Single Axis Sun Tracking Solar System Using IC L293D

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Abstract-- Of all the renewable energies, solar power is the only energy gained its popularity and importance quickly. Through the solar tracking system, we are able to manufacture a plenteous quantity of energy that makes the solar panel's workability far more efficient. Perpendicular quotient of the solar panels with the sun rays are that the reason lying behind its efficiency. Pecuniary, its installation charges are high provided cheaper choices are on the market. This project is mentioned all regarding the design and construction mechanism of the paradigm for the sun solar tracking system having a single axis of freedom. The main control circuit is based on upon motor controlling IC L293d. The LDR sensors, in accordance with the detection of the sun rays, will provide direction to the DC Motor that during which manner the solar panel goes to revolve. Through this, the solar panel is positioned in such a way that the utmost quantity of sun rays could be received as compared with the other motors, DC motor is simplest and therefore the suave one, the torque of that is high and speed of the motor is slow enough. We can program it for ever-changing the direction however the very fact that it rotates solely in one direction subject to exception as far as programming is concerned. 1985, initial time ever it had been witnessed for production of the silicon solar cells with an efficiency of 20 % percentage, although a hike within the efficiency of the solar panel had a handsome increase still perfection was a far fetching goal for it. Below 40%, most of the panels still hover to control. Consequently, peoples are compelled to get a variety of panels to meet their energy demands or purchase single systems with giant outputs. Availability of the solar cells varieties with higher efficiencies is on provided they're too expensive to buy. Ways to be accessed for increasing solar panel efficiencies are a plethora in range still one among the ways to be availed for accomplishing the said purpose while reducing prices, is chasing. Tracking helps in the wider projection of the panel to the Sun with enlarged power output. It may well be twin or single.

Keywords – Solar Panel, Solar tracker, LDR sensors, DC motor, Efficiency.

I. INTRODUCTION

In last 10 years, several of residential round the world used electrical solar system as a sub power at their homes. This is often as a result of solar power is a limitless energy resource, set to become progressively necessary within the long run, for providing electricity and heat energy to the user. Solar power conjointly has the potential to be the main energy supplied within the future. Solar tracker is an automatic electrical device that truly follows the Sun to extend the power. The sun's position within the sky varies each with equipment over any stable position. One well-known form of solar tracker is that the heliostat, a movable mirror that reflects the moving sun to a stable location; however numerous alternative approaches are used in the future. Active trackers use motors and gear trains to direct the tracker as commanded by a controller responding consistent with the tracker direction. The solar tracker is used for many applications like solar cells, solar day-lighting system and also for solar thermal arrays. The solar tracker is extremely helpful for device that wants a lot of daylight for higher potency like solar cell. Several of the solar panels had been positioned on a stable surface like a roof. As sun is a moving object, this approach isn't the most effective method. One amongst the solutions is to actively track the sun employing a sun tracking device to maneuver the solar panel to follow the Sun. With the Sun forever facing the panel, the utmost energy is absorbed, because the panel is working at their greatest potency. The main reason for this project is to induce the utmost potency for the solar cells. Though there are several solar trackers within the market, the worth is expensive and unaffordable as a result of the marketplace for solar tracker remains new, and solely certain countries use the solar tracker like the USA and South Korea. The massive scale solar tracker that commonly used isn't appropriate for the residential use. As a result, this project can prosper a Sun tracking system specially designed for residential use for a less expensive cell. Previous researchers used LDR and photodiode as sensors severally. Meantime and used DC motor with gear and stepper motor severally. This comes has disadvantages and a few of the disadvantages are high value throughout development, tough to manage motor speed and tough to design because using a microprocessor. The main motive for this project is to develop the sun tracking system model that could be a device that follow the movement of the Sun no matter motor speed. Besides that, it's to boost the overall electricity.

II. THEORY

A. Theory of using two LDR's

The Fig. 1 depicts the notion for the installment of the light dependent resistors (LDR). A secure state is earned once the light intensities of the 2 LDR become identical. The principal source of light energy, the Sun, moves from east to west, this movement of the Sun causes the variation within the level of light intensities falling on the 2 LDR's. The designed algorithm compares the variation within the light intensities among the microcontroller and therefore the motor then is operated to rotate the solar panel, thus it moves aligned with the path of the light source.

