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Literature Review on Automated Solar Tracker System

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Abstract-Renewable energy sources are becoming one of the most important resources in today's world because of their Renewable energy sources are becoming one of the most important resources in today's world because of their many benefits. In particular, solar energy continues to be a source of non-combustible and non-polluting energy to meet our ever-growing energy needs. However, solar panels, which are important components of solar energy conversion, are not able to track the direction of sunlight through daily and seasonal changes. This reduces the area of exposure to sunlight to solar panels and the efficiency of the solar tracking system involving solar panels. We have developed a solar tracking system using a combination of micro-controller, stepper motor and light dependent resistors (LDR's) for the primary purpose of improving solar energy efficiency. A key part of this tracker is an Arduino controller designed to detect sunlight with the help of LDRs and then set up a ladder to position the solar panel in such a way that it receives maximum sunlight. So this system can achieve greater light and can reduce the cost of generating electricity by requiring a small number of solar panels with the right shape and sunlight.

Keywords: Solar tracker mechanism, LDR, DC motor, controller, solar panel, Inverter, AC load etc.

I. INTRODUCTION

It has been found that the efficiency of solar panels improves by 30-60 percent when using a portable solar tracking system instead of a fixed solar panel system. Therefore, designing and using an energy-efficient solar tracker is challenging due to the immobility of solar panels.

The angle of inclination of the sun's rays and solar panels continues to change due to the movement of the sun from east to west due to the rotation of the earth without weather conditions. In addition, during cloudy days the situation becomes extremely tense. Increasing the rotation of the earth changes the distance between the earth and the sun which introduces a change in the pattern of incoming solar radiation. All of these factors must be taken into account in designing a solar tracking system to achieve maximum efficiency. We decided to develop a solar tracking system using a combination of micro-controller, stepper motor and light dependent resistors (LDR's) with the primary objective of improving the efficiency of solar panels. Nowadays Many street lights soalr have a solid location, pointing to this problem statement we want to add a dual solar tracking system.

A key part of this tracker is an Arduino controller designed to detect sunlight with the help of LDRs and then set up a ladder to position the solar panel in such a way that it receives maximum sunlight. So this system can achieve greater light and can reduce the cost of generating electricity by requiring a small number of solar panels with the right shape and sunlight.

In this project, we have discussed a solar tracking system designed using some LDR (light-based light), Arduino control, OPAMP's contrast, crystal oscillator, stepper motor and stepper motor driver, tracker Mechanism . The basic idea behind this work is that the intensity of the light will be felt by the LDR separated by a certain angular distance, the comparators will compare the intensity of the incident light with the intensity of the perpendicular incident. The controller will rotate the stepper motor at the angle you want depending on the output of the comparators with the stepper driver circuit to increase efficiency. Due to changes in the position of the device and the weather conditions, the intensity of the sunlight changes, which we have done to change the value of the threshold by changing the resistance.

II. PROBLEM STATEMENT

Too many areas prefer to use mineral oil as their main source of electricity. This means that people are subject to the limits and the filth that comes with it. With traditional power, broad and expensive infrastructure must be installed which means that in developing countries, electricity is limited to one lamp or brand new buildings. This project proposes to implement a system that can improve solar energy production by 30-40% using a tracking system to use a control circle that sets the two stepping motors used to orbit the solar panel properly.

III. OBJECTIVES OF STUDY

The main objectives of the research are set out below:

A. Design a system that can control the location of the solar panel in line with the solar environment.

B. Establish a more affordable solar tracker for commercial solar trackers.

C. To apply this power to AC loads using MPPT and inverter module.

The aim of our projects is to utilize the highest solar energy through a solar panel. This is a digital digital day tracking system.The solar panel automatically tracks the sun from east to west for maximum light intensity.

IV. LITERATURE REVIEW

After reviewing the various research papers associated with the solar tracker system, the conclusions are outlined below,

Anshul Awasthi et.al. 2020, This paper begins with a brief introduction of solar PV cells and materials used in their construction. It also discusses the types of solar PV systems and types of solar tracking systems. Solar energy is plentiful, abundant, inexpensive, renewable green energy source. In view of the aforementioned qualifications, the earth today is researching and exploring the most probable way to use this solar system to track this result. It focuses on building and analyzing the performance of solar systems following the proposed two-axis track in recent years. Although the choice in the use of trackers mainly depends on the material of the world but in general the system proved to be more efficient and more profitable than its single axis counterparts and non-permanent counterparts.

Gagari Deb et. al. 2012, This paper discusses the design and implementation of a solar tracker system dedicated to PV conversion panels. The proposed single axis solar tracker device ensures efficient solar conversion by properly aligning the PV panel in line with the actual solar environment. The performance of the device test model is based on a Stepper motor cleverly driven by a dedicated driving unit that moves a small PV panel based on signals obtained from two simple but efficient sensors. In this paper machine to create an effective solar tracking system with the help of Labview software is discussed and discussed with the stepper motor control strategy. In this study it was found that the engine will move the solar array in line with sunlight.

