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ROTATING SOLAR PANEL USING ARDUINO

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ABSTRACT

The aim of this project is to consume the maximum solar energy through solar panel. A Solar Tracker is a device onto which solar panels are built-in which tracks the motion of the sun ensuring that maximum amount of sunlight strikes the panels all over the day. Power output from a solar cell will be maximum when it is facing the sun i.e. the angle between its surface and sun rays is 90 degree. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. The components used for its construction are servo motor, Arduino . The active sensors continuously monitor the sunlight and alternate the panel towards the direction where the intensity of sunlight is maximum. For rotation part, one standard servo motor has been selected. Power output from a solar cell will be maximum when it is facing the sun i.e. the angle between its surface and sun rays is 90 degree. In software part, the code is constructed in C programming and inserted in Arduino. This project is designed for low power and portable application. Therefore, it's suitable for rural area usage. Moreover, the effectiveness of output power which collected by sunlight are increased.

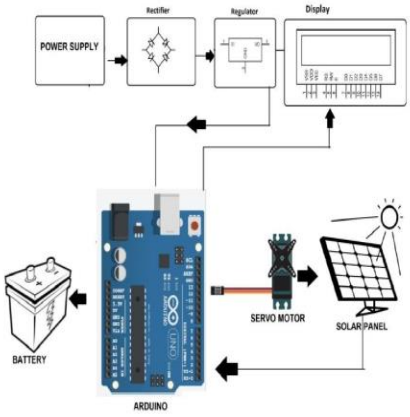
KEY WORDS: Solar Panel, Arduino, Atmega 328, Servo Motor.

1. INTRODUCTION

The aim of this project is to consume the maximum solar energy through solar panel. A Solar Tracker is a when it is facing the sun i.e. the angle between its surface and sun rays is 90 degree. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. The components used for its construction are servo motor, Arduino . The active sensors continuously monitor the sunlight and alternate the panel towards the direction where the intensity of sunlight is maximum. For rotation part, one standard servo motor has been selected. Power output from a solar cell will be maximum when it is facing the sun i.e. the angle between its surface and sun rays is 90 degree. In software part, the code is constructed in C programming and inserted in Arduino. This project is designed for low power and portable application. Therefore, it's suitable for rural area usage. Moreover, the effectiveness of output power which collected by sunlight are increased.

METHODOLOGY

BLOCK DIAGRAM:



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PROPOSED SYSTEM:

The Rotating Solar Panel Using Arduino project aims at charging a 12VDC Battery with the help of Solar Panel mounted on platform which can rotate with the help of a motor. This motor is getting controlled by Atmega328 microcontroller mounted on an Arduino Uno Board which is in turn mounted on the PCB. The Rotating Solar Panel system scans from one horizon to other to know the current position of sun and hence the position from which the greater solar energy can be harnessed. The position which has the highest energy capacity is choosen to charge the battery. In this way we can harness the most of from the Solar panel by adjusting it to be incident directly towards sun consistently. Thus this project makes this process of harnessing solar energy more efficient and hence smarter.

DEVELOPMENTATION AND IMPLEMENTATION

3.1:SCHEMATICDIAGRAM

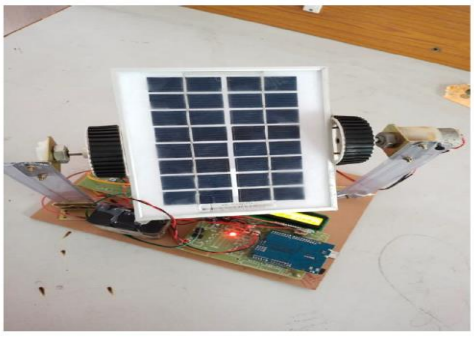

FIG 3.1 SCHEMATIC DIAGRAM FOR ROTATING SOLAR PANEL USING ARDUINO

3.2:WORKING

Coming to the working of Rotating Solar Panel Using Arduino, it has panels mounted in a particular arrangement at an angle of 45 degrees in such a way that it can receive solar raditation with high intensity easily from the sun. These solar panels converts solar energy in to electrical energy as studied earlier. The of this project is to consume maximum amount of energy from the sun. The motor is connected to the batteries through connecting wires. From this motor the solar panel rotates in two directions that is East and West. When the light fall on the sensor the solar panel rotates.When the light fall on the east side sensor its moves the solar panel to the East direction. When the light fall on the west side sensor its moves the solar panel to the West direction.

