e-ISSN:2582-7219

# INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 9, September 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

© 2024 IJMRSET | Volume 7, Issue 9, September 2024| DOI: 10.15680/IJMRSET.2024.0709030

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

# Rotating Solar Panel Using Arduino

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**ABSTRACT***:* According to the modern era, the usage of the electrical devices has rose upto 20%, The International Energy Agency said that searches for common devices, such as TVs and laptops, had increased by double digits over the previous year based on Google Trends' search traffic index. TVs had a search volume index score of merely 46 in June 2019 as opposed to 60 in2020. For searches involving personal computers, the index scoreincreased as well, rising from 68 in 2019 to 88 in June 2020. Blenders and microwaves were also far more prevalent. Currently, 15% of home power is consumed by electronic gadgets, although this percentage is growing quickly. With an average of more than 1.3 televisions in every home with access topower, there are currently close to 2 billion televisions in use. More than half of the world's population has a mobile phone subscription, and there are already more than 5.5 billion externalpower supply connected to various electronic gadgets. It might bedifficult to evaluate someone with more resources because itrelies on their lifestyle, type of work, number of family members, and appliances. However, the majority of electrical businesses believe that a lower income group can get by with 200–250 units per month. This equals 6.5–8 Units every day.It is found that power gain of hybrid dual axis solar tracking system is almost equal to continuous dual axis solar tracking system, whereas the power saved in system operation by the hybrid tracker is 44.44% compared to the continuous tracking system. Since renewable energy sources are ecologically beneficial and sustainable, they have attracted a lot of interest. One such source is solar energy. The proposed system uses the technology of solar thermal energy conversion to produce electricity in much improvised manner.

**KEYWORDS***:* solar panel, Arduino IDE

## I. INTRODUCTION

The concept of a rotating solar panel system using Arduino involves the integration of solar energy technology with automation and control systems. This approach aims to optimize the efficiency of solar panels by continuously adjusting their orientation to maximize exposure to sunlight throughout the day.Solar panels are devices that convert sunlight into electricity. However, their efficiency can be significantly affected by their orientation relative to the sun. A fixed solar panel setup doesn't account for the movement of the sun across the sky, leading to lessthan optimal energy generation. A rotating solar panel system, alsoknown as a solar tracker, addresses this inefficiency. By automatically adjusting the position of the solar panels to follow the sun’s trajectory, it ensures maximum exposure to sunlight,thereby increasing the energy output. Arduino is a popular open-source microcontroller platform usedfor building digital devices and interactive objects. In the contextof a rotating solar panel system, an Arduino board serves as the control center. It processes inputs from sensors, runs the tracking algorithm, and controls the motors that adjust the panel's position.

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## II. LITERATURE SURVEY

The proposed system helps us to track the solar energy in anefficient manner. These are some of the technical literature in engineering and technology where people have tried to implement similar kind of Systems which are mentioned below with their shortcomings with respect to our application.

[1] Author Abubakar Sadiq Aliyu et al (2016) have implemented Design and Construction of a Sun Tracking Solar Panel System" This paper discusses the design and implementation of a solartracking system using light-dependent resistors (LDRs) and an Arduino microcontroller. It covers the mechanical design of the system, the circuitry, and the programming logic for sun tracking.

[2] Author M. H. Burhan et al. (2018) have implemented "Development of Solar Tracking System Using Arduino Uno Microcontroller" . This paper presents the development Solar tracking system using an Arduino Uno microcontroller. It describesthe hardware setup, including sensors and motors, and provides details on the software implementation for sun tracking.

[3] Author R. Badgujar et al. (2017) have implemented Development of a Dual-Axis Solar Tracking System with Arduino for Solar Photovoltaic Applications" .This paper focuses on the design and development of a dual-axis solar tracking system using Arduino for photovoltaic applications. It discusses the hardware components, including sensors and actuators, and presents the control algorithm implemented with Arduino.

[4] Author A. K. Singh et al. (2020) have implemented Performance analysis of solar panel with sun tracking system using Arduino". This paper investigates the performance of solar panels with sun tracking systems using Arduino. It discusses the energy yield improvement achieved through sun tracking and provides experimental results to validate the effectiveness of the system.