Fig. 1 Concept of Using Two LDR

B. Theory of Solar Tracker

The position of the sun changes continuously throughout the day. It's because of the motion of earth that we have a tendency to expertise sun at different angles within the sky. Earth exhibit 2 kinds of motion. One is that the motion of earth on its own axis, and therefore the other is that the earth revolving round the sun. The motion of the earth on its own axis, referred to as rotation, leads to the development of days and nights. One rotation of the earth takes 23 hrs and 56 min's. On its own axis, the motion of the earth is west to east.

Fig. 2 Earth Rotation

Revolution, that's the motion of the earth round the sun is liable for the various seasons within the year. The earth takes one year to revolve round the sun. Earth revolves round the sun in an elliptical orbit and therefore the plane covered by the earth throughout the revolution is known as the ellipsis. The axis of rotation and ellipsis makes an angle of 66.5 degrees between themselves. This can be the reason behind the summer/winter solaces and spring fall equinoxes. Because of these motions of the earth, the quantity of daylight received throughout the year varies. Sunlight is that the radiation from the sun taken by the earth. The full power given off by the sun into area is far over that intercepted by the earth.

Within a given amount of your time, the emission of radiation is somewhat constant and therefore the intensity this radiation striking a unit space of the earth's crust is additionally constant, referred to as solar constant. The absorption of radiation on the surface of the planet additionally varies with completely different parameters. Latitude and line of longitude are one in every of the prescribed parameters. Latitude the horizontal imaginary line, parallel to the equator, is that the angle suspended by the arc linearly be a part of a person's position and therefore the equator, at the middle of the earth. On the contrary longitudes are the vertical unreal lines, wherever meridian is that the angle suspended by the arc connecting the north-pole and south-pole in addition as passing through the given location, linearly with the Greenwich meridian, at the middle of the earth. The latitude and meridian specific north-south and east-west directions severally on the earth.

Fig. 3 Earth Rotation and Revolution

The sunlight is determined at completely different angles reckoning on the place on the earth and therefore the angles of the sun. The sun's angle may be classified into the following: -

- 1) Elevation Angle
- 2) Zenith Angle
- 3) Azimuthal Angle

Elevation angle is that the angle created by the sun with the horizon. The elevation angle is zero degree at sunrise and ninety degrees around noontime, at the equator. The elevation angle is completely different at a special time of the day and different for various latitudes. The represented formula may be accustomed determine the elevation angle.

Zenith angle is akin with elevation angle. The only change being it's measured on the vertical. Therefore, it's the angle between the sun and therefore the vertical i.e. celestial point Angle = 90 degree – elevation angle.

Azimuthal Angle, this can be the compass direction from that the daylight is coming back. At solar hour, the sun is directly south inside the hemisphere and directly north inside the hemisphere. The AZ angle varies throughout the day. At the equinoxes, the sun rises directly east and sets directly west despite the latitude. Therefore, the AZ angles are ninety degrees at sunrise and 270 degrees at sunset.

The mounted collectors are secured at an area wherever the gross solar power obtained is relatively more than most of the predefined places and is that the inclination is unbroken in accordance with the outlined context. The motive is to put in

collected places that are subjected to receive the most quantity of daylight and collect solar power over an extended amount of time therefore the demand for tracking devices will be overcome. This creates a considerable diminution within the expenses and therefore the preservation of the collectors. The information of the movement of the sun throughout a season and completely different hours of the year is crucial to change most captivation of solar energy.

Fig. 4 Angle of Elevation and Zenith Angle

III. METHODOLOGY

A. Hardware

The hardware epitome is assembled of various electronic devices, and elementary materials used for the mechanical support. The electronic devices/circuit that are used within the epitome are once more subdued under 3 basic title.

1) The solar Input

The solar input contains of the solar panel and 2 modules of photo sensors, every of that is joined to the solar panel on its length on either aspect of the panel. The solar panel is supported to the wood base by the mechanical structure. The photo sensors are thus, connected to the controlling circuit. The photo sensors employed in the epitome are light Dependent Resistors.

Fig. 5 Solar Cell

2) Light Dependent Resistor

The problem of light dependent resistor and photoresistor is employed during a supplementary and during a complementary manner bury area during a synonymous type. By being the photosensitive devices, it's an embodiment of electric resistance that is that to operate of incident radiation. Photoconductors and photoconductive cells or easy photocells are a number of the names by that such devices are selected. Established out of semiconductor materials, these devices are supported with high resistance. Symbolic Balkanization is that suggests that to point the LDR, one among the foremost normally used image is shown within the figure below. The arrow indicates light falling thereon.

