DUAL AXIS SOLAR TRACKING SYSTEM USING LDR

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Abstract –*Solar energy is rapidly gaining notoriety as an important means of expanding renewable energy resources. It has emerged as one of the most promising renewable energy source characterized by a huge potential of conversion into electrical power.*

The problem is that, the conventional solar panel power system is stationary, means the solar panel will not always be facing to the direction of sun, this make the light intensity falling on the solar panel is not maximum level so the solar panel will not always work in its maximum performance. This paper will include the design and construction of "Dual axis solar tracking system by using LDR". This solar move in any direction(horizontal as well as vertical). The proposed system uses IC LM339 Comparator as a brain to control the whole system. The LDR (light dependent resistor had been used to sense the intensity of light and sent the data to the comparator. This comparator will compare the data and rotate a geared motor to right direction .the sun tracking is performed by changing the solar panel orientation in horizontal and vertical direction by two motors. A working system will ultimately be demonstrated to validate the design.

Key Words: **Solar tracking system, Solar panel, IC LM339, LDR, IC L293D ,Geared motor**.

1.INTRODUCTION

A solar chasing is nonspecific term used to describe solar devices that familiarize various payloads toward the sun. Payloads can be photovoltaic panel reverberators, lenses or other optical devices. In standard photovoltaic (pv) application chasers are used to minimize the angle of incidence between the received light and photovoltaic panel . this increases the amount of energy produced from a fixed amount of fitted power generation capacity .in standard photovoltaic application, it is predictable that chasers are used in a least 85% of marketable installation than 1MW from 2009 to 2012 [1].

In today's high-tech environment, energy has become the impulse for socio-economic growth. Since the Manufacturing Rebellion, humans have used fossil fuels as their main energy source. However, the quantity of fossil fuels on the earth is restricted, and their use has caused unmatched changes to the global environmental and climate. Gases from fiery fossil fuels can build up in the atmosphere, becoming thicker and thicker to produce greenhouse special effects such as expanding global temperature and ocean level. These effects will intensely alter our alive environment. Luckily, humans are becoming more conscious of environmental protection, and are seeking new energy sources that cause less pollution and do not portend the environment.

As a free, non-polluting, unrestricted energy, solar energy is ideal for generating electricity. Currently, generating electricity by solar energy is unproductive, so our project focuses on how to improve its efficiency. In remote areas the sun is a cheap source of electricity because instead of hydraulic generators it uses solar cells to produce electricity. Since, the output of solar cells depends on the intensity of sunlight and the angle of incidence. It means to get supreme effectiveness; the solar panels must remain in front of sun during the entire day. But due to turning of earth those panels can't maintain their position always in front of sun. This problem results in decrease of their efficiency. Thus to get a constant output, an programmed system is required which should be capable to constantly rotate the solar panel. The Sun Chasing System was made as a example to solve the problem, mentioned above. It is completely automatic and keeps the panel in front of sun until that is visible. The exclusive feature of this system is that instead of taking the earth as its position, it takes the sun as a guiding source. Its active sensors constantly display the sunlight and rotate the panel towards the direction where the concentration of sunlight is maximum.

A solar trailer is maneuver onto which solar panel are built-in which paths the sign of the sun through the sky which guarantees that supreme volume of daylight strikes the panel during the daytime. Later outcome the sunlight, the follower will try to traverse through the track ensuring the finest sunlight is spotted.

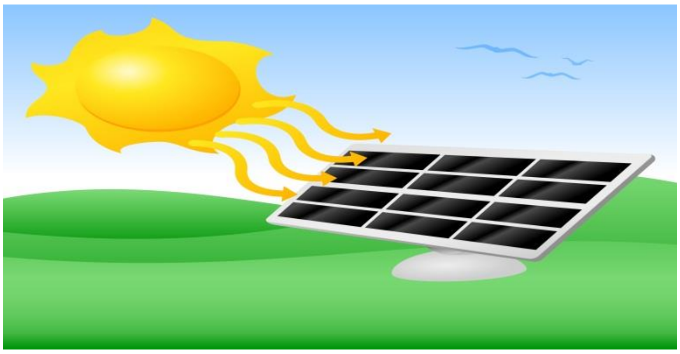

Fig- 1

1.1 DESCRIPTIONS OF DEVELOPMENT WORK

The solar follower includes comparator IC LM339, H-bridge motor driver IC L293D (IC2) and a rare discrete apparatuses. Light-dependent resistors LDR1 through LDR4 are used as sensors to notice the panel's location virtual to the sun. These deliver the indicator to motor driver IC2 to rotate the solar panel in the sun's way. LDR1 and LDR2 are secure at the ends of the solar panel along the X axis, and associated to comparators A1 and A2, correspondingly. Presets VR1 and VR2 are set to get small comparator output at pins 2 and 1 of comparators A1 and A2, respectively, so as to rest motor M1 when the sun's waves are vertical to the solar panel[2].