[5] Author R. A. Al-Rahmawy et al. (2020) have implemented Optimization of Arduino-based Sun Tracking System for SolarPanel". This paper presents optimization techniques for anArduino-based sun tracking system applied to solar panels. It discusses methods for improving tracking accuracy and energyefficiency through algorithmic adjustments and sensor calibration.

[6] Author S. H. Al-Sawad et al (2018) have implemented Experimental Investigation of Arduino-Based Solar Tracking System Performance for Energy Harvesting". This paper presents an experimental investigation into the performance of an Arduino- based solar tracking system for energy harvesting. It includes data analysis and evaluation of energy output under different tracking conditions.

[7] Author A. K. Das et al. (2017) have implemented "Real-time Monitoring and Control of Solar Tracking System using Arduino". This paper discusses the development of a real-time monitoring and control system for solar tracking using Arduino. It covers the integration of sensors, communication protocols, and user interfaces for remote monitoring and adjustment of the tracking system

## III. EXISTING SYSTEM

The literature related to hybrid PV-T applications are reviewed,and a small-scale solar dryer utilizing amorphous type photovoltaic-thermal (PV-T) as a collector and to design and test. A 40 Wp amorphous solar panel is used as a solar collector and covered with double glass at the top. The output air temperature of the collector is found to vary from 35 to 50 C during the day with the global solar irradiation of 300 – 1000 W/m2. The output of electricity varies 4 – 25 Watt. This study presents a thermal performance simulation of solar central heat generation system for multi-purpose applications we extensively compare simple forecasting methodologies with more sophisticated ones over 32 photovoltaic plants of different size and technology over a whole year. Evaluate the impact of weather conditions and weather forecasts on the prediction of PV power generation. Work is aimedat presenting a building integrated photovoltaic system power prediction concerning the building's various orientations based on the machine learning data science tools. The proposed prediction methodology comprises a data quality stage, machine learning algorithm, weather clustering assessment, and an accuracy assessment.

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## IV. OVERVIEW OF THE PROPOSED SYSTEM

### A. OBJECTIVE

The panel moves along its dual axes in search of locations with themost solar energy using servo motor. The Dimension of the solar panel is 25*150*240 mm. As a result, the solar panel is positioned to receive the most sunrays possible. This system is powered by Arduino, consists of Servo motor. The collected data from the LDR (light dependent resistor) is given as an input to processor according to the instruction given by the processor, servo motor will execute the task.

### B. METHODOLOGY

In proposed method, ARDUINO UNO microcontroller is used to interface with the sensors and to the communication devices. We use LDR to detect which side the sunlight is present the dc motors are used to change the angle of the solar panel into the side that sunlight is present. We use rain sensor to detect the rain and when the rain happens the servo motor move a cover to the top of the solar panel to protect it from rain. The solar panel is used to get theenergy from the sunlight and we use python machine learning to predict the exact voltage produced by the solar panel. These consistof three main parts. These are the single axis, dual-axis, and four- axis. Of these, dual-axis and single-axis are the main ones used. This method allows us to generate electricity through the sunlight at maximum efficiency. This is because the solar panel opensautomatically toward sunlight. For that, the light-sensitive sensors are incorporated into these systems. we also used two LDR sensorsfor this project. Usually, we can measure the light values using these sensors.

## V. BRIEF ABOUT EACH COMPONENTS

### A. ARDUINO UNO

Arduino is an open-source project that created microcontroller- based kits for building digital devices and interactive objects that can sense and control physical devices. These systems provide setsof digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, includingUniversal Serial Bus (USB) on some models, for loading programsfrom personal computers. For programming the microcontrollers, the Arduino project provides an integrated developmentenvironment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

### B. LIGHT DEPENDENT RESISTOR

A Light Dependent Resistor (aka LDR, photoconductor, or photocell) is a device which has a resistance which varies according to the amount of light falling on its surface.A typical light dependent resistor is pictured above together with

