



ARIES-

AUDRINO SOLAR PANEL

iNDEX

What You Need to Know

Audrino Controlled Solar Panel

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Problem Statement

A solar panel which can rotate in the direction of sun in 2 doFs

PROJECT OVERVIEW

- The purpose of this project is to examine how a system of light sensors can be used as a solar tracker for a solar panel. The goal is to capture as much solar energy as possible and to maximize efficiency.

PROJECT

Components-

Arduino Uno

The **Arduino Uno** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller.

Servo motors

Servomotor is a rotary actuator that allows for precise control of angular or linear position, velocity and acceleration.

Solar panel

Solar panel a collection of photovoltaic cells, which can be used to generate electricity through photovoltaic effect.

LDR sensor

LDRs have a sensitivity that varies with the wavelength of the light applied.

Arduino IDE

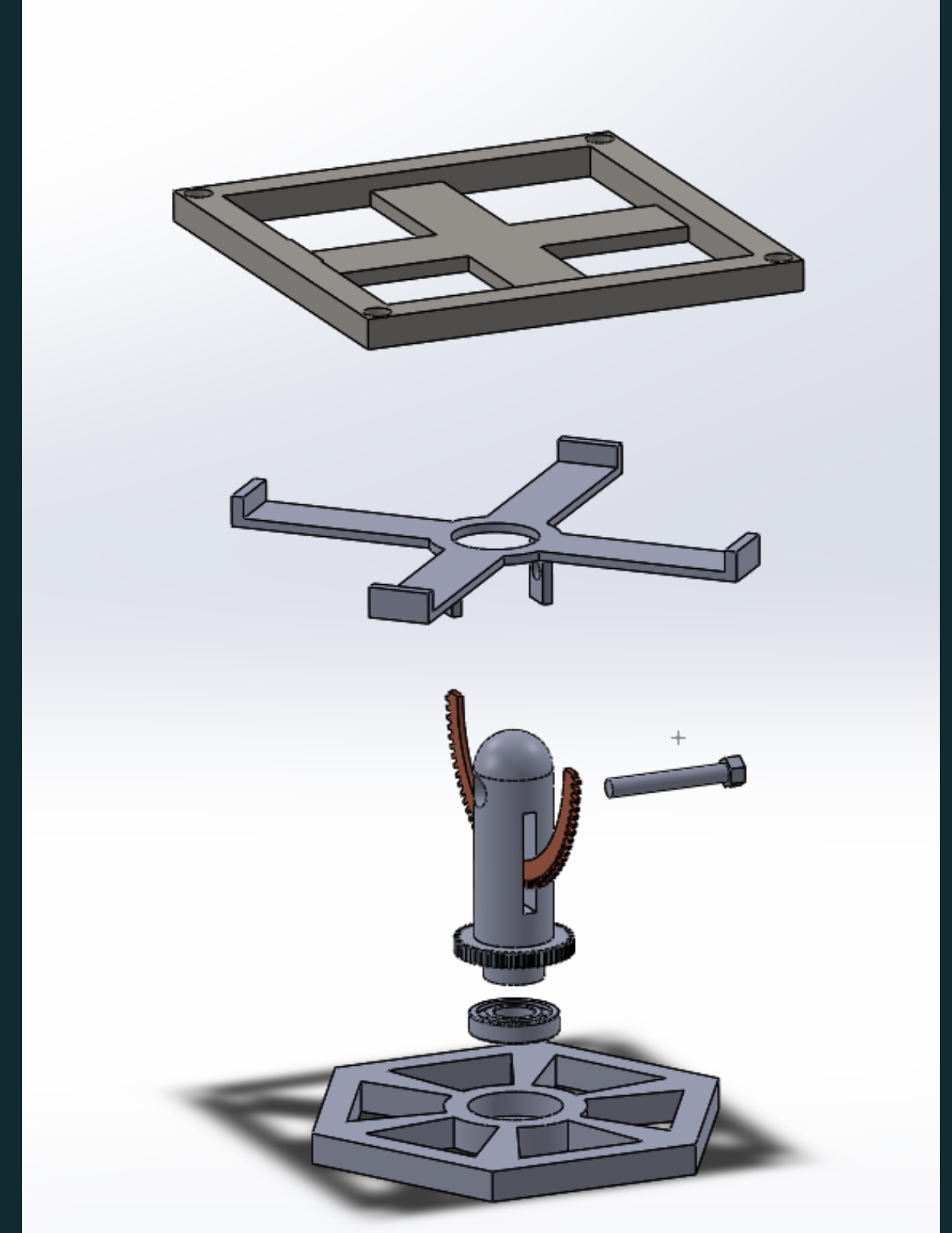
Arduino IDE is an open source software that is mainly used for writing and compiling the code into the Arduino Module.

