College of Engineering
College of Education

Intelligent Solar Tracker

Project Overview
This Arduino-based project will be focused on making a two-axis sun tracker to maximize sun exposure.

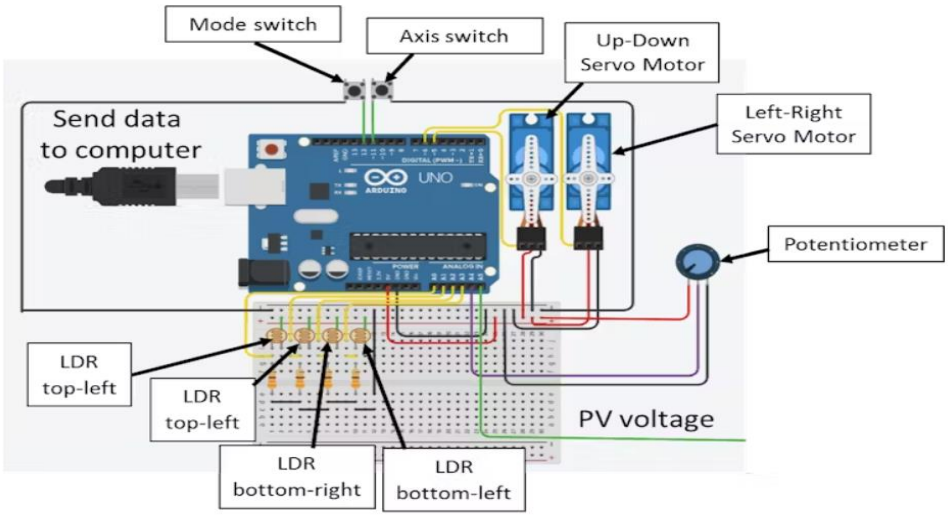
Course Connections	21st Century Skills	CTE Alignment
Middle School Science High School Physics High School Engineering	Communication, Critical Thinking, Collaboration	Energy, Environment, and Development Pathway

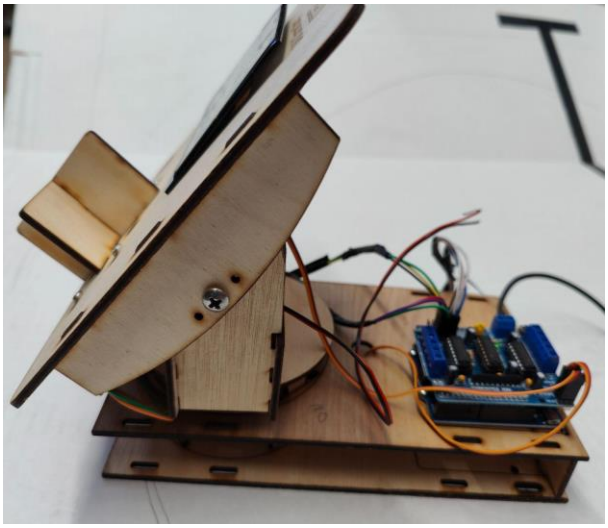
Objective
Students will make a two-axis sun tracker that can track the sun direction and rotate to maximize the sun exposure.

Materials

- Laser cut solar tracker kit (designed by Wrebotics)
- Arduino Uno board and motor shield
- 2 Servo Motos
- 2 Solar Panels
- 4 photoresistors (LDRs)
- 4 10K-Ohm resistors
- LED lights

Block Diagram





Solar tracker kit provided by [Wrebotics]

Application

To maximize power generation, the solar panel should be pointed at the Sun at the perpendicular angle. This solar track can be used to improve the power generation efficiency of small solar panels installed on city facilities like street lamps, pedestrian passing lights, and other decorating lights.

Outline/Schedule

Part 1: Introduction to the project and assemble the solar tracker kit (complete by Day 1)

- Introduce solar panels, how to measure power generation efficiency, and impact of angle between the solar panel and sunlight to the power generated.
- Introduce the solution of an intelligent solar tracker and explain the benefits of using it.

- Discuss the materials needed for the project, draw the block diagram, explain to them how the system works.
- Assign team tasks, distribute materials, and plan the schedule.
- Assemble the solar tracker kit.
- Record video clips for important steps.

Part 2: Programming the Arduino Uno and photoresistor (complete by Day 3)

- Review the basics of programming with Arduino and LDR sensors.
- Introduce the code structure.
- What issues one will run into Arduino programming (e.g. syntax error) the LDR sensor.
- How to improve the accuracy for the LDR sensor value?
- Allow team time to program their microcontrollers and test the LDR sensors.
- Record video clips for important steps.

Part 3: Adding a Servo Motor (complete by Day 5)

- Introduce the Servo Motor and how it can be used to control the rotation of solar panel horizontally and vertically.
- Install the Arduino Servo library.
- Demonstrate how to connect and control a Servo Motor with Arduino Uno.
- Review what problems one can run into when connecting wires and motors into the system
- Allow teams time to mount the Servo Motors to their solar tracker kit and test them.
- Record video clips for important steps.

Part 4: Adding LEDs Integration (complete by Day 7)

- Introduce the use of LEDs to indicate the power generated.
- Demonstrate how to connect and control LEDs with the Arduino Uno.
- Mention to students the problem one may run into due to polarity of leds
    - Reminder for LED's polarity
- Allow teams time to integrate LEDs and test it.
- Record video clips for important steps.

Part 5: Finalizing and Testing the Project (complete by Day 9)

- Design the testing plan based on the project objectives and requirements.
- Discuss the troubles that students may encounter and how to troubleshoot.
- Allow teams time to finalize their project and test it according to the testing plan provided.
- Have teams present their projects and demonstrate their functionality.
- Record video clips for important steps.

Part 6: Prepare the project presentation and make the video demo (complete by Day 9).

Reflection
Have students reflect on their experience with the project and what they have learned about programming, robotics, and Arduino. ● Discuss how STEM skills and knowledge can be applied to real-world problems and applications. ● Allow time for students to provide feedback on the project and suggest improvements for future iterations.

Sample Code
Sample Code