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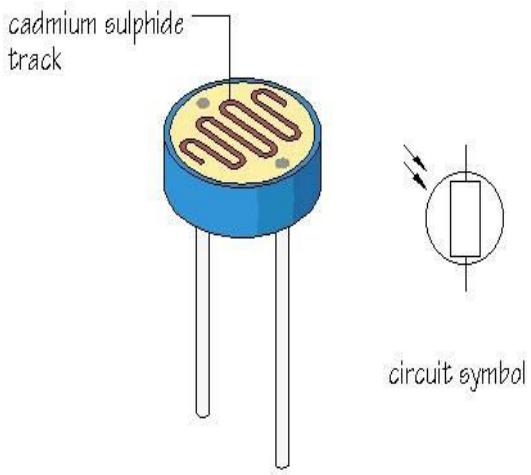
(on theright hand side) its circuit diagram symbol. Different LDR's have different specifications, however the LDR's we sell in the REUK Shop are fairly standard 11 and have a resistance in total darkness of 1 MOhm, and a resistance of a couple of kOhm in bright light (10-20kOhm @ 10 lux, 2-4kOhm @ 100 lux). Light dependent resistors are a vital component in any electric circuit which is to beturned on and off automatically according to the level of ambient light for example, solar powered garden lights, and night security lighting.




**C. SERVO MOTOR**

A Servo Motor is a small device that has an output shaft. This shaftcan be positioned to specific angular positions by sending the servoa coded signal. If the coded signal changes, the angular position of the shaft changes. In practice, servos are used in radio-controlled airplanes to position control surfaces like the elevators and rudders.They are also used in radio-controlled cars, puppets, and of course,robots. servo motors use feedback to determine the position of the shaft, you can control that position very precisely. As a result,servo motors are used to control the position of objects.

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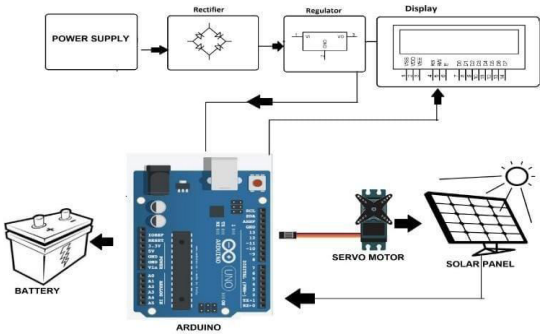
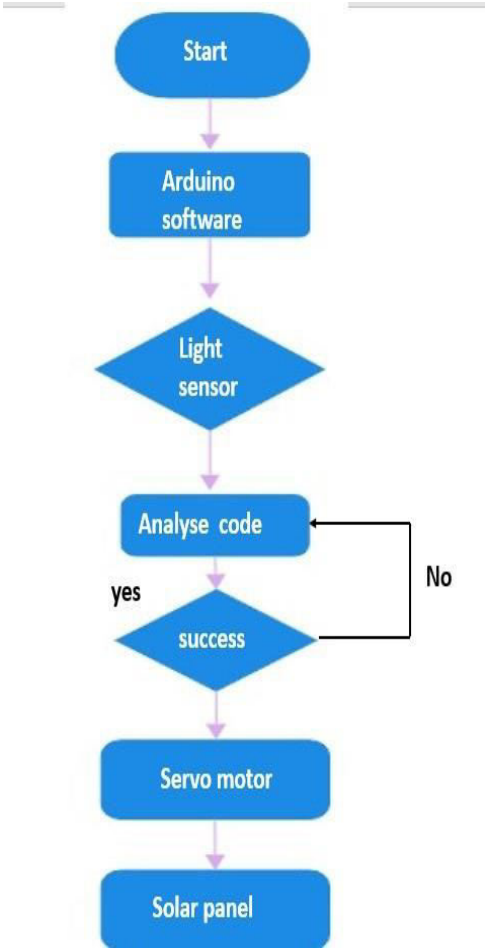
## VI. BLOCK DIAGRAM




