



## The Solar Tracker

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**Abstract :-**Energy production from the reduction of fossil fuels is widespread task for the subsequent half of century. The concept of changing solar energy into energy the use of photovoltaic panels holds its vicinity in the front line as compared to different renewable assets. But, the non-stop alternate in the corresponding attitude of the solar toward the earth reduces the watts brought via the solar panel. In this situation the solar tracking gadget is the high-quality manner to increase the efficiency of a photovoltaic panel. The sun panel that monitors the sun includes two LDRs, a solar panel and a servo motor and an ATmega328 Micro controller. Mild-primarily based resistors are mounted on the rims of the solar panel. Light-based lesions produce low resistance while mild falls on them. A panel-connected servo motor rotates the panel within the path of the sun. The panel is arranged in this type of manner that the mild inside the LDRs in comparison to the panel is turned around next to the LDR which has a better capability for lower resistance in comparison to the opposite. The Servo motor rotates the panel at a positive attitude. when the light strain falling at the right LDR is higher, the panel actions slightly to the right and if the pressure at the left side of the LDR is higher, the panel movements slower to the left. Throughout the day, the sun is in the front and the depth of mild on both panels is the identical. In such cases, the panel stays intact and there may be no rotation.

**Index Terms—**Light dependent resistor, ATmega328 Micro controller, Solar Panel, Arduino IDE

## I. INTRODUCTION

Sun powered charger has become one of the source as actually doable. Earth gets  $16 \times 10^{18}$  sun powered energy consistently, which is multiple times the human need on the planet. At the point when the sun is situated on the outer layer of the earth, it rises day by day and sets in the west. As a rule, the star cell PV can deliver a great deal of yield when the outer layer of the cell is presented to radiation. By keeping the region consistent in the sun's beams, day by day outflows and the transformation of sun oriented energy into electrical energy are upgraded. this is regularly alluded to as the star-pursuing framework, which frequently helps the foundation of consolidating the best energy with a star-temperature framework as well as being an electrical framework. At present sunlight powered chargers in a proper structure that decreases proficiency. Critical outflows from the nearby planet group will further develop proficiency. Two sensors on the two sides feel the heading of the greatest force of light. Two sensors on both sides feel the direction of the maximum intensity of light. The Microcontroller is utilized to handle the information power from the correlation circuit and control where the engine will be moved to get greatest light from the sun. Force is put away on the battery. This venture is liable for innovative work of the Sun global positioning framework. Presently the sun based environmentally friendly power arrangements are progressively growing. Expanding the energy from the nearby planet group is attractive to build productivity. To boost the energy yield from sun powered chargers, one need to keep the boards in accordance with the sun, implies that sunlight based following is required. This is a substantially more viable arrangement than purchasing extra sunlight based chargers. The framework is organized, the framework utilizes ATmega 328 Microcontroller, Sham Sun powered charger, Stepper Engine, Voltage Controller, Diode, Transfer driver IC, Transformer. Sun powered chargers gather daylight from the sun and convert that energy into electrical energy. Sunlight powered chargers contain numerous sun oriented cells. These sun based cells work comparably in enormous semiconductors and utilize a huge space of p-n intersection diode. At the point when sun powered cells are presented to daylight, p-n intersection diodes convert energy from daylight into usable energy. The energy created by photons hitting the highest point of the sunlight powered charger permits the electrons to be let out of their channels and delivered, and the electric fields in the sun based cells pull these free electrons to the circle, where the metal contacts in the sun based cell can't produce power. The more sun oriented cells are in the sunlight powered charger and the higher the nature of sun based cells, the more complete impact of the sun's energy can be delivered. The transformation of sunlight based energy into environmentally friendly power is known as the Photovoltaic Impact. The sun based tracker is an instrument that coordinates the heap from the sun towards the sun. The utilization of sun based trackers could build power creation by about a third, with some platitude it is 40% in certain locales, contrasted with modules at a decent point. In any sun based use, the productivity of the change is further developed when the modules are continually turned at a more noteworthy point as the sun goes through the sky. Since further developed execution implies further developed yields, the utilization of trackers can have a huge effect in profit from a huge harvest.

