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Arduino Solar Tracker

FEBRUARY 29, 2016 BY [ADMINISTRATOR](#) — [63 COMMENTS](#)

In modern solar tracking systems, the solar panels are fixed on a structure that moves according to the position of the sun.

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Let us design a solar tracker using two servo motors, a light sensor consisting of four LDRs and

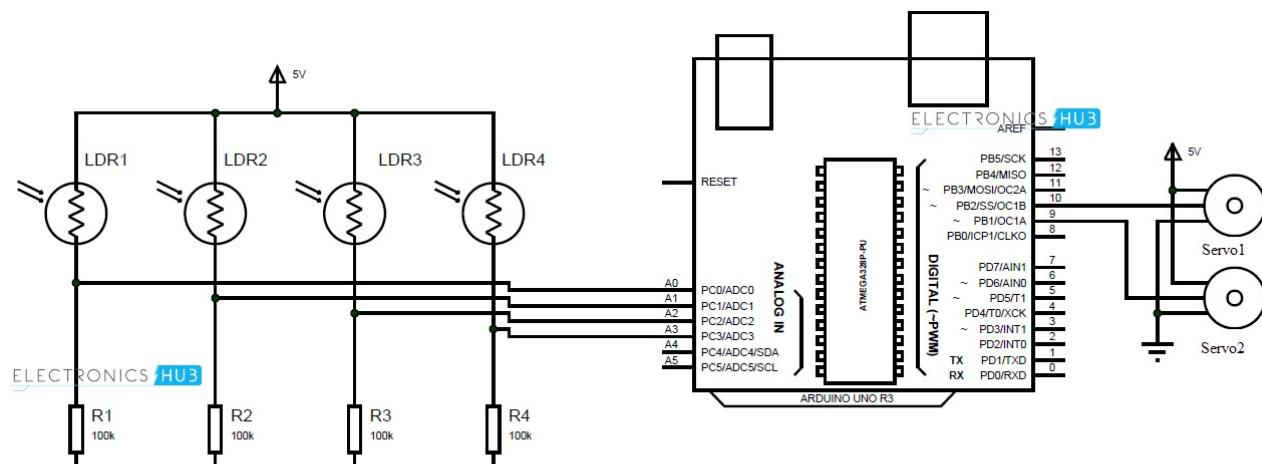
Arduino UNO board.

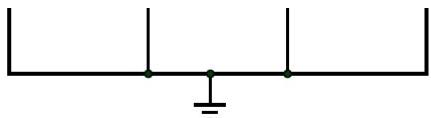


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Circuit Diagram





The circuit design of solar tracker is simple but setting up the system must be done carefully.

Four LDRs and Four $100\text{K}\Omega$ resistors are connected in a voltage divider fashion and the output is given to 4 Analog input pins of Arduino.

The PWM inputs of two servos are given from digital pins 9 and 10 of Arduino.

Working

LDRs are used as the main light sensors. Two servo motors are fixed to the structure that holds the solar panel. The program for Arduino is uploaded to the microcontroller. The working of the project is as follows.

LDRs sense the amount of sunlight falling on them. Four LDRs are divided into top, bottom, left and right.

For east – west tracking, the analog values from two top LDRs and two bottom LDRs are compared and if the top set of LDRs receive more light, the vertical servo will move in that direction.

If the bottom LDRs receive more light, the servo moves in that direction.

For angular deflection of the solar panel, the analog values from two left LDRs and two right LDRs are compared. If the left set of LDRs receive more light than the right set, the horizontal

servo will move in that direction.

If the right set of LDRs receive more light, the servo moves in that direction.