## VII. FLOWCHART



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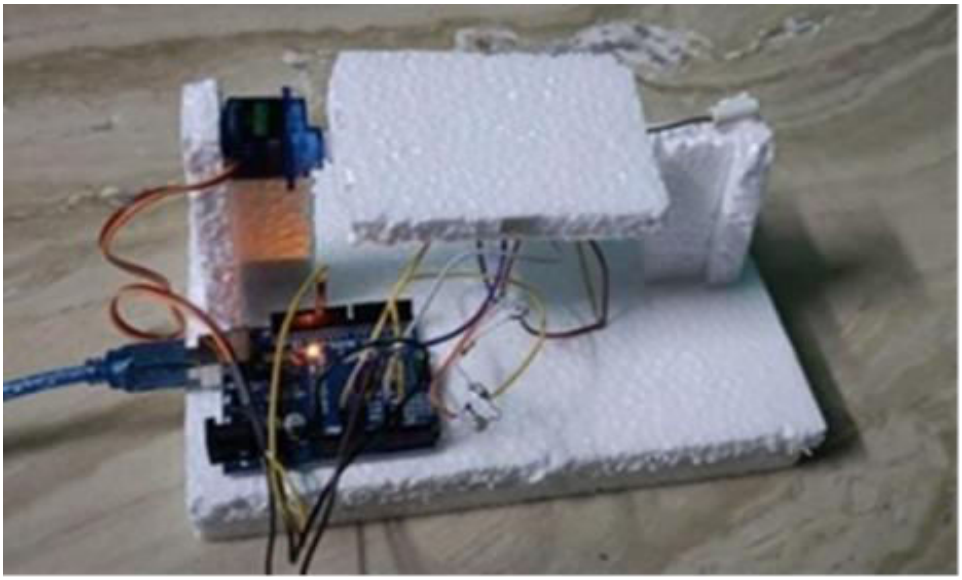
The Flowchart explains about the step by step process in tracking the solar panel with the help of arduino and servo motors.It includes elements such as software, light dependent resitor ( LDR ) sensor, coding in Arduino, success and failure paths, servo motor, and solar panel. The flowchart depict the steps involved in the project from start to end in easiest way to understand.

## VIII. OUTPUT



## IX. SUMMARY

To avoid the loss of solar energy, The proposed system help us to detect which side the sunlight is present the dc motors are used to change the angle of the solar panel into the side that sunlight is present with the help of LDR sensor.The proposed system is used to get the energy from the sunlight and we use python machine learning to predict the exact voltage produced by the solar panel.The system help us to predict the data quality stage, machine learning algorithm, weather clustering assessment, and an accuracy assessment.

## X. SCOPE

Hybrid PV-T Solar Collector using Amorphous Type of SolarCells for Solar Dryer. A photovoltaic solar panel is attempted to use both as solar thermal and as electricity generator at the same time so called hybrid photovoltaic-thermal (PVT) collector for a solar dryer system. A 40 Wp amorphous solar panel is used as a solar collector and covered with double glass at the top. The outputair temperature of the collector is found to vary from 35 to 50 oC during the day with the global solar irradiation of 300 – 1000 W/m2. The output of electricity varies 4 – 25 Watt.

## XI. CONCLUSION

The panel moves along its dual axes in search of locations with themost solar energy using DC motors. The Dimension of the solar panel is 25*150*240 mm. Programming of this device is done in the manner that the LDR sensor, in accordance with the detection of the sun rays, will provide direction to the DC Motor, which waythe solar panel is going to revolve. As a result, the solar panel is positioned to receive the most sunrays possible.

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## XII. DISCUSSION

This chapter offers as an overview of what to expect from the development project's outcomes. To ensure the project's success, the approach and test established in prior study can be used. This achievement contributed to the project goal of developing a systemthat can move a servo motor and show the direction based on the intensity of light. It also can reduce cost of purchasing more solar panel. Besides, this project is design for detect and compare the intensity of light to obtain the maximum source of light energy.

## XIII. ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance, Support and kind co-operation from many, for successful completion. We wish to express our sincere thanks toall those who were involved in the completion of this project.

It is our immense pleasure to express our deep sense of gratitude to our respected chairman Thiru R. S. Munirathinam, our vice chairman Thiru R. M. Kishore, and our director Thiru R. Jothi Naidu for the facilities and support given by them inthe college.

We are extremely thankful to our principal Dr. N. Anbuchezhian, M.S, M.B.A, M.E, Ph. D., for giving us anopportunity to serve the purpose of education.

We are indebted to Dr. G. Amudha, M.E, Ph.D., Professor, Head of the Department in Computer Science and Business Systems for providing the necessary guidance and constant encouragement for successful completion of this project on time.

We extend our sincere thanks and gratitude to our project guide,Ms.R.Monica Lakshmi Assistant Professor in the Department ofComputer Science and Business Systems, who guided us all along till the completion of our projectwork.

Last but not the least, I wish to thank all the teaching and non- teaching staff of CSBS department for their help in the completion of the project.

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