International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 06 | June -2018 www.irjet.net p-ISSN: 2395-0072

Design and implementation of Automatic dual axis solar Tracking System

Ambeyraj mishra[1], Manvendra singh[2], Sarjana singh[3], Rishita singh[4], Bhavana sharma[5]

[1,2,3,4]UG Scholar, EEE Dept. GLBITM Greater Noida, India,
[5]Asst. Professor, EEE Dept. GLBITM Greater Noida, U.P. India

---

Abstract - *"Automatic dual axis solar tracking system" is a method of generating power by the use of sunlight. Since the older panels were not so efficient in producing power whole day. It was maximum only at mid noon. This paper is for gaining maximum power automatically even when the sun is not at its peak. So the automatic solar system is for maximum intensity. For the maximum intensity this system rotates automatically hence increasing power efficiency.*

Key Words: solar panel, Light detecting resisters, DC stepper motor, Arduino. Transformer,

1. INTRODUCTION

Solar Panels are used for converting solar energy into electrical energy, photovoltaic cells or solar cell, are placed in a matrix like pattern on the surface of solar plate. Solar panels are made with silicon(crystalline), used in such as microprocessor industry, for example gallium arsenide, which is more expensive for solar cells. The radiation from sun is collected by the solar panel, comprised of various single solar cells. It's function similar to the semiconductors used in pn-junction diode. When sunlight falls on solar panel, the junction diode converts the solar energy into electrical energy. Generated energy from photons striking at the surface of solar panel makes electrons to be taken out of the orbits and are released, electric fields in photovoltaic cells pull the electrons in directional current, by which metal contacts can generate electricity. The more are the photovoltaic cells in a panel the higher is the capability of the photovoltaic cells to produce more power, hence more output is produced by the solar panel.

Solar energy can be used in both the ways that is indirectly and directly. It may be used in various applications like thermal, for example, water heater, cooking, air heater etc. the heated liquid is transformed into vapour and can be used for generation of electrical power. It can be used for commercial as well as non-commercial purposes.

1.1 Purpose of solar tracking system:

- Able to convert maximum solar energy throughout the day.
- Efficiency of the system is increased.
- Power per unit area is increased.

Fig 1 solar tracking system

The sun direction in the sky vary whole day as the sun moves in the sky 0 to 1800. Hence there are also two types of solar tracker:

- Single Axis
- Dual Axis

Single Axis Solar: Single axis tracking system can have either vertical axle or a horizontal axle. The vertical type is used in high latitudes as in UK where the sun does not get very high, but summer days can be very long The horizontal axel is used in tropical regions where the solar rays very high at noon, but the days are short.

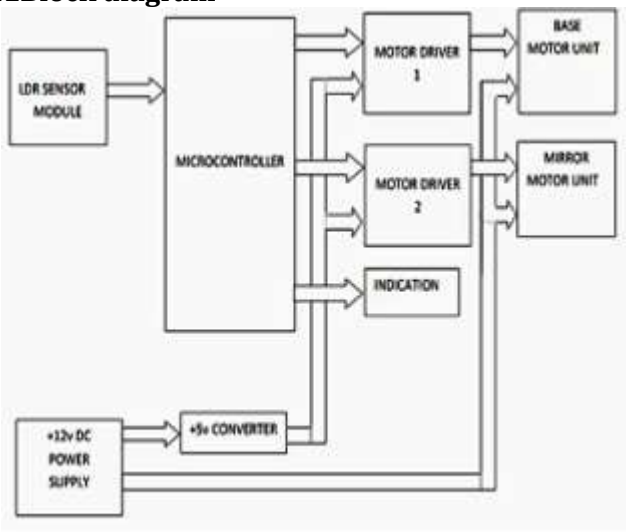
Dual Axis Solar Tracker: Dual axis tracking system have both vertical axle and a horizontal axel so can be used to track the sun motion anywhere in the upper sky. This tracking system is used for the control of astronomical telescopes, and due to which there are hundreds of software available to predict the motion of the sun across the sky and track automatically. Dual axis tracking system track the sun both North to South and East to West for efficient power output.

2. Hardware

Fig 2.1 hardware

We are using solar panel 6v and 3w, voltage regulator 7805, motor driving IC l293d, rectifier circuit, LDRs, two stepper motors, arduino ATmega328p and transformer.