Setup

Step-1

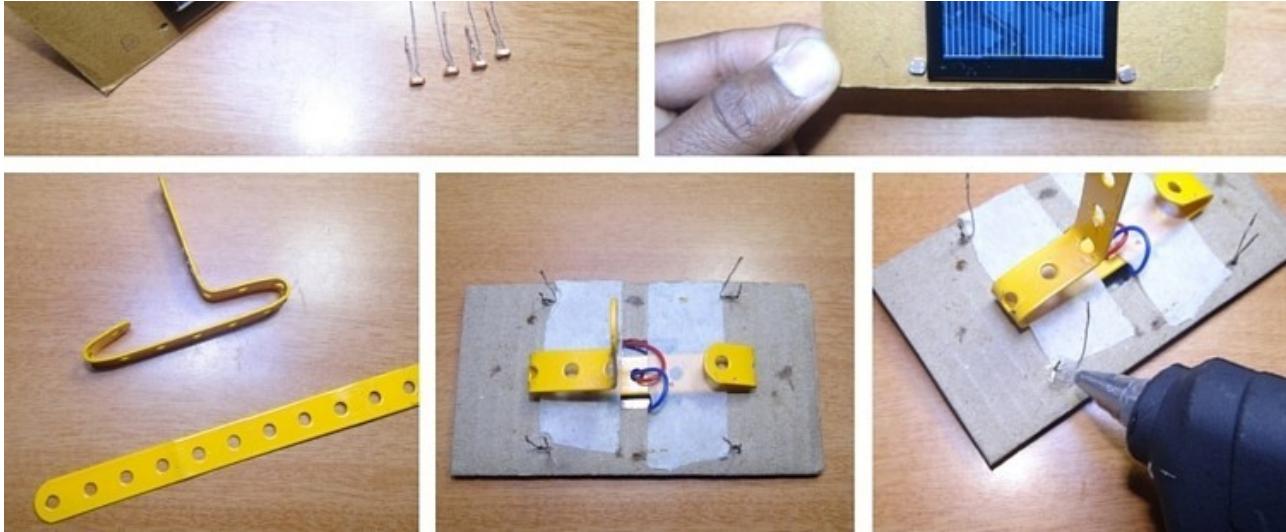
- Take cardboard. Make a hole in the middle and four holes on four sides so that LDR fit into that.
- Stick the solar panel to the cardboard and bring two wires of the panel out as shown.



Step 2

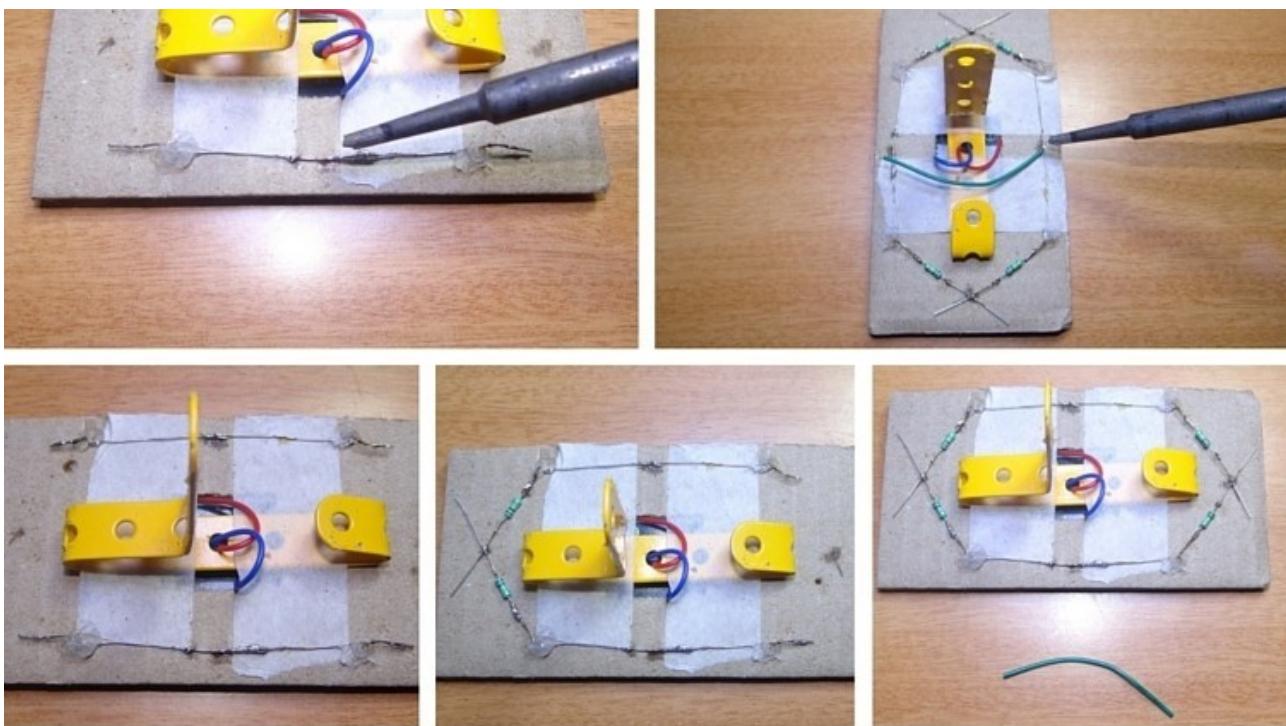
- Now cut one of the two leads of the LDR so that one lead is shorter and other is longer.
- Insert these four LDRs into four holes as shown.
- Bend the straight Perforated metal strip as shown below.
- Place the bent metal strip on the back side of the cardboard
- Apply glue to the LDR to fix them firmly.