PROBLEM STATEMENT:

Problem associated with in the use of solar energy is that its availability varies widely with time. The variation in availability occurs daily because of the day night cycle and also seasonally because of the earth's orbit around the sun. To rectify these above problems the solar panel should be such that it always receive maximum amount of light.

ADVANTAGES:

- ❖ The solar energy can be reused as it is non-renewable resources.
- ❖ This also saves money as there is no need to pay for energy used (excluding the intial setup cost).
- ❖ Helps in maximizing the solar energy absorption by continuously tracking the sun.
- ❖ Eco-Friendly
- ❖ Simple

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- Low cost
- We can monitor directly using PC
- Tracking accuracy is more
- Reduce the usage of power from power grid
- High degree of flexibility since it moves in two directions.
- Its flexibility allowing for higher energy output during Sunny days.
- Higher degree of accuracy in directional point.
- Ability of tracking sun light at any weather.
- Installation is easy and operates automatically.
- Energy is free.
- Solar energy causes no pollution.
- Solar energy will last forever whereas it is estimated that the world's oil reserves will last for 30 to 40 years.

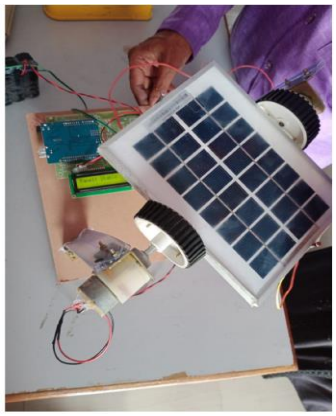
DISADVANTAGES:

- Solar electricity is not available night and is less available in cloudy weather conditions. Therefore, a storage or complimentary power system is required.
- Although solar energy can be saved to batteries, they are heavy and occupy more space and required to change time to time.
- Limited power density.
- Solar cells produced DC which must be converted to AC when used in currently existing distribution grids.
- Initial investment is high on solar panels.
- It's a bit of difficult for servicing, as the tracking systems are not quit popular regionally. Moving parts and gears which will required regular maintenance. May required repair or replacement of broken parts over a long run.
- Expensive
- Sun is not always prevalent.
- Solar energy can only be generated in day light.
- Weather affects solar panels efficiency
- Solar power is used to charge batteries so that solar powered devices can be used at night. The batteries can often be large and heavy, taking up space and needing to be replaced from time to time.

APPLICATIONS:

- These panels can be used to power the traffic lights and street lights.
- These can be used in home to power the appliances using solar power.
- These can be used in industries as more energy can be saved by rotating the panel.
- Can be used for small and medium scale power generations.
- For power generation at remote places where power lines are not accessible.
- For domestic back up power systems.

RESULT:



The above diagram says about that the solar panel is in the stable state. In this the sun rises does not fall on the sensors. It does not consume any energy from the sun.

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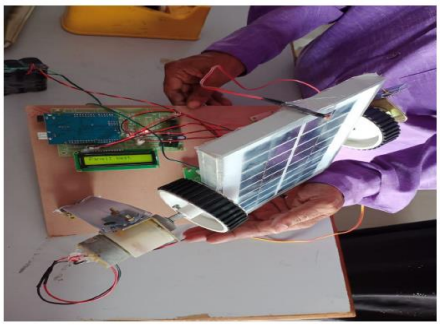
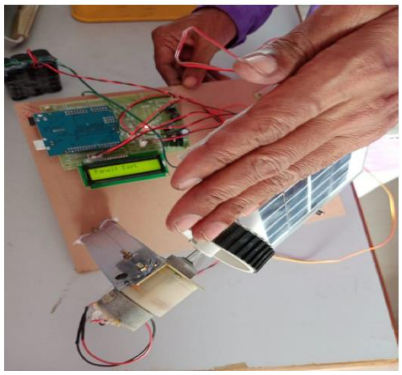


In this the sun rises falls on the West sensor then the solar panel moves towards the west direction. The east direction waiting until the sun rises falls on it.



