Web Monitoring," Akhter and Nayeem (2018) showed how a machine-driven solar panel may generate more power than the present system. The purpose of this article is to design an automatic sun lightweight pursuit system that can locate the sun's location. The pursuit mechanism may orient the solar battery perpendicular to the sun for maximum energy conversion in the shortest amount of time. Our technology can provide up to a quarter of the energy that star panels can. The pursuit module shows the battery charge proportion and advises the US during charging. The major goal of this article is to connect a system to an electronic computer that will control and monitor the energy production level via a native or live server. The system will update the energy manufacturing level automatically at regular intervals and display it on native or live server web applications. Daily system data may be saved into information.

Chowdhury et al. (2019) presented in their paper titled "A Low-value Closed-Loop star chase System supported the Sun Position Algorithm" describes Sun position and also the optimum inclination of a solar battery to the sun vary overtime throughout the day a simple but correct star position activity system is important for maximising the output power from a solar battery to extend the panel potency whereas minimising the system value Sensor-based sun position measurement systems are unable to maintain the star position throughout a cloudy or intermittent day, and they require accurate installation and occasional calibrations. Sun position algorithms, on the other hand, use mathematical formulas or astronomical information to determine the sun's position at a certain geographical location and time. A standalone low-cost but high-precision dual-axis closed-loop sun-tracking system based on the sun position formula was implemented in an 8-bit microcontroller architecture. The Astronomical Almanac (AA) formula was utilised because of its simplicity, dependability, and speedy computation capability of star position. According to the findings, incorporating the sun position formula into a star chase system outperforms the mounting system and optical tracking system by 13.9 percent and 2.1 percent, respectively. In conclusion, even for a small-scale star chase system, the algorithm-based closed-loop dual-axis chase system improves overall system potency.

Subhasri. G and Jeyalakshmi. C (2018) examined the IoT framework for solar panel tracking systems in their study titled "A Study of IoT Based Primarily Solar Battery Chase System." The entire paper is a study of the star chase systems enabled by IoT, and it has been completed so that it may be modified anywhere, such as at home or at work.

Mustafa et al. (2018) showed in their article titled "Simple Design and Implementation of Star Chase System 2 Axis with Four Sensors for Baghdad City" that the most important purpose of increasing the power is to get the most power from the solar battery. The goal of this project is to design and build a simple and low-cost star huntsman system with two axes (azimuth angle and altitude angle) using lightweight materials. The project consists of a solar battery, a two-motor satellite dish, and a ball-joint, as well as an LDR device module connected to an electronic circuit. This device was compared against a mounted solar battery, and the results indicated that the star huntsman produced more electricity than a fixed solar panel. The project is divided into two sections: hardware and electronics. The hardware half is typically made up of a solar battery, two-DC motors with cases, and an LDR device module. The second portion of this work is an electronic circuit that detects the sun's location in two steps. The first stage is direct sensing, which is conducted using a set of LDR sensors as output standards to trim the angle and altitude angles. The second stage, once the weather is cloudy, dirty, or rainy, the chase system can stop that the system keeps within the position of the sun while not moving but consistent with Kelly circular function relation the facility will decrease according to the Republic of Iraq - Baghdad town weather as we have approximately 10-15 rainy days that each day has (2-4) hours of cloudy and rain. The amount of energy taken from an electrical phenomenon (PV) or any solar furnace is determined on the irradiance of the sun. The solar furnace panel must constantly be traditional to the incident radiation for maximum energy extraction from the sun. Star trackers move the solar collector to follow the sun's path and maintain the solar collector's orientation at the optimal angle. The star chase system significantly improves the energy potency of a photovoltaic (PV) panel. In this research, an autonomous twin axis star chase system is intended and built by utilising lightweight Dependent electrical device (LDR) and DC motors on a mechanical structure with gear arrangement. The results showed that the automated star chase system is more dependable and cost-effective than the mounted one.

In their work titled "Solar Home Lighting System with AC and DC loads," Jain et al (2017) stated that the goal of the study is to create an alternate lighting system by utilising alternative energy. The research system comprises of a 10W solar battery, a 12 V battery, a star charge controller, a Multivibrator IC (CD 4047), a MOSFET (IRF Z44N), and a step down transformer (12- 0-12). It bridges the gap between energy demand and energy availability. The charge controller regulates the flow of charge to the battery, preventing overcharging and deep draining. At the same time, PV technology is the fastest growing energy generating technology that also gives a solution to global warming. Almost every region of tropical India is favourable for adopting this technology. PV energy is being used all around the world using various conversion technologies as autonomous power packs and as grid-integrated systems. The design of the convertor and cargo is determined by the application. The study analyses the star battery-powered house lighting system extensively and confirms the system's appearance for dependable and optimal performance.

Kumar B et al. (2017), in their analytical piece titled "Dual-Axis Star Tracker," have unmistakable findings. Non-renewable energy sources, such as fossil fuels, are rapidly depleting, and in the near future, humanity will be faced with their extinction. Renewable energy sources that are abundant and easily accessible are required. Because the sun's insulation meets all of the criteria, there are emerging technologies focused on generating alternative energy. Because of the earth's spin, we tend to see the sun in several positions throughout the day, so lightweight huntsman is used in conjunction with mechanisms that orient a solar battery or a concentrating panel throughout the day. Planning and fabricating a twin axis star huntsman requires a correct understanding of Basic physics, management system.

Racharla and Rajan (2016) examined in their paper titled "Solar Chase System—A Review" that the facility from the reduction of fossil fuels is that the most important challenge for the subsequent 0.5 century the concept of converting alternative energy into electricity exploitation electrical phenomenon panels holds its place in the front row compared to different renewable sources however the continual change within the relative angle of the sun to the world reduces The results of this review show that the angle and altitude twin axis chase system is more cost-effective than other tracking systems, but in terms of value and adaptability, the single-axis chase system is more capable than the twin axis tracking system.

PROPOSED SYSTEM

The study describes a modern solar tracking system that maximises electricity output. LDR sensors are employed in this system to detect light from the environment. This system has two operating modes: manual and automatic. When the user changes the settings of the tow potentiometers in manual mode, the position of the servo motors will likewise change depending on the input given by the user using the potentiometer. In automated mode, the LDR drops or rises in resistance as the intensity of light increases, and the servomotor changes its angle to acquire the maximum voltage and thus the solar panel. When there is a drop in resistance on any of the LDRs during the day, the street lights turn off, and when there is no drop in resistance on any of the LDRs during the night, the lights (LED) turn on. In this approach, an LCD is utilised to display the project's status at each stage.

The different components used in this system are:

- LDR Sensor
- Servomotor
- Potentiometer
- LED
- Solar Panel
- LCD

CONCLUSION

The study discusses the principles of solar technology as well as the need for remote monitoring utilising cutting-edge approaches. In a nutshell, the paper provides an overview of an efficient solar tracking system for maximum power output.

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