## II. RELATED WORK

Fundamentally, sun based global positioning frameworks are isolated into two categories: passive (mechanical) and active (electric) trackers. Sun based global positioning frameworks depend on warm development of synthetics (normally Freon) or memory combinations. This kind of sun based energy global positioning framework is generally comprised of a couple of contradicting



Fig. 1. Image recognizing process.

actuators. In the event that the actuators are enlightened under various conditions, lopsided powers will be created to turn the board opposite to where the sun is situated for acknowledging new equivalent light. All the more as of late, the utilization of costly webcams has been utilized as a detecting components for viable global positioning frameworks. Because of mature webcam innovation and photograph handling, they can be effortlessly taken on in powerful sun oriented following projects. Such global positioning frameworks have additionally demonstrated to be exceptionally powerful in examinations. In any case, many picture techniques unavoidably have utilized double pictures to decide the position and position of the sun. A large number of the modern techniques used to decide the limit esteem are introduced, for example, histogram structure, estimation space, blending, entropy, object properties, spatial focus, and the standard hazy situation. Indeed, tracking down the perfect measure of impediments is intricate and tedious. Particularly on shady days, precision is low. Hence, a sun oriented global positioning framework utilizing such picture strategies isn't reasonable for dynamic use. This review proposes a better approach to imagine and investigate the situation of the sun. At long last, we contrast our methodology with that of utilizing the Hough change to discover the sun. We have just one sun in the sky, and no other incredible light source shows up occasionally in the sky. Accordingly, the locale where the sun is found means the most splendid spot in the sky and it is sensible to decide the situation of the sun by highlighting that area. With respect to the conventional technique for picture imaging of the sun, specialists zeroed in on how they could see a circle in the sky, that is, the sun. The critical cycle in that interaction decides the greatest measure of paired picture creation. Now and then it is troublesome and convoluted to track down the most extreme sum of course, and it must be done physically; subsequently, it can't be utilized for dynamic use. Much under specific impedance, there is no reasonable incentive for creating a round object in a paired picture, and a critical deviation from the real sun oriented focus is evident. As far as our profoundly straightforward local methodology, it is plainly forestalling the breaking point esteem issue. As per the outcomes we don't have a clue that it is so natural to track down the perfect spot for the sun free sky. Under the smallest aggravation from the little cloud, a slight deviation from the genuine sun powered focus happens. The tried nearby planet group is consistently in the sun based district, and won't leave hand. Be that as it may, when an enormous and substantial cloud is upset, a splendid side of the cloud will show up and the picked sun based focus might be a long way from the genuine sunlight based focus. The issue under this condition actually should be improved. The Raspberry Pi camera can not exclusively be utilized in a sunlight based global positioning framework, yet can likewise be utilized to screen climate conditions; is fundamental for the administration and upkeep of the nearby planet group. Furthermore, minimal expense and constant execution are the advantages of our methodology. In outline, this original photograph approach offers a better approach to beat the defects of the conventional photograph global positioning framework, and make the photograph approach conceivable in certifiable applications. In any case, we face difficulties. For instance, mists behave like hints of room. Concluding how to eliminate the sounds utilizing the area channel and making the framework more steady is a beneficial future exertion.

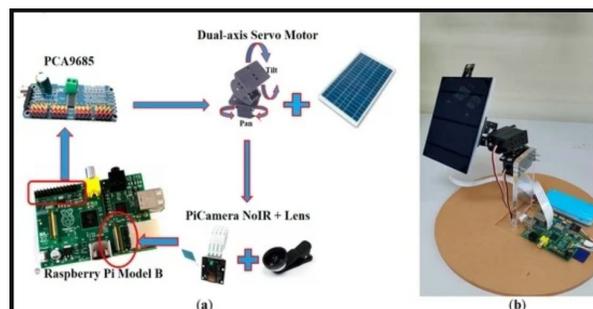


Fig. 2. The constituent parts of the solar tracking system are illustrated

### III. PROPOSED

In this examination project, the most affordable parts of the sun oriented global positioning framework were chosen. The fundamental control board comprises of the ATmega328 Microcontroller pack which fills in as the primary unit with the voltage controller and the intensifier as the sign rectification unit. The plan idea of the proposed sunlight based following regulator as displayed in Figure 3. The regulator is intended to control the stepper engine at the leave, where the stepper engine is joined to the cog wheels that will substitute the PV sunlight based charger. On the info side, two LDRs are utilized where each LDR is put on different sides of the PV sunlight based charger, individually. The relating LDR position will guarantee the distinction in opposition esteems (light and dim conditions) that will be coordinated to turn the engine in clockwise or pedestrian ways.