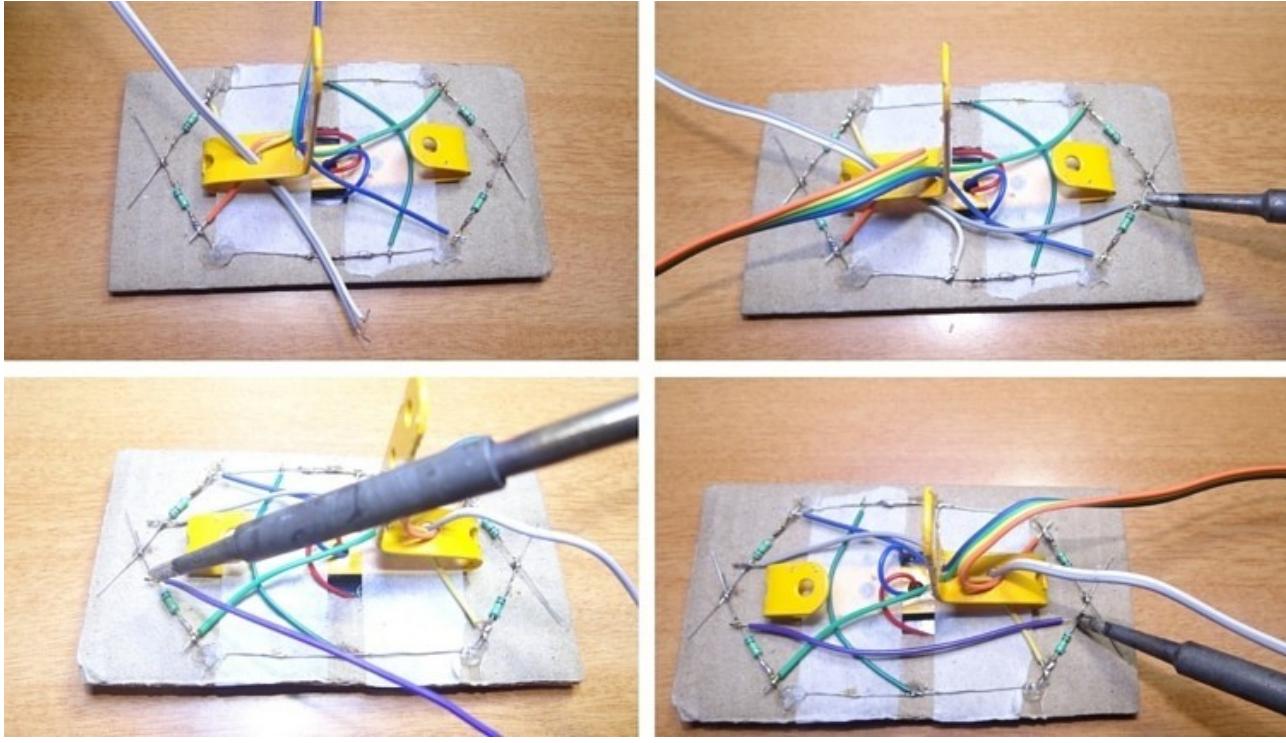
Step 3

- Solder the two leads of LDR as shown
- To the other ends of LDR Solder resistors of 10k ohm
- Join the four leads of the 4 LDRs by connecting with a wire.



