A

PROJECT REPORT

ON

SOLAR TRACKING SYSTEM USING ARDUINO

Submitted By:

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Introduction:

In an era where renewable energy sources are becoming increasingly vital for sustainable development, harnessing solar energy efficiently is of paramount importance. Solar panels are widely used to convert sunlight into electricity; however, their efficiency can be significantly affected by their orientation relative to the sun's position in the sky. A fixed solar panel may miss out on optimal sunlight exposure throughout the day, leading to reduced energy generation.

Aim:

This project aims to create a solar tracking system using an Arduino microcontroller, which automatically adjusts the orientation of a solar panel to follow the sun's path across the sky. By employing light-dependent resistors (LDRs) as sensors to detect sunlight intensity, the system can continuously adjust the angle of the solar panel to maximize its exposure to sunlight.

Objectives of the Project:

1. Maximize Solar Energy Collection: The primary goal of the solar tracking system is to increase the efficiency of solar energy collection by ensuring that the solar panel is always oriented toward the sun.
2. Automate Tracking: The system will automatically adjust the position of the solar panel based on real-time light intensity readings, eliminating the need for manual adjustments.
3. Cost-Effective Solution: By utilizing widely available and affordable components such as Arduino, servo motors, and LDRs, the project aims to provide a low-cost solution for enhancing solar energy efficiency.

Detailed description of Components

- Arduino Microcontroller

The Arduino microcontroller is the central processing unit of the solar tracking system. It acts as the brain of the project, executing the logic necessary to read sensor data, make decisions based on that data, and control the servo motors that adjust the solar panel's position.

The Arduino microcontroller enables real-time processing of sensor data, allowing the solar tracking system to make immediate adjustments to the solar panel's position based on the intensity of sunlight detected by the LDRs.

- Light-Dependent Resistors (LDRs)

LDRs are passive electronic components that change their resistance based on the intensity of light falling on them. In this project, they are used to detect the direction of the strongest light source (the sun).

> Sensitivity to Light: LDRs have high sensitivity to light, making them ideal for detecting changes in light intensity.
> Analog Output: The resistance of an LDR decreases as the light intensity increases, which allows for analog voltage readings that can be interpreted by the Arduino.

By placing two LDRs on either side of the solar panel, the system can compare the light intensity detected by each sensor. This comparison allows the Arduino to determine which direction the solar panel should move to maximize sunlight exposure.

- Servo Motors

Servo motors are electromechanical devices that can be precisely controlled to rotate to a specific angle. In the solar tracking system, servo motors are used to adjust the angle of the solar panel.

The servo motors enable the physical movement of the solar panel based on commands from the Arduino. They ensure that the panel can track the sun's position throughout the day, optimizing energy collection.

- Solar Panel

The solar panel is the primary component that converts sunlight into electricity. It consists of photovoltaic cells that generate direct current (DC) electricity when exposed to sunlight.

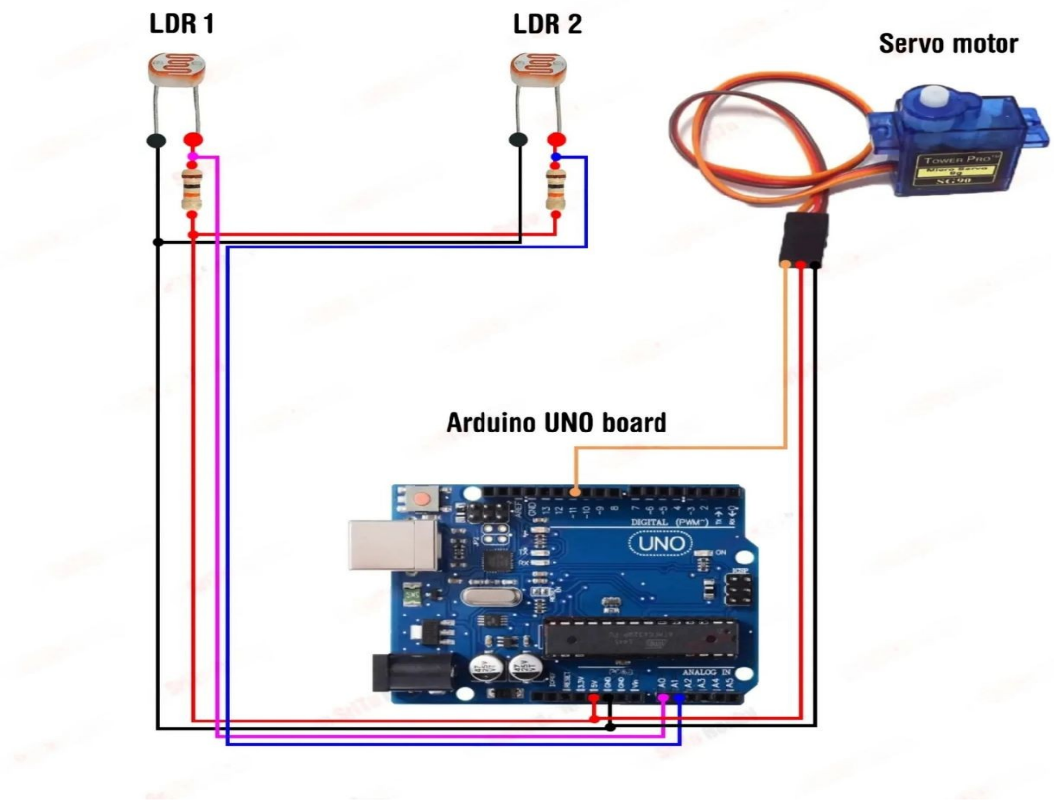
> Photovoltaic Technology: Solar panels use photovoltaic cells made from semiconductor materials (like silicon) to convert solar energy into electrical energy.

The solar panel is the ultimate goal of the tracking system. By ensuring that it is always oriented towards the sun, the tracking system can significantly increase the amount of electricity generated compared to a fixed panel.

- Power Supply

The power supply provides the necessary electrical energy to operate the Arduino, servo motors, and any additional components in the system.

SCHEMATIC:



Program:

```
#include <Servo.h>


Servo myServo;  // Create a servo object
int ldrLeft = A0;  // Left LDR
int ldrRight = A1; // Right LDR

void setup() {
  myServo.attach(9);
}

void loop() {
  int leftValue = analogRead(ldrLeft);
  int rightValue = analogRead(ldrRight);

  if (leftValue > rightValue + 10) {
    myServo.write(myServo.read() - 1);
  } else if (rightValue > leftValue + 10) {
    myServo.write(myServo.read() + 1);
```

```
  }

  delay(100); // Delay for stability
}
```

Future Scope:

The future scope of solar tracking systems using Arduino includes enhancing efficiency through advanced algorithms, reducing costs for dual-axis systems, and integrating smart technologies for real-time monitoring. Additionally, research may focus on improving scalability for larger solar farms and exploring renewable energy integration.

Conclusion:

In conclusion, the solar tracking system is a practical solution for maximizing solar energy capture, offering both economic and environmental advantages. Future enhancements could include advanced sensors and IoT integration for improved functionality