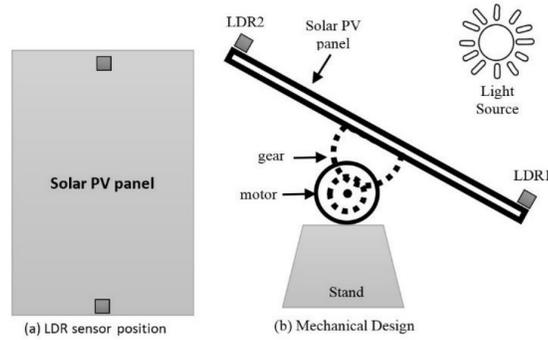


Fig. 3. The design concept of the proposed solar tracker

#### A. LDR Sensor Properties

Generally, LDRs are utilized to decide the force of light. In the most pessimistic scenario, the LDR opposition is around 1M ohms, and when enlightened, the obstruction esteem drops fundamentally to many ohms. Such hardware is significant for recognizing a light source, for instance by looking at the opposition upsides of two LDRs put at various focuses on a sun based PV board: The outer layer of the sun powered PV can be changed by an engine to turn toward the light source. For LDR to work, a progression of connectors with a resistor is needed as displayed in Figure 4. The circuit frames a force separator at the intersection of the sensor and the resistor. Ordinarily, an adjustment of the light force brings about an adjustment of the yield ability to be utilized as a contribution to the ATmega328 Miniature Regulator.  $V_0$  can be estimated from the  $V_0 = 5 \text{ volt} [RLDR / (RLDR + R_1)]$  power lattice. By setting the fitting obstruction esteem,  $R_1$ , the force reach can be set, for instance 0 volt in splendid light and 5 volt in the shadow mode. This simple voltage, going from 0 and 5 volts will be perused by 10-digit ADC as 0 decimal and 1023 decimal, separately.

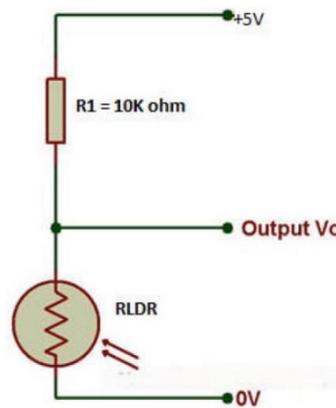


Fig. 4. Circuit for measuring the output voltage of LDR sensor

## B. ATmega328 Microcontroller

### ATmega328 & Arduino



Fig.5: Arduino

ATmega328 is an AVR family miniature controller. Based on the high level plan of RISC. It is a 8-cycle regulator. It has 32K Bytes of Programmable Blaze memory, 1K Bytes of EEPROM and 2K Bytes of SRAM. It has 23 programmable I/O pins. It upholds fringe highlights like two 8-cycle clocks, one 16-digit clock, 6 channel ADC with 10-bit goal, programmable USART, Sequential Fringe Interface, 2 wire sequential interface (I2C), and so on.

## C. System Block Diagram and Circuit Design

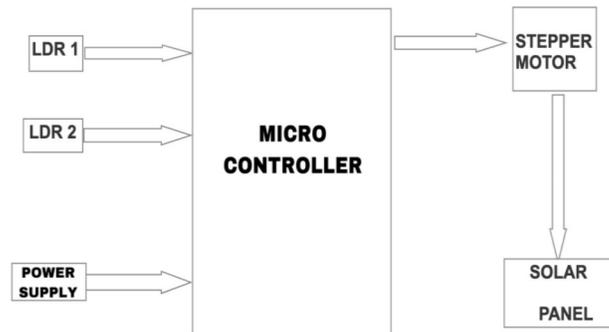


Fig. 6: Block Diagram

- Two sensors on both sides to sense the direction of extreme intensity of light. The difference between sensor output is given to microcontroller component.
- A microcontroller is used to process the input voltage from the comparison circuit and to control where the motor has to be rotated to receive maximum light from the sun.
- The energy is stored in the battery.

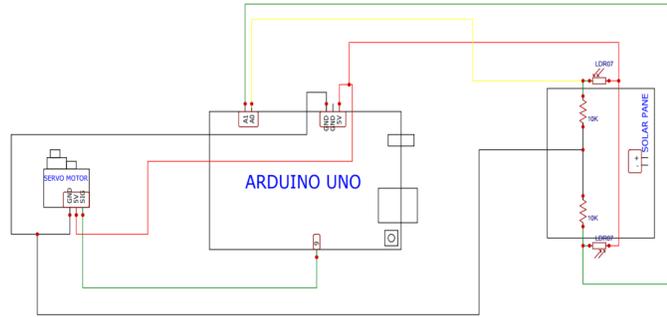


Fig. 7. Circuit diagram

#### Components in circuit:

The components used in the circuit are Atmega328 Micro controller, the circuit operating voltage 5volts, recommended input voltage 7-12volts and maximum is 6-20volts. The Atmega328 Micro controller containing analog pins, digital I/O pins, Flash memory, SRAM, EEPROM and DC current for pins.