When LDR2 accepts extra light than LDR1, it deals lower resistance than LDR1, providing a high input to comparators A1 and A2 at pins 4 and 7, correspondingly. As a outcome, output pin 1 of comparator A2 goes high to swap motor M1 in one way (about, anti-clockwise) and turn the solar panel[2]. When LDR1 accepts extra light than LDR2, it proposals lower resistance than LDR2, giving a low input to comparators A1 and A2 at pins 4 and 7, correspondingly. As the voltage at pin 5 of comparator A1 is currently higher than the voltage at its pin 4, its output pin 2 goes high. As a outcome, motor M1 alternates in the reverse way (roughly, clock-wise) and the solar panel turns. Likewise, LDR3 and LDR4 path the sun along Y axis. Fig(1) under displays the planned meeting for the solar chasing system.

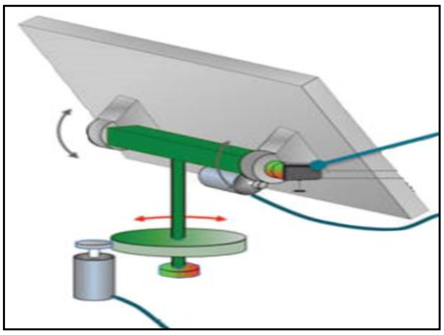

Fig -2 Dual axis follower

1.2 CIRCUIT AND MECHANISMS

SL. NO.	COMPONENTS	SPECIFICATION
1.	**Semiconductor**	• IC1(A1-A4) – LM339 • IC2-L293D
2.	**Resistors**	• R1 - 50-kilo-ohm • R2 - 12-kilo-ohm • R3 - 12-kilo-ohm • R4 - 50-kilo-ohm • R5 - 22-kilo-ohm • R6 - 22-kilo-ohm • R7 - 10-kilo-ohm • R8 - 10-kilo-ohm • R9 - 10-kilo-ohm • R10 - 10-kilo-ohm • LDR1 • LDR2 • LDR3 • LDR4
3.	**Pre sets**	• VR1-47-kilo-ohm • VR2-100-kilo-ohm • VR3-100-kilo-ohm • VR4-47-kilo-oh
4.	**Diodes**	• D1-D4-IN4148
5.	**Motors**	• M1,M2-12V,3RPM Geared Motors

1.3 MAIN APPARATUSES:-

1. Light Dependent Resistor

A photo resistor or light dependent resistor or cadmium sulfide (CdS) cell is a resistor whose resistance drops with growing incident light strength. It can also be referenced as a photoconductor. A photo resistor is prepared of a high resistance semiconductor. If light sinking on the device is of high sufficient regularity, photons engrossed by the semiconductor give sure electrons sufficient energy to hedge into the conduction band. The resulting free electron (and its hole spouse) conduct electricity, thereby dropping resistance.

A photoelectric maneuver can be either intrinsic or extrinsic. An intrinsic semiconductor has its individual charge carriers and is not an effective semiconductor, e.g. silicon. In intrinsic devices the only obtainable electrons are in the valence band, and hereafter the photon must have sufficient energy to stimulate the electron across the entire band gap. Extrinsic devices have impurities, also called dopants, and added whose ground state energy is closer to the conduction band; meanwhile the electrons do not have as remote to hurdle, lower energy photons (i.e., lengthier wavelengths and lower frequencies) are adequate to prompt the device. If a taster of silicon has some of its atoms substituted by phosphorus atoms (impurities), there will be extra electrons obtainable for conduction. This is an example of an extrinsic semiconductor.

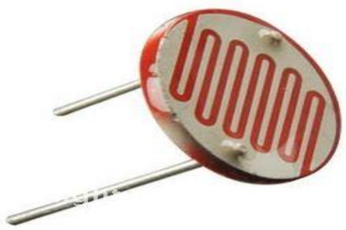

Fig-2 LDR

2. Direct Current Motor

There are numerous kinds of DC motors that are obtainable. Their benefits, difficulties, and other simple evidence are listed below in the Table 1 .DC motor mechanism by changing electric power into mechanical work. This is skilled by imposing current over a coil and creating a attractive field that rotates the motor. The greenest DC motor is a single coil device, used here to discuss the DC motor concept [1].