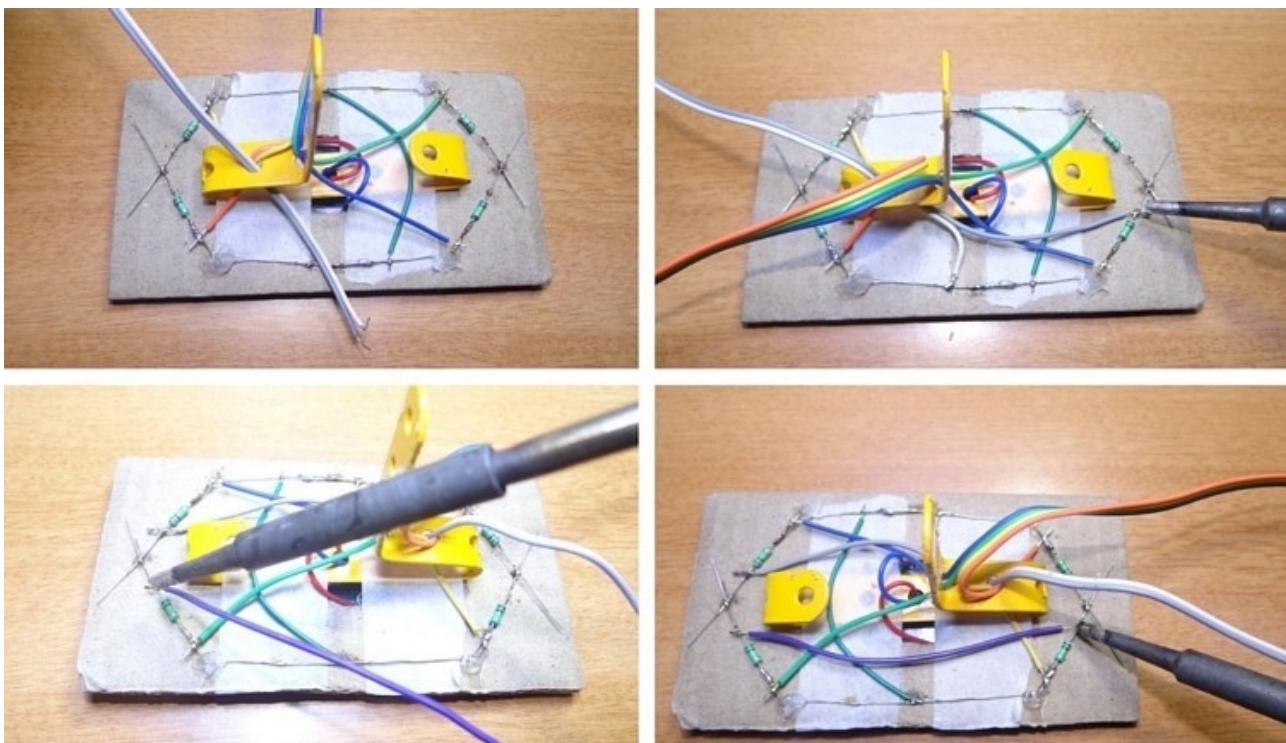
Step4

- Now take a bus wire.This is used to connect the Outputs of four LDRs to Arduino board.
- Insert it into metal strip as shown in the image.
- Now Solder the four wires to four LDRs at any point between LDR and resistor.



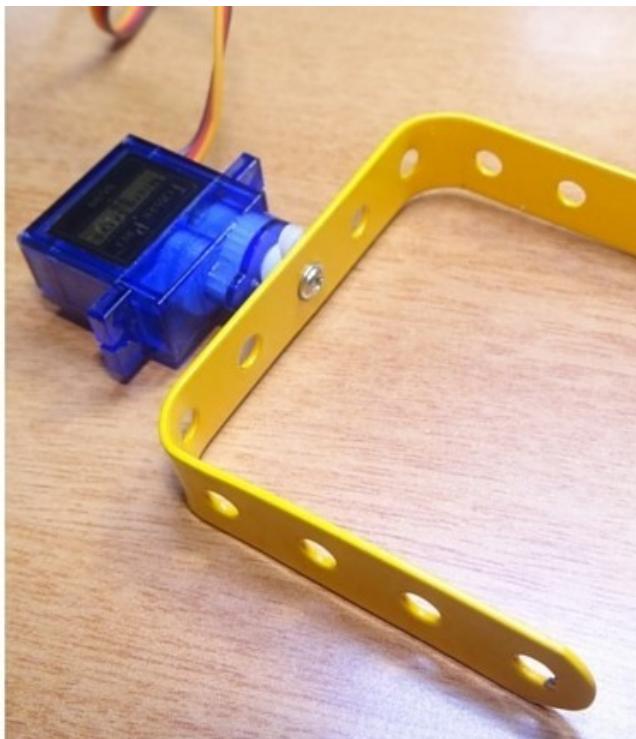
Step 5

- Insert another two wire bus into the perforated metal strip as shown. This is used for supplying Vcc and GND to LDR circuit.
- Solder one wire to the leads of LDRs which are connected to resistors and other wire to the other leads.
- Short the leads of LDRs connected to resistors using a wire as shown.



