Bharati Vidyapeeth

(Deemed to be University)

College of Engineering, Pune

DEPARTMENT OF INFORMATION TECHNOLOGY

TOPIC : “Dual Axis Solar Tracker System”

Under the guidance of

Prof. Prakash Devale

ROLL NO.	NAME	PRN
37	Sarthak Srivastava	2314110314
56	Rushikesh Girpunje	2314110678
66	Rahul Kumar	2414111034

IDEA TITLE

DUAL AXIS SOLAR TACKER SYSTEM USING ARDUINO UNO

Solar tracker systems are designed to enhance the efficiency of solar panels by continuously adjusting their position to capture the maximum amount of sunlight throughout the day.

Dual-axis trackers offer more precise movement than single-axis or fixed solar panels, allowing them to follow the sun more accurately and produce more energy throughout the day.

Implementing dual-axis trackers significantly increases energy production compared to single-axis or fixed systems.

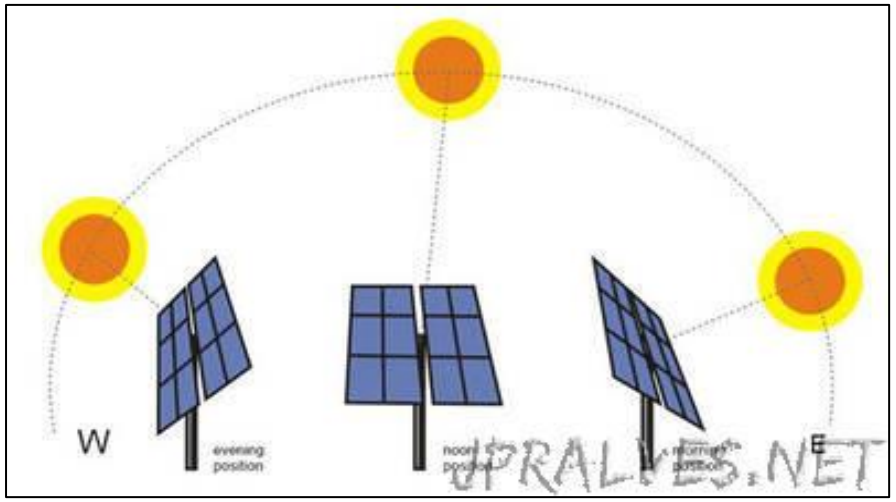
Introduction to Solar Tracker Systems

1. Solar Energy Optimization

Solar tracker systems play a crucial role in maximizing the efficiency of solar panels by constantly adjusting their position to capture the most sunlight.

2. Types of Trackers

- **Fixed panels**: No movement , stay in one position
- **Single-axis trackers**: Adjust along one axis
- **Dual –axis tracker** : Adjust along both axes for maximum sunlight capture



Application

- **Residental :** Used in home solar installation to increase energy efficiency
- **Commerical:** Deployed in solar farms for businesses to reduce energy loss
- **Industruial :** Utilized in large-scale powerplants to maximize renewablae enery production

Components and Circuit Design

- **Arduino Uno**

The microcontroller that controls the system.

- **Servo Motors**

Responsible for rotating the solar panel along both the horizontal and vertical axes.

- **LDR (Light-Dependent Resistors)**

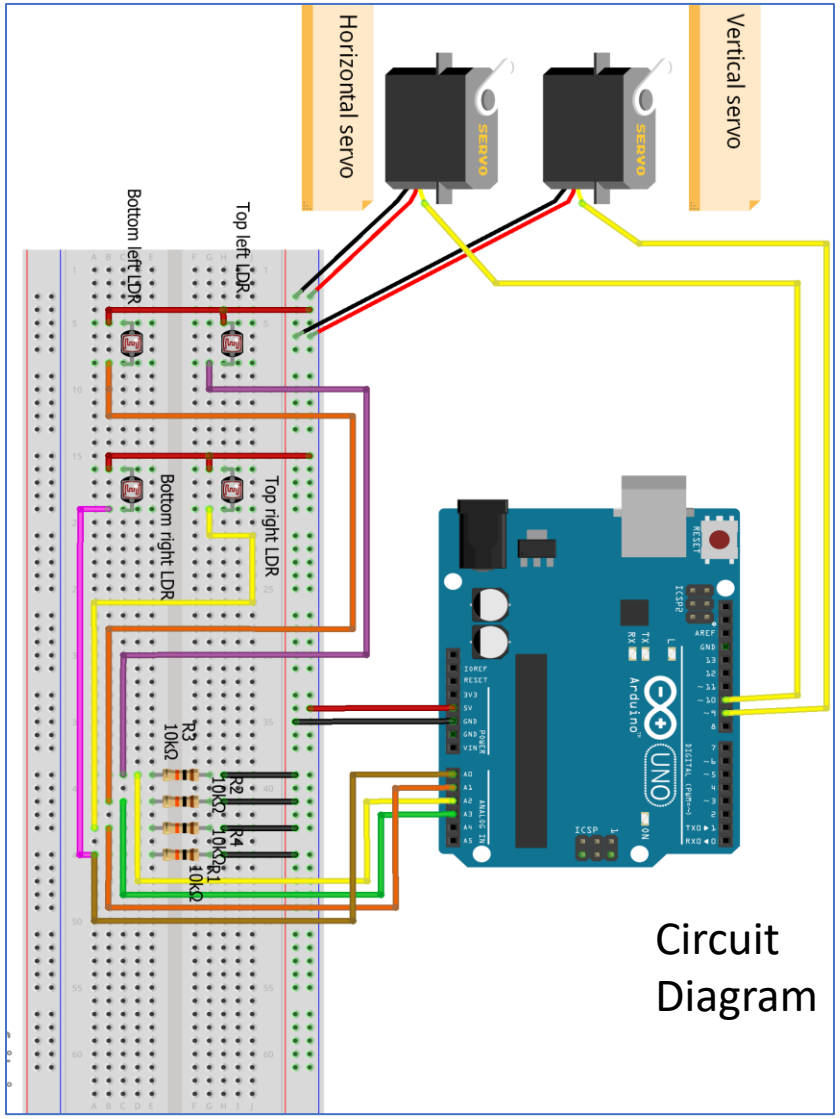
Used to detect the light energy's position and provide feedback to the Arduino Uno.