#### D. Program Execution Flowchart

The flowchart of the sun tracker system is displayed in Figure 8. From this figure, the sign from the LDRs is changed over into a computerized structure, and afterward contrasted with the ATmega328 Microcontroller so the stepper-engine turns appropriately. Truth be told, the obstruction of LDR getting brilliant light abatements, which thus brings about lower energy levels. Then again, high force implies that LDR is in a dim state. At the point when two LDRs have a similar measure of solidness, the engine is kept inactive and in great condition. In case LDR1 is more intense (lower) than LDR2, it implies that LDR1 obstruction is lower. This position permits the vehicle to circle the sun powered charger clockwise. On the other hand, when LDR2 is more remarkable than LDR1, the LDR1 will have a higher obstruction esteem that makes the moving vehicle pivot on the clock toward the light source. These cycles will proceed for the duration of the day at 19:00, during which time at Microcontroller, the board will be reestablished to its unique working position the following day.

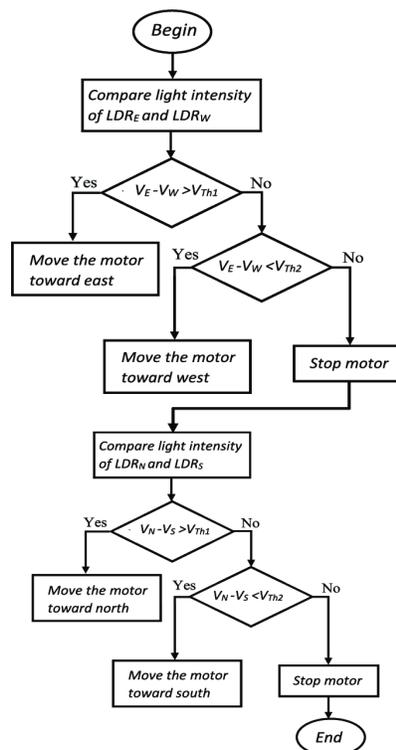


Fig. 8. Flow chart

## IV. IMPLEMENTATION

### A. Results of The Solar Tracker

This proposes a calculation for deciding the situation of the sun and the execution of this control calculation in a solitary sun based global positioning framework. The tracker comprises of a photovoltaic board and moves its position nearly to the right piece of the sun to recognize high photon energy and convert it into electrical energy. Sun based energy is one of the advanced wellsprings of sustainable power. The energy from the sun is boundless. Nonetheless, the greatest test stays to build energy productivity to catch sun-light based radiation to change over energy straightforwardly into power. One more way of expanding productivity is to utilize a sunlight based global positioning framework with sun powered chargers. This is done as such that the beams from the sun fall in an alternate manner on the sun-light based charger and subsequently guarantee the discovery of the greatest accessible sun based energy. The tracker consistently follows the way of the sun during the day so that the area of the board is consistently in the sun. Every one of the elements of the sun powered global positioning framework performed to date depend on a similar idea of feeling of position. Generally, following is finished utilizing an assortment of sensors that identify the situation of the sun. This idea paper proposes a remarkable sunlight based following calculation rather than the conventional calculation. Dissimilar to the utilization of photograph condors, light resistors, photograph semiconductors or photodiode, those can't work freely and require predisposition power this new sort of sensor calculation depends on the force produced by the sun-light based charger. The sun-light based charger creates radiation as light beams fall on it. The electrical force produced differs with the transformation of the light circuit. The way of the sun is along these lines gotten by discovering a change related with the point of the sun-light based occasion. Likewise, this recommends the utilization of a low-power microchip (like ATmega32) to keep up with generally execution. The proposed configuration consequently improves on the activity of sun based following and decreases working expenses and expenses.