Fig. 6 Symbol of LDR

3) The Driving Motors (DC motor)

This phase of the epitome is liable for the rotation of the solar panel, thus tracking the direction of the sun. The phase contains of a driving module (L293D) and a DC motor. The driving module is our system is enforced for the bidirectional movement of our rotation axis, that is connected to the solar panel. The driving module compels the DC motor to cause rotation. The driving module is additionally connected to the DC power provide of nine volts. Donning with the instruments like a shaft, rotor (i.e, armature), stator, commutator, field magnet(s), brushes, DC motor might be found to own several applications. This chapter unfolds the logical understanding of the operation and construction of the DC motors. DC motor has the characteristics of low power consumption, massive force, low noise, small size, light weight, and simple to use. The DC motor used as mechanism within the system has most angular speed of ten revolutions per minute and twelve V of voltage provide. it will move or rotate simply, as shown in Fig. 7. Direction and speed of the DC motor represent plant outputs. During this case, the direction of DC motor may be set use of the motor driver module, specifically L293D. As explicit before that the DC motor are in off -mode once the different within the intensity of each 2 LDRs received are little ($< 0.1V$). This price is predicated on the experiment results and is meant to avoid oscillation.

Fig. 7 DC Motor

B. Implementation

The solar tracker includes comparator circuit contains 2 transistors of PNP, H-bridge motor driver IC L293D (IC) and a number of distinct elements. Light Dependent Resistors LDR1 and LDR2 are used as sensors to find the panel's position according to the sun. These give the signal to motor driver IC to move the solar panel within the sun's direction. LDR1 and LDR2 are fastened at the perimeters of the solar panel on the X axis, and connected to transistors t1 and t2 severally. Pre sets VR1 and VR2 are set to induce low comparator output through t1 and t2 severally. Therefore on stop motor M once the sun's rays are perpendicular to the solar panel.

Fig. 8 Circuit Diagram

When LDR1 receives additional light than LDR2, it offers lower resistance than LDR2, providing a high input to transistors t1 and transistors t2 severally. As a result, motor controller rotate motor M in one direction (Anti-clockwise) and switch the solar panel.

When LDR2 receives additional light than LDR1, it offers lower resistance than LDR1, giving an occasional input to transistors t1 and t2 severally. As a result, motor M rotates within the other way (Clock-wise) and therefore the solar panel turns.

Fig. 9 Single Axis Tracker

IV. FUTURE SCOPE

The terrible embodiment through that the artistic movement problem be put aside, is that the project referred to as “Single Axis Sun Tracking Solar System”. A trailblazer by its spirit, this method works in its utmost potency, either that be in terms of its monetary ability or in terms of its accessibility. Within the smoke of the darkness wherever pollution engulfing each sphere of advancement as an outcome of reducibility, this device in its terribly potency work towards solely advancement and development by flushing out the pollution at massive.

V. CONCLUSION

Today within the world of rampant productivity, energy is that the basic supply upon that the entire civilization relies upon. Because it is alleged that energy will neither be created nor be destroyed and, in this response, it will be import that it will somehow be keep. The try towards creating such goal supported, this project has been endeavored towards unraveling the trail of such judgement. It's quite natural that constant usage of energies somehow opens the door of deficiency as per as earthbound sources are involved. Sun, within the stand of that, the tallest supply, spiked over for age's right from the origin of the entire universe, through that life has been formed, is that the basic and also the mother source of all the energies. Considering the terribly basic from the perspective of storing such energy, the project has been unraveled. Energies apart from the Sun, are the method from that such are being made through the burning of different materials, involving emission of a bigger quantity of pollution, inflicting the atmosphere and therefore the atmosphere sick day by day. Fastness and smartness of the world's current activity visibility, wherever quick access of each sphere of life is in would like of the acute comfortability, each day could be a new challenge of hatching one thing new and distinctive that makes an energy to be the demand source behind all the exertions exists. in this regard it might be worthier to reveal that commercialization has boomed its wings to such an extent within the

would like of cash and power that we tend to a somehow present within the pool of acute content of the world's resources insufficiency, in consequence of that the entire world is wounded. Healing the planet is that the basis cultivation with that the hour clock is looking, and this project presents the attention, therefore, to open the corridors of reducing the quantity of pollution in storing of energy culled out from the Sun and conjointly to form the pace of advancement revved around.

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