PROJECT

Mechanical Design-

The Mechanical Design consists of a simple 2-axis gimbal.

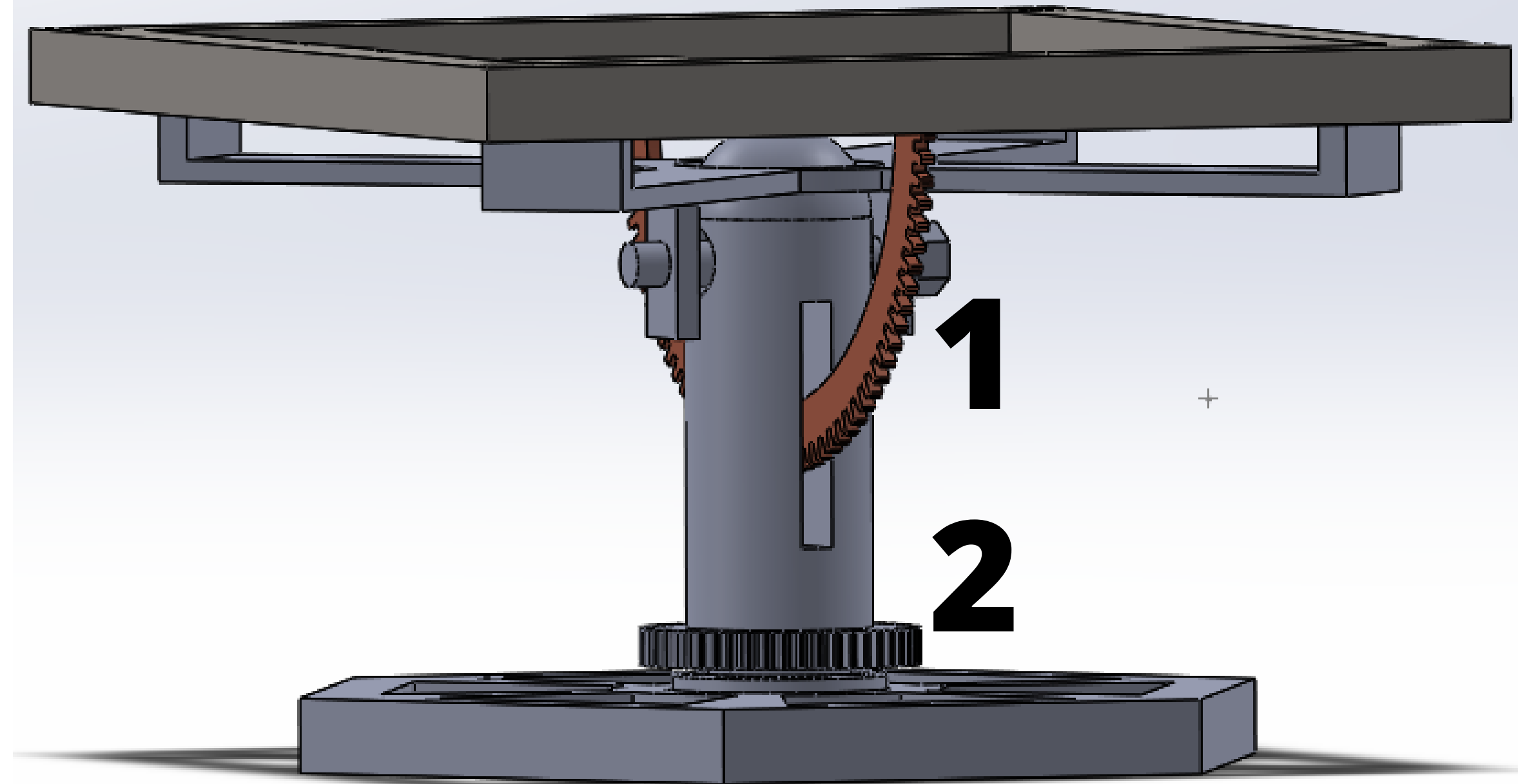
We have designed an approximate 2-axis gimbal system using Solid Works to provide the rotation along 2 DoF.