Okandeji et. al. 2020, Solar energy is the most reliable source of renewable energy, especially in rich areas such as Africa. In particular, a country with an epicenter of electricity such as Nigeria with a current capacity of about 3.5GW of energy has a long solar cycle of about 90% of the year, making Nigeria very rich in solar energy. The use of solar energy in usable electricity remains a major problem as existing models can use up to 70% of available energy. To make the most of solar energy, the solar panel must be compatible with a source of energy for all 12 hours of sunlight, and must be able to follow the movement of the sun throughout the day. Therefore, this work looks at the analysis, construction, and implementation of a flexible solar axis tracking system. The test result shows that the proposed system exceeds the stationary solar tracking system.

Liping Guo et.al. 2009, This paper describes a high-end design project that uses full solar energy by following the sun throughout the day. The solar tracker tracks the sun from east to west during the day. Additional energy is collected by controlling the solar panel to follow the sun like a sunflower. The solar tracking system is a mechatronic system that integrates electrical and mechanical systems, as well as computer and software hardware. The main components of the solar tracking system are standard photovoltaic (PV) solar panels, deep circuit rechargeable battery, battery charger, stepper motor, circuit conditioning circuits and BasicX-24p microcontroller.

Priti Debbarma et.al. 2019, A study of this paper reviews the different types of tracking systems for solar tracking systems. Basically the solar tracking systems consist of two types - a single axis tracker and a double axis tracker. One-axis trackers are areas around the equator where there is no significant change in the solar system. Dual axis trackers are areas where sun movement is tracked from east to west throughout the day and from east to north or south throughout the seasons.

Reshmi Banerjee et.al. 2015, "Solar Tracking System" is a way to generate energy from the sun. This method of generating energy is simple and taken from a natural source. This requires only high sunlight to produce energy. This paper helps to generate energy by setting up equipment to automatically detect large amounts of sunlight. This system tracks the intensity of intense light. In the event of a decrease in light intensity, the system automatically changes its direction to achieve greater light intensity.

Rashwan M. A et.al. In 2014, this paper is about managing a solar panel on two axes using 4 light dependent resistors (LDRs) such as sensors, steppers and direct current motors (DC) as actuators (M1, M2) and microcontroller PIC16F877A as a unit. of the controller. The prototype of the solar tracking system has an accurate control mechanism to maintain automatic tracking of the sun and gain maximum power in the solar cell. The results prove that, the model has a high accuracy in tracking the movement of the sun throughout the day.

Mohamad et.al. 2021, Typically, solar tracking systems are classified as single-axis solar tracking systems and dual solar tracking systems. Several researchers have performed both simulation and experimental work to compare and evaluate the effectiveness of solar tracking systems against vertical solar panel systems, as well as between different systems of the solar tracking system. A common consensus among researchers is that the efficiency of solar tracking systems is often higher than that of stagnant solar panels. Some researchers are also conducting studies on how weather conditions affect the performance of solar panels, and they conclude that systems with tracking systems can cope with a wide variety of climates.

Dr. Tanvir Arafat Khan et. al. 2010, Solar energy gained immediate focus as an important way to increase renewable energy consumption. Solar cells convert solar energy into expensive energy and are less efficient. Various methods are used to increase the efficiency of the solar cell to reduce costs. A solar tracking system is the most effective technology for improving the efficiency of solar cells by tracking the sun. A design approach based on the automatic solar tracker microcontroller is presented in this paper. Light-based resistors are used as solar tracker sensors. The designed tracker has an intuitive control system that will provide three ways to control the system. A small prototype of the solar tracking system has also been developed to use the design method presented here.

Suneetha Racharla et. al. 2015, Power generation since the reduction of fossil fuels is a major challenge for the next half century. The idea of converting solar energy into solar energy using photovoltaic panels holding their place in the front line compared to other renewable sources. But continuous change of the relative angle of the sun toward the earth reduces the watts brought by the solar panel. In this context a solar tracking system is the best way to increase the efficiency of a photovoltaic panel. Solar trackers transmit solar charge throughout the day. This paper has reviewed various types of tracking systems and their pros and cons are discussed in more detail. The results presented in this review confirm that the azimuth and altitude dual axis tracking system is more efficient compared to other tracking systems. However, with the cost of changing the viewing area a single-axis tracking system is more likely than a dual-axis tracking system.