- **Resistors**

Used with LDRs to create a voltage divider, ensuring accurate light intensity readings while protecting the Arduino from excessive current.

- **Jumper Wires**

Flexible wires that connect the Arduino, servo motors, and LDRs, allowing for quick and easy circuit assembly and modifications.



Circuit Diagram

Step-by-Step Process of Solar Tracking

1 Initialization

Configure Arduino pins for the light-dependent resistors (LDRs) and servo motors. This step establishes communication channels between the microcontroller and the sensors and actuators.

2 LDR Readings

Read light intensity values from the LDRs to determine the sun's location. Higher light intensity readings indicate a stronger signal from the sun.

3 Angle Calculations

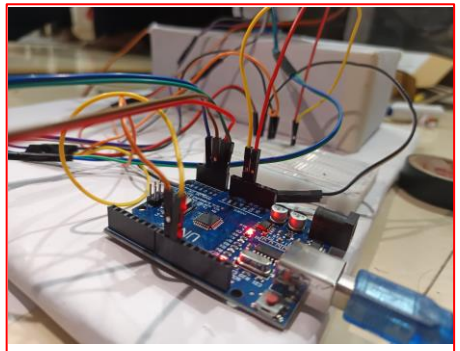
Calculate the servo motor angles based on the LDR data. These angles represent the desired positions for the solar panel to maximize sunlight absorption.

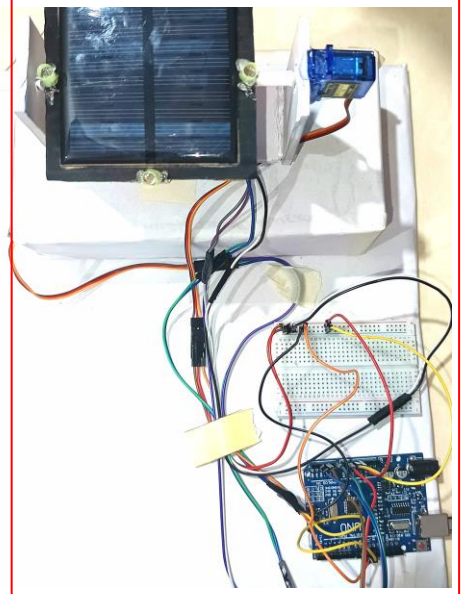
4 Servo Control

Rotate the solar panel to the calculated angles using the servo motors. This action physically adjusts the panel to face the sun's direction.

5 Continuous Adjustment

Implement a loop to continuously read LDR data, calculate angles, and adjust the panel throughout the day. This ensures consistent tracking of the sun's movement.





Solar Tracking System

Advantages of Solar Tracking Systems

Increased Energy Efficiency
25-50% more energy absorption compared to fixed panels

Enhanced Absorption
Maximizes energy capture throughout the day

Self-Cleaning
Reduces manual cleaning requirements

Clean Energy
Sustainable power source with minimal emissions

Reduced Carbon Footprint
Contributes to a healthier environment

Future Enhancements of Solar Tracking Systems

Smart Technology Integration
IoT devices for remote monitoring and real-time data analysis

AI Optimization
AI algorithms to predict solar patterns and improve efficiency

Energy Storage Solutions
Advanced battery systems to store excess energy for later use

Scalability
Modular systems for easy expansion and integration

Weather Adaptability
Sensors to adjust panels based on weather conditions

User-Friendly Interface
Mobile app for monitoring, alerts, and remote control