PROJECT

Mechanical Design

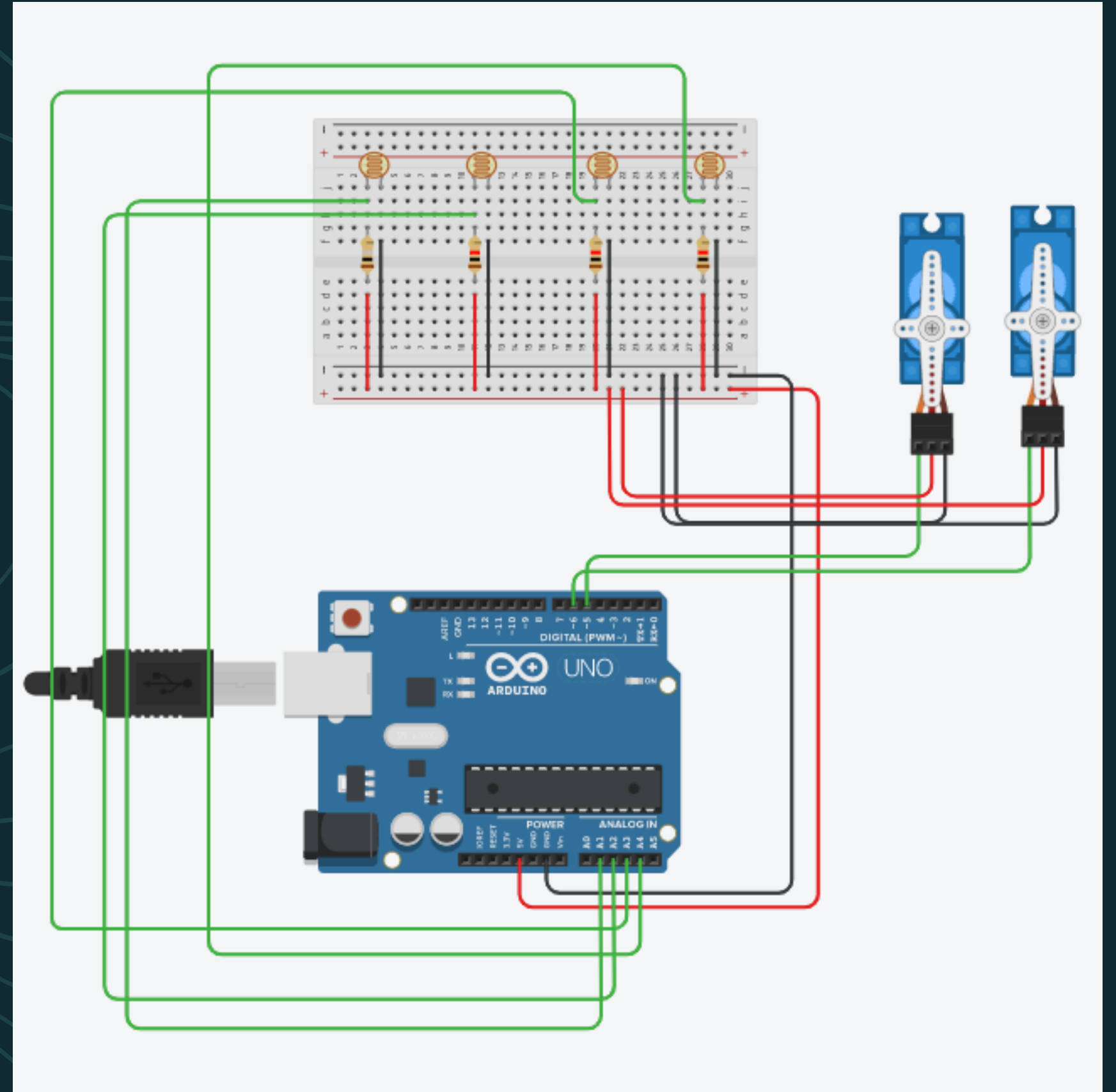
- Gears 1 and 2 will be attached to servo Motors in order to provide rotation along 2-axes.
- Gear 1 is responsible for the tilting of Solar Panel-LDR Module assembly, while Gear 2 is responsible for the rotation of complete assembly about vertical axis.