Dhruva Aravind et. al. 2015, This paper discusses the efficiency of solar cells with and without tracking system. It also includes a proposed system of simple double axis tracking device based on servo motors and connected using an arduino microcontroller kit. There are many types of trackers available that are distinguished separately based on their mounting and the types of driving that are also discussed below. The graphs below provide a clear comparison of the efficiency of a solar panel with a tracking system in that external and external tracking system. The instructions to the ser-vo engine range from very light-based anti-light elements that look at the moment of PV panels to very high light.

Shubhangi Bhatambrekar et. al. 2015, This paper provides the design and construction of a microcontroller 8051 solar panel tracking system to generate solar energy. The solar tracking system generates a lot of energy since the solar panel is always aligned with the sun. This paper examines the purpose of the solar panel tracking system which is to keep the solar photovoltaic panel aligned with the sun throughout the year for optimal performance. Invisible control is used to control the location of a DC vehicle. The solar tracker is a tool that tracks the movement of the sun as it rotates from east to west every day. Trackers are used to keep solar collectors / solar panels oriented in the sun as it travels in the sky every day.

Abhishek Shukla et. al. 2017, This paper will involve the design and construction of the "Dual axis solar tracking system using LDR". This is the movement of the sun in any direction (horizontal and vertical). The proposed system uses the IC LM339 Comparator as the brain to control the entire system. LDR (light-based resistor used to detect light intensity and send data to the compiler. This component will compare the data and rotate the engine in the right direction. .

Shreyasi Chakrabory et. al. 2015, This limits the area of exposure to sunlight to solar panels and the efficiency of the solar tracking system involving solar panels. We have developed a solar tracking system using a combination of micro-controller, stepper motor and light dependent resistors (LDR's) for the primary purpose of improving solar energy efficiency. The main component of this tracker is the AT89S52 micro-controller which is designed to detect sunlight with the help of LDR and activate the stepper motor to position the solar panel in such a way that it receives maximum sunlight. So this system can achieve greater light and can reduce the cost of generating electricity by requiring a small number of solar panels with the right shape and sunlight. This project is an application development that takes place on a college project.

Karan Salgaonkar et. al. 2017, The purpose of this paper is to introduce the novel design of a dual autonomous solar tracking system using a support with a quadrant light dependent resistor (L.D.R) and a simple electronic circuit to provide sinewy system performance. The proposed system uses a tracker to actively track solar radiation and appropriately adjust the panel to increase power output. This project focuses on the simulation and application of a highly efficient algorithm on a double axis solar tracker orbiting azimuth and altitude direction. This simulation puts the panel in a hemi spherical cycle that absorbs high sunlight and thus increases the total amount of electricity generation.

V Sundara Siva Kumar et. al. 2014, The purpose of this paper is to introduce solar energy technology for photovoltaic cells. To introduce this effective solar power system, a double-axis solar tracker is designed. The tracker actively tracks the sun and adjusts its position accordingly to increase power output. The tracking system designed consists of sensors, control circuits used by the microcontroller to drive DC motors and ground-carrying gear systems. Two geared dc motors are used to move the solar panel so that the sun's rays can stay in line with the solar panel.

Shivanshu Tiwari et. al. 2014, With increasing focus on using the sun as a source of energy, not only changing the use of fossil fuels as a major energy source but also reducing pollution, it is vital that solar energy be taken seriously. possible efficiency. As we know the efficiency or emission of a solar panel depends on the materials used and the amount of exposure they receive from sunlight. Currently, the materials used to make solar panels are not working very well and research is still ongoing in that area so it is important that we make the solar panel exposed to the highest possible rays from the sun throughout the day, get the highest amount of energy and operate close to its normal working condition. The following research paper is an attempt to demonstrate LDR-based follow-up events to do the same.

Prof. Pooja K. Chhatwani et. al. 2013, Currently, most solar panels are repaired, that is, the solar array has a straight shape in the sky and does not change to follow the sun. To increase the brightness of the solar unit area on solar panels, we have developed a solar-powered generating system. The design approach holds the solar panel and allows the panel to make almost 3-dimensional (3-D) hemispheroidal rotations to track the movement of the sun during the day and improve overall electrical output. This system can achieve greater light and energy efficiency and reduce electricity costs by requiring fewer solar panels, therefore, it has great potential for research and development. A key application of this report is the use of solar energy. Now the day we have a great need to use solar energy as in the coming days everything we use may depend on these types of systems.

Syed Arsalan et. al. 2013, The use of alternative energy sources is growing worldwide. Our sun is also an excellent source of energy for various forms of energy; light energy has a very significant value. Solar panel converts light energy into electrical energy. The efficiency of the solar panel can be enhanced by merging the solar panel. A solar tracking system is built into this project, providing a reliable and affordable way to direct the solar panel on a single axis. This project is based on microcontroller 8051 with a simple circuit and sun tracking software.