The voltage source forces voltage over the coil via sliding contacts or brushes that are allied to the DC source. These brushes are create on the end of the coil wires and make a provisional electrical linking with the voltage source. In this motor, the brushes will make a linking every 180 degrees and current will then flow through the coil wires. At 0 degrees, the brushes are in interaction with the voltage source and current is flowing. The current that flows through wire section C-D interacts with the magnetic field that is current and the outcome is an rising force on the section. The current that flows through section A-B has the same contact, but the force is in the descending way. Both forces are of equal magnitude, but in differing directions since the path of current flow in the sections is inverted with respect to the magnetic field. At 180 degrees, the same wonder occurs, but section A-B is forced up and C-D is forced down. At 90 and 270-degrees, the brushes are not in interaction with the voltage source and no force is formed. In these two locations, the revolving kinetic energy of the motor keeps it rotating until the brushes recover interaction. One problem to the motor is the big amount of torque ripple that it has. The aim for this excessive ripple is because of the fact that the coil has a force assertive on it only at the 90 and 270 degree positions. The rest of the time the coil turns on its own and the torque falls to zero. The torque curve created by this single coil, as more coils are extra to the motor, the torque curve is flattened out[1].

The subsequent torque arc not ever ranges the zero point and the normal torque for the motor is importantly increased. As more and more coils are added, the torque curve slants a straight line and has very slight torque ripple and the motor goes much more easily. Additional process of increasing the torque and rotating speed of the motor is to rise the current delivered to the coils. This is talented by increasing the voltage that is sent to the motor, thus growing the current at the equal period.

Fig-3 DC Motor

3-IC1 LM339:-

LM339 is **a** comparator IC with four inherent comparators. A comparator is a humble circuit that moves signs between the analog and digital domains. It links two input voltage levels and gives digital output to indicate the superior one. The two input pins are termed as inverting (V-) and non-inverting (V+). The output pin goes high when voltage at V+ is greater than that at V-, and vice versa. In mutual requests, one of the pins is provided with a mention voltage and the other one receives analog input from a sensor or any outside device. If inverting pin (V-) is set as mention, then V+ must exceed this mention to result in high output. For inverted logic, the mention is set at V+ pin.

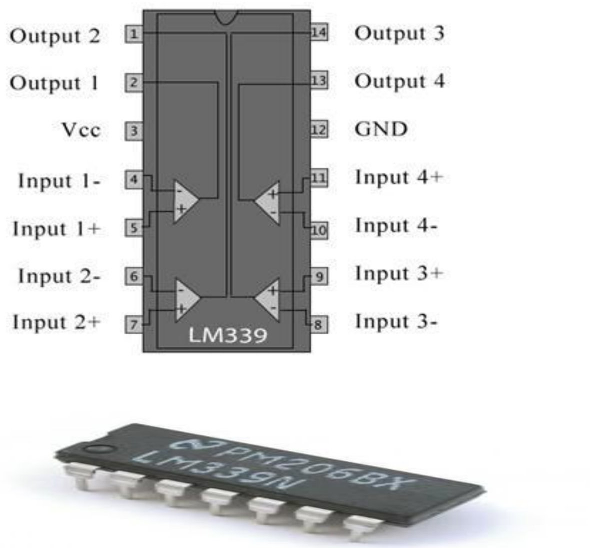

Fig-4 LM339

Pin Description:

Pin No	Function	Name
1	Output of 2nd comparator	Output 2
2	Output of 1st comparator	Output 1
3	Supply voltage; 5V (+36 or ±18V)	Vcc
4	Inverting input of 1st comparator	Input 1-
5	Non-inverting input of 1st comparator	Input 1+
6	Inverting input of 1st comparator	Input 2-
7	Non-inverting input of 2nd comparator	Input 2+
8	Inverting input of 3rd comparator	Input 3-
9	Non-inverting input of 3rd comparator	Input 3+
10	Inverting input of 4th comparator	Input 4-
11	Non-inverting input of 4th comparator	Input 4+
12	Ground (0V)	Ground
13	Output of 4th comparator	Output 4
14	Output of 3rd comparator	Output 3

4-IC2 L293D :-

L293D is a double H-bridge motor driver combined circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and offer a higher-current signal. This larger current signal is used to drive the motors.