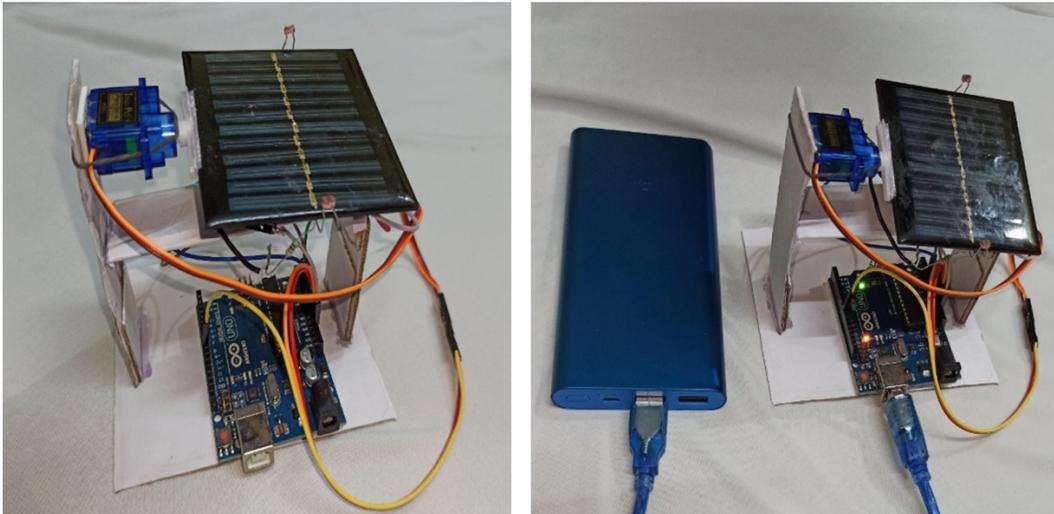


Fig.9: Results

### B. CODE

```
1 #include <Servo.h> //including the library of servo motor
2 Servo myservo;
3 int initial_position = 90;
4 int LDR1 = A0; //connect The LDR1 on Pin A0
5 int LDR2 = A1; //Connect The LDR2 on pin A1
6 int error = 5;
7 int servopin=9; //You can change servo just makesure its on arduino's PWM pin
8 void setup()
9 {
10
11 myservo.attach(servopin);
12 pinMode(LDR1, INPUT);
13 pinMode(LDR2, INPUT);
14 myservo.write(initial_position); //Move servo at 90 degree
15 delay(2000);
16 }
17
18 void loop()
19 {
20 int R1 = analogRead(LDR1); // read LDR 1
21 int R2 = analogRead(LDR2); // read LDR 2
22 int diff1= abs(R1 - R2);
23 int diff2= abs(R2 - R1);
24
25 if((diff1 <= error) || (diff2 <= error)) {
26
27 } else {
28 if(R1 > R2)
29 {
30 | initial_position = - initial_position;
31 }
32 if(R1 < R2)
33 {
34 | initial_position = ++initial_position;
35 }
36 }
37 myservo.write(initial_position);
38 delay(100);
39 }
```

Fig. 10. Program for sun tracking solar panel

## V. FUTURE SCOPE

This paper outlines the idea and application of the proposed solar tracker on the ATmega328 Micro-controller. The successful execution of the taken hardware and its functionality was presented and discussed. However, to upgrade the reliability of the proposed approach, these following points are of interest and will be the subject of our future work. The LDR sensors has been selected as an input due to its wide range of availability and low cost compared to other sensors. To further develop the tangible affectability conditions, an examination of different sorts of sensors will be performed fully intent on expanding the quantity of sensors utilized as information. One more significant highlight be talked about in future work is the investigation of the outcomes corresponding to the current answer for the sunlight based global positioning framework. The comparative method includes performance, reliability, program cost or materials and suitability to be used in India.

## VI. LIMITATIONS

- Solar trackers are more expensive than their standing counterparts, as they are considered complex systems with moving parts.
- Trackers require more care than fixed systems. The type and quality of the tracking system controls how much the system needs and how often.
- All tracking systems require extensive site preparation. Additional cord pulling and grading is also required.
- Financial tracking projects are seen as a complex and risky task from an investor perspective.
- Solar trackers are not compatible with snowy weather and are only suitable for tropical climates. Comparing this with planned weather-friendly programs rather than tracking programs.
- Fixed tracking systems are field-based systems that can penetrate up to 20 percent of the slopes on the E / W. side.

## VII. CONCLUSION

In this paper, a review on the development and implementation of one approach on a solar tracking system using two light dependent resistor (LDR) sensors has been introduced. The circuit design was implemented at low cost and integrated into a single simple organizational micro-controller board. The ease design of the control board machine hopefully can fit inside the basic speaker of the solar tracker system. The ATmega328 Microcontroller software controller was written with Arduino IDE, which was simple and intuitive. From the results of Arduino IDE software with simulation and hardware prototype testing, it is shown that the coded system in ATmega328 works well in terms of the proposed solar tracker concept. The development of the board was constrained by an adjustment of light between the two sensors which implies that the outer layer of the PV sun-light based charger is kept uniform in the sun's beams. This strategy guarantees high emanation of sun based energy by sun based PV cells.

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