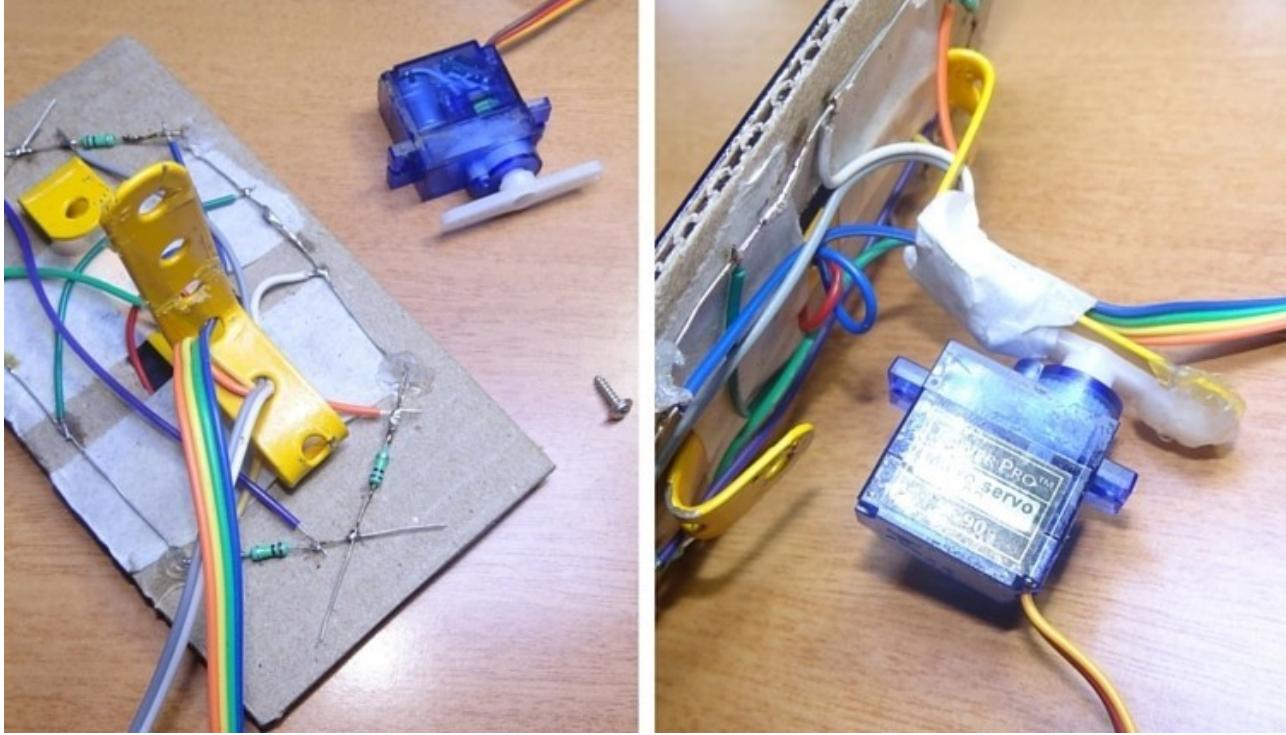
Step 6

- Now connect a servo motor to the Perforated metal strip using Screw.
- Apply glue to the servo to fix it firmly.



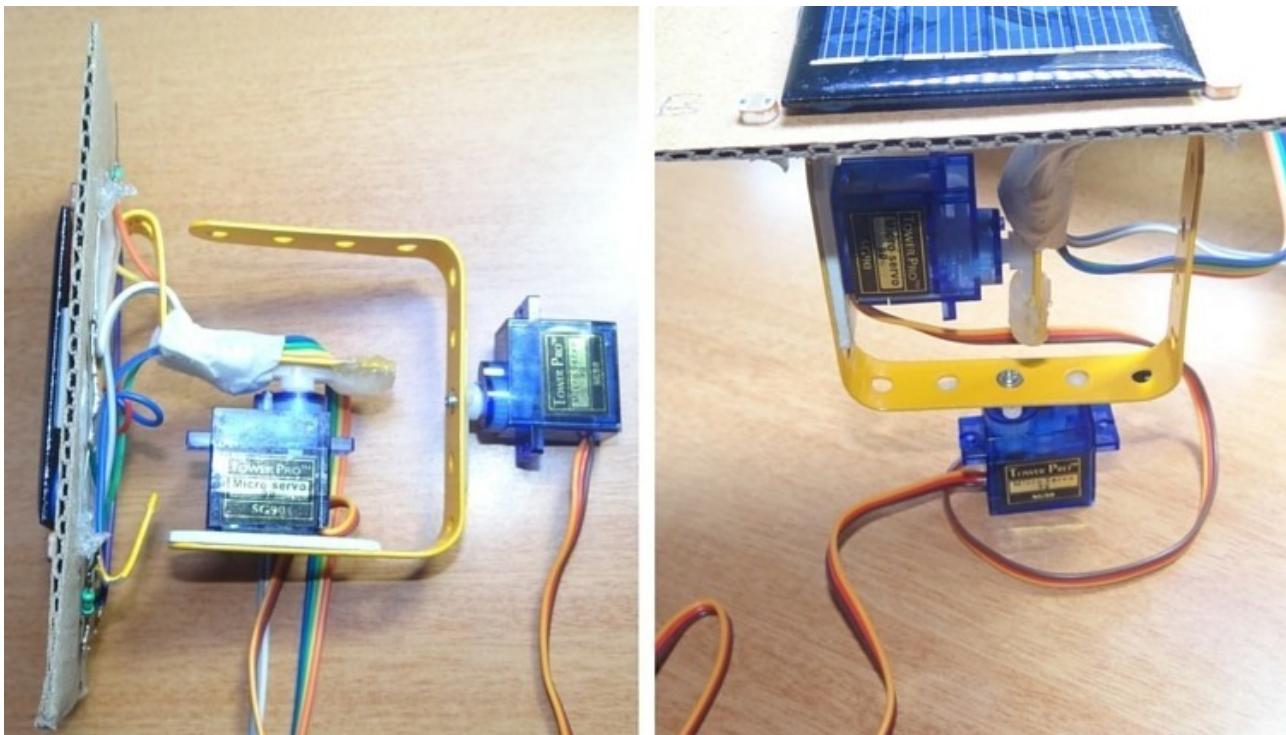
Step 7

- Take another straight Perforated metal strip and bend it as shown in the figure.