L293D comprises two inherent H-bridge driver circuits. In its common mode of operation, two DC motors can be driven instantaneously, both in forward and reverse way. The motor processes of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will halt the corresponding motor. Logic 01 and 10 will switch it in clockwise and anticlockwise ways, respectively. Enable pins 1 and 9 (conforming to the two motors) must be high for motors to start working. When an enable input is high, the related driver gets enabled. As a outcome, the outputs become active and work in phase with their inputs. Likewise, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

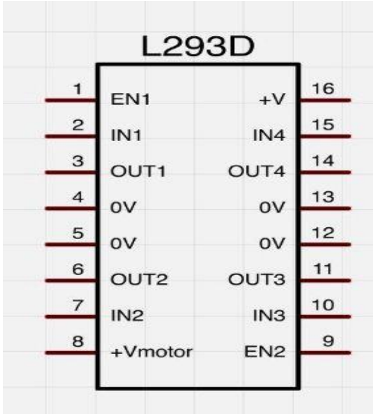

Fig-5 L293D

Pin Description:

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc_2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc_1

5-BATTERY

We are using 12v Dc battery.

6-Solar Panel

A solar panel modules electrically linked and attached on a associate arrangement. A photovoltaic module is a wrapped, linked assembly of solar cells. The solar module can be used as a module of a higher photovoltaic system to produce and supply electricity in profitable and suburban applications. Each module is valued by its DC output power under standard test conditions (STC), and naturally ranges from 100 to 320 watts. The efficiency of a module governs the area of a module given the same rated output -

an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. Because a single solar module can yield only a limited volume of power, most connections contain many components.

3. BLOCK DIAGRAM OF THE WORKING PROCESS

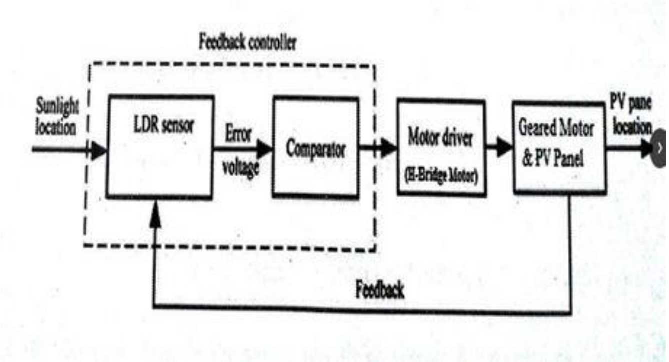

Fig-6 block diagram

The sensor –based opinion regulator contain the LDR sensor and comparator. In the chasing process, the LDR sensor actions the sunlight intensity as a reference input signal. The undermine in voltage generated by the LDR sensor is amplified and then generates a feedback error voltage .the error voltage is relative to the difference between the sunlight position and the PV panel point .At this time the comparator compress the error voltage with a quantified threshold (tolerance). If the comparator output goes high state, the motor driver is triggered so as to rotate the dual axis (azimuth and advancement) chasing motor and bring the PV panel to face the sun. Therefore, the feedback controller makes the vital functions. PV Panel and sunlight are continually checked and send a differential control signal to drive the PV panel until the error voltage and send a differential control signal to drive the PV panel until the error voltage is less than a pre-specified threshold value.

Fig -7 final outcome project model

3. CONCLUSIONS

This paper has presented a novel and a simple control implementation of a sun tracker that employed double dual axis Dc motor to follow the Sun. The proposed two –motor design was simple and self –contained, and did not require programming and a computer interface. the proposed methodology is an innovation so far. It achieves the following attractive feature.

1- A simple and cost–effective control implementation.
2- A stand-alone PV inverter to power the entire system.
3- Ability to adjust the tracking accuracy.
4- Applicable to moving platforms with the Sun tracker.
At the ,the empirical findings lead us to believe that the research work may provide major contribution to the development of solar energy.

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6.BIOGRAPHIES

Abhishek Shukla was born in Agra on june 2, 1993.He completed his B-Tech in Electronics & Electronics Engineering from Sam Higginbottom University of Agriculture, Technology, & Sciences Allahabad india in 2014 After that he Prepared GATE exam and qualified GATE EXAM .presently selected as Engineer at SDMC Govt of india. His research interests include Energy Systems, Power System and Control System.

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