V. CONCLUSION

New innovations in solar tracking systems have enabled the development of more solar thermal and photovoltaic systems for a variety of applications in recent years compared to conventional solar panels. Solar systems that follow changes in the path of the sun during the day collect a very large amount of solar energy, and as a result produce much higher output energy. This paper has presented a review of major types of solar tracking systems developed over the past 20 years. It has been shown that these solar tracking systems can be broadly classified as single-axis and double axis, depending on their orbit. In addition it can be classified as an active and passive tracker depending on the actuator. The sub-section and their basic terms for each method have been updated. Overall, the results presented in this review confirm that the azimuth and altitude dual axis tracking system are more efficient compared to other tracking systems. However the cost and flexibility of point viewing a single-axis tracking system is more likely than double-axis. In the

future the details of the current paper will be helpful in choosing the most accurate and specific tracker in terms of region, available location and estimated costs. Current work may be helpful in improving the design features of different types of solar tracking systems to improve performance.

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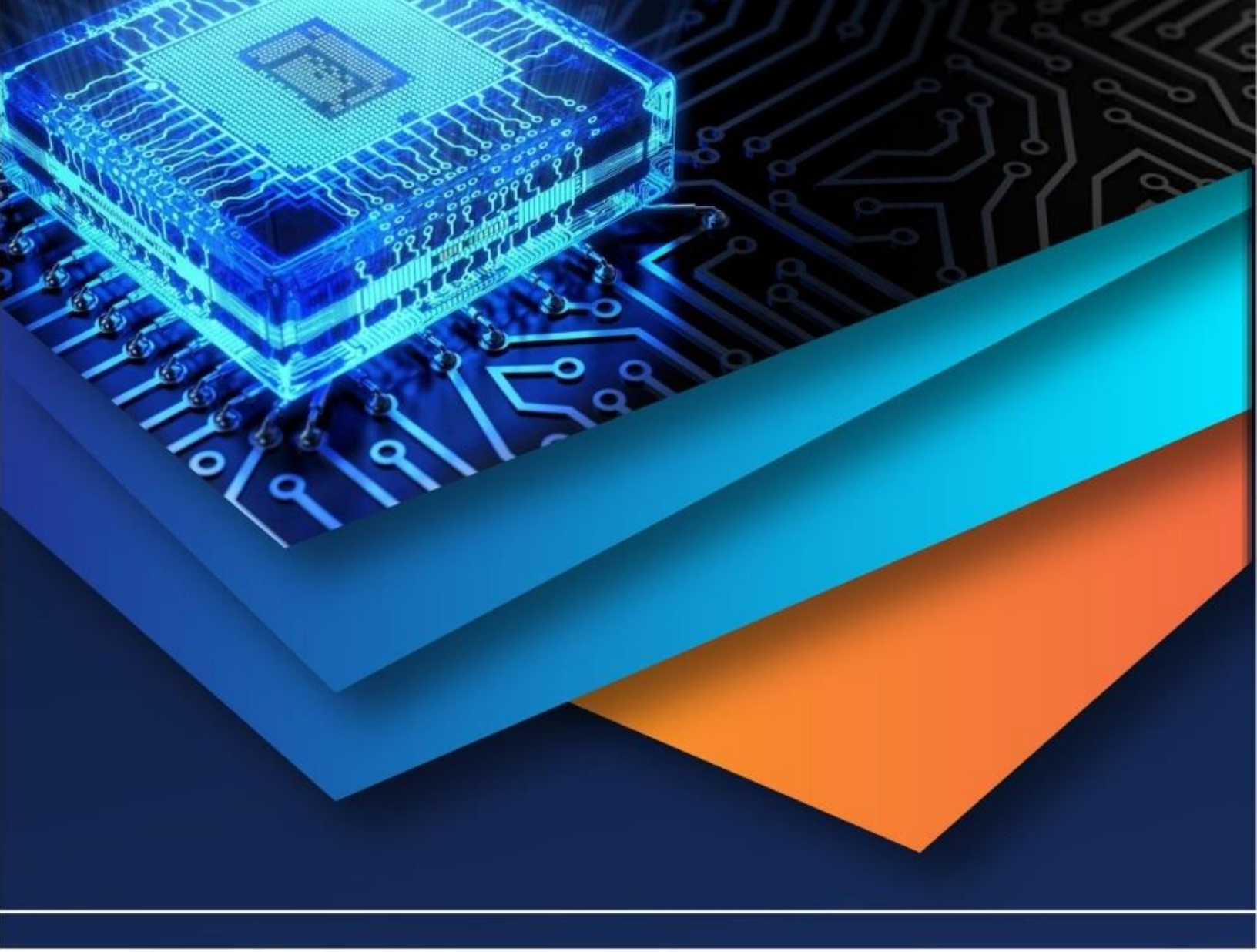

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