Step 8

- Now place the set up of solar panel and first servo motor to the metal strip of second servo motor as shown.



Project Code

```
1 #include <Servo.h>
```

```
2 //defining Servos
3 Servo servohori;
4 int servoh = 0;
5 int servohLimitHigh = 160;
6 int servohLimitLow = 20;
7
8 Servo servoverti;
9 int servov = 0;
10 int servovLimitHigh = 160;
11 int servovLimitLow = 20;
12 //Assigning LDRs
13 int ldrtopl = 2; //top left LDR green
14 int ldrtopr = 1; //top right LDR yellow
15 int ldrbotl = 3; // bottom left LDR blue
16 int ldrbotr = 0; // bottom right LDR orange
17
18 void setup ()
19 {
20     servohori.attach(10);
21     servohori.write(0);
22     servoverti.attach(9);
23     servoverti.write(0);
24     delay(500);
25 }
26
27 void loop()
28 {
29     servoh = servohori.read();
30     servov = servoverti.read();
31     //capturing analog values of each LDR
32     int topL = analogRead(ldrtopl);
33     int topR = analogRead(ldrtopr);
34     int botL = analogRead(ldrbotl);
35     int botR = analogRead(ldrbotr);
36     // calculating average
37     int avgtop = (topL + topR) / 2; //average of top LDRs
38     int avgbot = (botL + botR) / 2; //average of bottom LDRs
39     int avgleft = (topL + botL) / 2; //average of left LDRs
40     int avgright = (topR + botR) / 2; //average of right LDRs
41
42     if (avgtop < avgbot)
43     {
44         servoverti.write(servov +1);
45         if (servov > servovLimitHigh)
46         {
47             servov = servovLimitHigh;
```

```
48     }
49     delay(10);
50   }
51   else if (avgbot < avgtop)
52   {
53     servoverti.write(servov -1);
54     if (servov < servovLimitLow)
55     {
56       servov = servovLimitLow;
57     }
58     delay(10);
59   }
60   else
61   {
62     servoverti.write(servov);
63   }
64
65   if (avgleft > avgright)
66   {
67     servohori.write(servoh +1);
68     if (servoh > servohLimitHigh)
69     {
70       servoh = servohLimitHigh;
71     }
72     delay(10);
73   }
74   else if (avgright > avgleft)
75   {
76     servohori.write(servoh -1);
77     if (servoh < servohLimitLow)
78     {
79       servoh = servohLimitLow;
80     }
81     delay(10);
82   }
83   else
84   {
85     servohori.write(servoh);
86   }
87   delay(50);
88 }
```

Arduino Based Solar Tracking System hosted with ❤ by GitHub

[view raw](#)

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Comments



Venkat says

MARCH 15, 2016 AT 1:58 PM

How much power the panel is producing and how much the servos are consuming?

[Reply](#)



Anusha says

MAY 12, 2016 AT 12:27 AM

This designed only for tracking sun and increasing its efficiency....Power of the solar panel is not considered...Servo motors used here consume very less power..They are powered from arduino board it self

[Reply](#)

**Ferit says**

APRIL 10, 2016 AT 11:43 AM

what is Perforated metal measurements?

[Reply](#)**AZMAT ULLAH says**

APRIL 10, 2016 AT 1:06 PM

excelent

[Reply](#)**luis vallejo says**

APRIL 10, 2016 AT 5:28 PM

Page excellent , and excellent projects for beginners im a student and I think this is awesome because we need projects like this to be best. congratulations !

[Reply](#)**Purushothaman J says**

APRIL 19, 2016 AT 8:24 AM

nice one

[Reply](#)**Purushothaman J says**



APRIL 19, 2016 AT 8:25 AM

smart project

[Reply](#)**Antonio says**

MAY 14, 2016 AT 8:53 AM

It could be a self sufficient system! Optimizes solar power generation, that could power back the optimizer system itself! A win-win game! Very nice

[Reply](#)**ABUBAKAR MALIKI says**

JUNE 19, 2016 AT 5:50 PM

greetings to you sir and all on this site. please i want to work this project in my school. as my second year project in the university. What i want to ask is the solar panel tracker tracking the sun light intensity for other panels on 100w or others?thank you will be waiting for your reply

[Reply](#)**ABUBAKAR MALIKI says**

JUNE 19, 2016 AT 5:58 PM

sir,if one has about 10 100w solar panels how can he connect the solar tracker, and how many connection of the solar straker does he need