Project

Electronics-

- LDR Assembly And Connections-
 - LDR 1 connected to AnalogPin 1
 - LDR 2 connected to AnalogPin 2
 - LDR 3 connected to AnalogPin 3
 - LDR 4 connected to AnalogPin 4
- Servomotor Assembly-
 - ServoMotor 1 (SMTB) connected to Pin 5
 - ServoMotor 2 (SMLR) connected to Pin 6



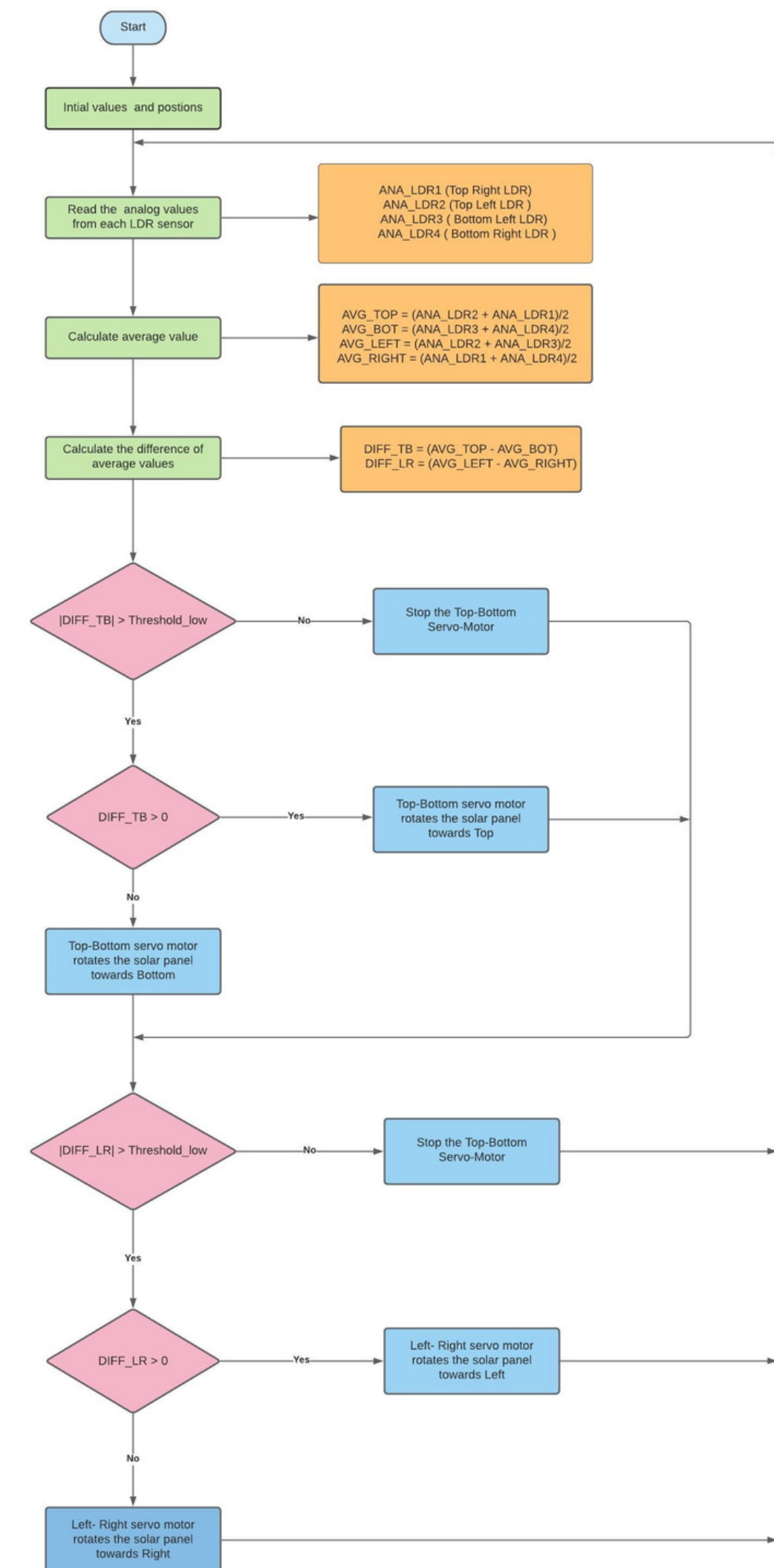
PROJECT

Algorithm-

PLEASE REFER SPECDOC FOR A CLEAR IMAGE

The Algorithm works on the law of differences. For top-bottom motion, we subtract the average values of top LDRs from bottom LDRs. If the difference is positive the Servo Motor (SMTB) rotates in the direction of the top. Vice versa if the difference is negative.

A similar mechanism goes for Left-Right Motion.



PROJECT

Programing-

The Complete Program is on SpecDocs shared with you.

Defining The LDRs-

```
int LDR1 = 1; //top right LDR
int LDR2 = 2; //top left LDR
int LDR3 = 3; // bottom left LDR
int LDR4 = 4; // bottom right LDR
```

Taking the Average of AnaLog Values-

```
int AVG_TOP = (ANA_LDR2 + ANA_LDR1)/2;
int AVG_BOT = (ANA_LDR3 + ANA_LDR4)/2;
int AVG_LEFT = (ANA_LDR2 + ANA_LDR3)/2;
int AVG_RIGHT = (ANA_LDR1 + ANA_LDR4)/2;
```

Taking The Difference-

```
int DIFF_TB = (AVG_TOP - AVG_BOT);
int DIFF_LR = (AVG_LEFT - AVG_RIGHT);
```

PROJECT

Programming-

For Motion of ServoMotors-

```
if(abs(DIFF_TB) > Threshold_low) {  
    if(DIFF_TB > 0 ) {  
        SMTB.write(SMTB_Angle + 1);  
    }  
    else {  
        SMTB.write(SMTB_Angle - 1);  
    }  
} else {  
    SMTB.write(SMTB_Angle);  
}
```

The Concept of Threshold_low

Practically it is impossible for the average differences to be zero. Hence we describe an Analog value as Threshold_low. ie. Only if the difference is above the Threshold_low value the further program gets executed.

Project

Further Developements-

- Now we can use the laptop to power our Arduino board and our motors. It reduces the efficiency of our model. So instead of using power from a laptop, we can use solar power to run servo motors and Arduino. For this, we have to store the Sun's energy in a chargeable battery in the beginning. By this, we can have more efficiency.
- Optimizing the Mechanical Design by placing both on the bottom side and using timing belts instead of a Large gear mechanism.

THANKYOU