2.1Block diagram



2.2 Solar panel: we are using solar panel of rating 6V and 3W, it works on the principle of photovoltaic effect it take heat energy from the sun and convert it into power.

2.3 LDRs: light detecting resistors are used to detect sun position and gives its output to the arduino which helps in sun tracking system. Resistance of theses ldr decreases when light falls on it. Which helps in controlling the solar tracking?

2.4 Transformer: primary side is connected to 220V ac supply and secondary side is connected to rectifier. It converts 220V ac to 12V ac and rectifier used to convert 12V ac to 12V dc.

2.5 Voltage regulator: 7805 voltage regulator is being used to give the voltage required by arduino that is 5V dc and no fluctuations are found using regulators

2.6 Stepper motor: It is a DC motor which used to rotate regarding step angle. It divides full rotation into various equal steps. Here 60rpm 12V motor is used according to the paper.

2.7 Motor driving IC: L293d is dual H-bridge motor driver integrated circuit. Motor driving IC act as a current amplifier since it takes low current control signal and provide high current signal is used to drive the motor.

Fig.2.2 Motor driving IC

3. Software:

Arduino ATMEGA328P is a 28 pin IC. We are using arduino to track the movement of Sun and at the same time align the panel in the direction of sun for maximum conversion of solar energy to electrical energy.

We are using 4 input pins(23-26) and 2 output pins(13-14) the output pins are connected to motor driving IC and it receives input from LDRs that connects 1k ohms resistance in series.

The following process takes place:

Step 1: When light falls on LDRs resistance decreases and due to which voltage drop take place. This voltage drop is received as input signal by arduino.

Step 2: It compare the input signal of both LDRs. If the difference between them is below 5 then it won't work and if it is more than 5 then the LDR whose resistance is low will give it output to motor IC.

Step 3: Motor IC receive signal from arduino output, accordingly motor is rotated.

Step 4: If resistance of both LDRs are same then arduino gives signal to motor IC and it stops the motor.

Step 5: Five sec delay is provided by arduino to motor IC to work accordingly.

5.1 Table comparison between single and dual axis.

Time	Single axis		Dual axis	
	Current (amperes)	Voltage (volts)	Current (amperes)	Voltage (volts)
8.30am	0.051	4.8	0.053	4.9
9.30am	0.052	4.9	0.054	5.0
10.30am	0.06	5	0.61	5.15
11.30am	0.067	5.1	0.071	5.25
12.30am	0.071	5.2	0.073	5.4
1.30pm	0.075	5.3	0.079	5.6
2.30pm	0.085	5.3	0.09	5.5
3.30pm	0.07	4.8	0.08	5.3
4.30pm	0.062	3.9	0.07	5.1
5.30pm	0.05	3.5	0.057	4.8

6. Advantages:

- Free fuel cost.
- Very reliable source.
- Pollution free .
- Unlimited solar power source.
- Non-conventional.

7. Result:

Maximum energy of sun is attained by the solar panel which makes it efficient approximately 40%. LDRs are used to track the sun positioning. Two stepper motors(geared) are used to rotate the solar panel which makes sun beam to be in alignment with the panels.

8. Conclusion

This research work can provide a help in contribution in development of solar power applications. First it is simple and economical control system, single pv inverter to power whole system, two axes can move together, accurate tracking, and it is useful in rotating platform with sun tracking. Paper shows that designing of solar panel(dual axis rotating). which is automatically rotated is build, designed and tested. It moves together from start of sunlight from east to the end at west and back to normal position facing east direction. This helps in saving a lot of energy as the motor is off during night. This system is simple, cost effective and very much accurate. This system(dual axis) have higher gain compared to other technologies used in the market.

REFERENCES

1) Electric Machines – D.P.Kothari, I.J. Nagrath – Tata Mc.Graw Hill Education.

2) Energy Conservation: Success and Failures – John C. Sawhill.

3) Handbook of Energy Conservation – H.M. Robert, J.M. Collins – Alken Publishing Unit.

4) B.il thareja, a.k. thareja a textbook of electrical engineering, vol 2AC & dc machine s.i system of unit.

5) S chand & company ltd, ram nagar, New delhi, India.

6) 6) Mohammad ali mazidi, Raolin D mckinly, Danny Causy, (2009) PIC microcontroller and embedded systems.