[Reply](#)

**Dhruv Jain says**

JULY 16, 2016 AT 10:47 AM

Hello,

I tried makin the project bt d motors r moving very slow. They r not moving as fast as given in d video. I tried changin d servo motor bt d issuse remains d same. Cn der b ny oder prob

[Reply](#)**Thomas says**

AUGUST 23, 2016 AT 7:59 AM

Hi, Anyone else noticed that the diagram might be wrong? It states 100k resistors, however i believe it should be 10k? 10k is also listed in the picture text step 3

[Reply](#)**Hinal Patel says**

OCTOBER 6, 2016 AT 1:26 PM

Is there any calculation required for angle by which servo motor will move...?

[Reply](#)**Gord. says**

SEPTEMBER 9, 2017 AT 8:44 AM

yes , 10 k would be better

[Reply](#)

**SAmmy98 says**

SEPTEMBER 24, 2016 AT 5:56 AM

can anyone please elaborate steps 4 and 5?

[Reply](#)**Embedded says**

NOVEMBER 10, 2016 AT 6:25 AM

Good work, Which kind of servo motors are used ?

[Reply](#)**Hanzla says**

MAY 30, 2017 AT 8:48 AM

good

[Reply](#)**santhosh says**

MARCH 13, 2017 AT 8:46 AM

What is the cost of this project?

[Reply](#)**Roby says**

MARCH 19, 2017 AT 2:28 PM

Where can i found the metal strip that is used in the project?

[Reply](#)



Vikramsinh Doke says

MARCH 22, 2017 AT 1:05 PM

Hey I want the advantage and application of Arduino based solar tracker

[Reply](#)



Angeliki Kouri says

APRIL 7, 2017 AT 7:08 AM

Is there a youtube video showing how it works??containing perhaps more details?

[Reply](#)



Anusha says

JUNE 20, 2017 AT 6:39 AM

You can see the video in the PAge itself

[Reply](#)

**Euloge says**

APRIL 20, 2017 AT 6:17 AM

Thanks a lot!

[Reply](#)**Nagaraj says**

APRIL 29, 2017 AT 10:55 AM

Sir plz help I connected ckt as per ur instructions but .. Model is not working

[Reply](#)**Anusha says**

JUNE 21, 2017 AT 8:42 AM

Hi, Please check the connections once again. Try to calibrate the servos and LDR before connecting.

[Reply](#)**andzer says**

MAY 8, 2017 AT 5:52 AM

Hi, the arduino code has to change. As it is now, it is not possible to use the High/Low limits for servos...

[Reply](#)**Anusha says**

JUNE 21, 2017 AT 8:40 AM

The limits for Servo motors are made as per our convenience. Please calibrate the servos and change the max limits for the servos.

[Reply](#)



Kevin Aprilianta says

JUN 11, 2017 AT 10:23 PM

Sir, when I combined that source code with code for ESP8266 to display the value of the LDR sensor on Thingspeak, the servo motor is not running. how to handle it? Thanks before.

[Reply](#)



Anusha says

JUNE 21, 2017 AT 8:40 AM

Hi, we haven't tried this particular setup. We will try it and update as soon as possible.

[Reply](#)



hayder says

MAY 18, 2017 AT 11:31 AM

thanx

[Reply](#)

**Hanzla says**[MAY 29, 2017 AT 5:15 AM](#)

its can not work properly plz help me in this

[Reply](#)**sobhy seleem says**[JUNE 12, 2017 AT 8:24 PM](#)

can you make a flow chart of this system ?

[Reply](#)**Johan Halmén says**[JULY 4, 2017 AT 5:19 AM](#)

How about using just two analog inputs? Place two LDR's on adjacent sides of the solar panels, not in the corners. One of the LDR's works as a pull-up resistor and the other one works as the pull-down resistor.

More thoroughly: connect 5V to the top side LDR, connect the other leg of the top side LDR to analog pin A0, connect A0 further to the bottom side LDR. And the other leg of the bottom side LDR to ground. Now, when the top gets more light, A0 voltage rises. When panel twists upwards, the bottom LDR gets more light and A0 drops back to the middle voltage. Similar connection for left and right and A1.

This setup might need additional resistors to assure that when the panel faces the sun and both LDR's get equally much light, the total resistance won't drop too low to draw too much current from the 5V. So you still need your 4 resistors, but you need only two analog input ports and the programming might become easier.

[Reply](#)**Anusha says**

 JULY 12, 2017 AT 4:01 AM

Hi, This is actually a great idea and you can complete with just two Analog pins. Try to share your work (in case you have implemented) so that others can benefit from it.