In this the sun rises fall on the East sensor then the solar panel moves towards the direction. The west direction waits until the sun light falls on it.

4.1 **CONCLUSION :**

The paper has presented a means of tracking the sun's position with the help of microcontroller. Specially, it demonstrates a working software solution for maximizing solar cell output by positioning a solar panel at the point of maximum light intensity. The prototype represents a method for tracking the sun both in normal and bad weather condition. Moreover, the tracker can initialize the starting position itself which reduce the need of any more photo resistors. The attractive feature of the designed solar tracker is simple mechanism to control the system. The solar tracker also provides lucrative solution for third world countries to integrate it into their solar system with a comparatively low cost through software based solution. Though the prototype has limitations in hardware areas as an initial set up, still it provides an opportunity for improvement of the design methodology in future. In order to meet the needs of the energy demand especially in the developing countries, this kind of solar tracking should be implemented in large scale. It will also help resolve the problem of depletion of non-renewable resources. It will also help in building a better eco-friendly environment which in turn will reduce the global warming. Application wise it can be used for efficient generation of electricity in remote homes, livestock, plantation irrigation, pool filtration, solar heating. It will also increase the efficiency of the solar panel by 35% to 60% compared to the mounted solar panel systems

4.2 **FUTURE SCOPE:**

As the proposed prototype is a miniature of main system, it has some limitations which can be mitigated through future developments. A small cardboard is rotated in the system and 12v solar panel is used for analysis. As a miniature system, it works out well. Larger Solar panel must be integrated with the system to prepare better result and cost analysis. It has been proven through our research and statistical analysis that solar tracking system with single-axis freedom can increase energy output by approximately 20%.Further mechanical enhancement can be done to the prototype, to implement dual-axis tracking.

4.3 REFERENCE:

1. Koyuncu B and Balasubramanian K, "A microprocessor controlled automatic

sun tracker," IEEE Trans. Consumer Electron., vol. 37, no. 4,pp. 913-917, 1991.
2. Konar A and Mandal A K, "Microprocessor-based automatic sun tracker," IEEE Proc. Sci., Meas. Technol., vol. 138, no. 4, pp. 237-241,1991.
3. Rizk J. and Chaiko Y. "Solar Tracking System: More Efficient Use of Solar Panels", World Academy of Science, Engineering and Technology 2008.
4. Filfil Ahmed Nasir, MohussenDeiaHalboot, Dr. Zidan Khamis A. "Microcontroller-Based Sun Path Tracking System", Eng. & Tech. Journal, Vol. 29, No.7, 2011.
5. Ashok Kumar Saxena, V. Dutta. "A Versatile Microprocessor Based Controller For Solar Tracking". Proc. IEEE, 1990', pp.1105- 1109.
6. Damm, J "An active solar tracking system, Home Brew Magazine " Issue #17, June/July 1990.
7. GamalM.Dousoky,Abou-HashemaM.ELSAYED,MasahitoShoyama. "Maximizing EnergyEfficencyInSingle Axis Solar Tracker Photovoltaic Panels".8th International Conference on Power ElectronicECCEAsia –May 30 June, 2011.
8. Alimazidi Mohammad, Gillispie J, Mazidi, Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", an imprint of Pearson Education, 2006.
9. Mehta V K, Mehta Rohit, "Principles of Electronics", S. Chand & Company Ltd, 2008.
10. Balagurusamy E, "Programming in ANSI C", Tata McGraw-Hill Publishing Company Limited, 2008.
11. MohdZulkifli,M.A.; Zolkapli.M.;Al-Junid,S.A.M. "High Efficency Dual Axis Solar Tracking Development Using Arduino" international conference of technology, informatics, management, engineering, and environment(TIME-E), 2013
12. Han Wan Siew, "Solar Tracker" SIM University,2008.
13. Solar Tracking System Using Stepper Motor Ankit Anuraj1 and Rahul Gandhi2 1 E-203, Shree Balaji Residency, Motera, Ahmedabad, Gujarat. 2 27Jayveer Society, Kalol, Ahmedabad, Gujarat
14. Design of a Solar Tracker System for PV Power Plants Tiberiu Tudorache1 ,Liviu Kreindler1, 2 1 Electrical Engineering Faculty, University Politehnica of Bucharest,