[Reply](#)**calvin says**

JULY 4, 2017 AT 7:30 PM

im using motor Ls-3006, once i connected everything and uploaded the program, the motor keep rotating (more the 180 degree). How can i control the rotation angle of the motor

[Reply](#)**Anusha says**

JULY 12, 2017 AT 4:00 AM

Hi, You should use maximum limits for both sides (left and right) and restrict your servo to rotate with in those limits.

[Reply](#)**Cindy says**

JULY 5, 2017 AT 9:23 AM

For this code, are we supposed to put in any values? If yes, what should we put?

```
,servoh = servohori.read();  
servov = servoverti.read();
```

[Reply](#)**Anusha says**

JULY 12, 2017 AT 4:00 AM

Hi, By values, if you mean any user inputs, then we need to set the Servo motor limits for both the servos. servoh = servohori.read();servov = servoverti.read(); This statement returns the current position of the servo in the form of angle (between 0 and 180).

[Reply](#)**roshan says**

JULY 14, 2017 AT 6:20 AM

i used the code provided above but it giving me error .plz help me fast i have project on monday

[Reply](#)

**Anusha says**

JULY 20, 2017 AT 2:56 AM

Hi, What is the error you are getting?

[Reply](#)**Ahmed says**

DECEMBER 10, 2017 AT 12:09 PM

Is it possible to run linear engines their 12V capabilities

[Reply](#)**Chong says**

AUGUST 1, 2017 AT 5:23 AM

Hi can i know have you connect the solar panel connection?

[Reply](#)**Charles says**

AUGUST 8, 2017 AT 3:06 PM

Which compiler is used? the code wont work for atmel studio 7 unless more peripherals and initialization is added

[Reply](#)

**Glenn says**

AUGUST 19, 2017 AT 12:16 AM

Could the servos be replaced with 12V linear motors, and the power to them be 12V instead of 5V? I am new to this & looking to learn.
Thanks

[Reply](#)**Dale says**

AUGUST 23, 2017 AT 3:37 AM

How can i make this together with a data Logger and also what's the code for that?

[Reply](#)**jackie says**

SEPTEMBER 13, 2017 AT 1:13 AM

hi, may i know you are using 180 degrees or 360 degrees servo motor?

[Reply](#)**EH Staff says**

OCTOBER 9, 2017 AT 1:49 AM

Hi, the servo motor can rotate approximately 180 degrees.

[Reply](#)

**keshaxa says**

SEPTEMBER 15, 2017 AT 11:44 AM

Hello sir ,

Can u please give us the parts required and their details .so we can do it easily

[Reply](#)**mohsin says**

SEPTEMBER 17, 2017 AT 7:24 AM

i want to provide power supply to arduino from battery or something else.so what should i do

[Reply](#)**ibrahim says**

SEPTEMBER 20, 2017 AT 9:25 AM

hi,

how can i use dc motor for this project.

[Reply](#)**Devesh mishra says**

OCTOBER 3, 2017 AT 8:15 AM

What is the power of resistor is it 10 k ohm or 100k ohm

[Reply](#)

**Omar says**

OCTOBER 6, 2017 AT 8:44 AM

what are the specifications for the LDR?

[Reply](#)**EH Staff says**

OCTOBER 9, 2017 AT 2:54 AM

Hi, We have used a 5mm LDR (Minimum Resistance of 400Ω and Maximum Resistance of $1M\Omega$).

[Reply](#)**Sagar says**

OCTOBER 10, 2017 AT 8:51 AM

can anyone tell me about all the components name and their rating so i can purchase them easily.

[Reply](#)**Abhishek says**

OCTOBER 24, 2017 AT 2:39 AM

Motor is not moving as fast as given in the video.plz help

[Reply](#)

**Syed Tufail says**

NOVEMBER 7, 2017 AT 12:16 PM

Can Another servo will work for this code instead of SG90

[Reply](#)**Ravi says**

DECEMBER 26, 2017 AT 2:22 AM

Yes. You can use MG90S.

[Reply](#)**Rajiv says**

NOVEMBER 16, 2017 AT 8:45 PM

Can any one send me the application of solar tracking system using the ardiuno uno...

Plzzz it's urgent....

[Reply](#)**Mert says**

DECEMBER 12, 2017 AT 2:27 PM

When I took light and push it to LDR the panel is not stopping.It has a little bit movements.If we take out the light the panel does not stay in the same position.Can anyone say reason?

[Reply](#)

**manos says**

DECEMBER 21, 2017 AT 9:59 AM

Is it possible to use Attiny85 instead of arduino?

[Reply](#)**Shivani says**

JANUARY 13, 2018 AT 7:32 AM

Please send advantages and applications

[Reply](#)**siddharth says**

JANUARY 22, 2018 AT 12:13 PM

Super i done it

[Reply](#)**Rajdeep Barman says**

JANUARY 31, 2018 AT 2:23 PM

very...gooood!

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