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High Efficiency Solar Monitoring System

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Abstract - *Solar energy is growing a very important means of renewable energy resource. With solar tracking and panel cleaning, it will become possible to generate more energy. So the solar panel maintain a perpendicular profile to the rays of the sun by tracker. This project discusses the design and construction of a prototype for method economical single axis sun tracking system of freedom and cleaning the panel with the help of wiper. Light Dependent Resistors are used for sunlight detection. The control circuit is based on an ATMega328P microcontroller control. It was programmed to detect sunlight via the LDRs before actuating the high torque servomotor to position the solar panel. The solar panel is established such that it is able to receive maximum light. Servomotors are low cost and provides better result while operating in low speed & able to maintain their torque. For panel cleaning DC gear motor is used and submersible pump is used to spread water on panel.*

Key Words: **Arduino, Servomotor, DC Gear Motor, Solar Panel, Wiper, Submersible Water Pump, Battery, LDR etc**.

1. INTRODUCTION

The exact aim of this project is to increase the efficiency of the solar panel. That is the output per square of the solar panel is increased. Solar energy is clean and available in abundance. These are for industrial and domestic applications. With the alarming rate of depletion of depletion of major conventional energy sources like petroleum, coal and natural gas, coupled with environmental caused by the process of harnessing these energy sources, it has become an urgent necessity to invest in renewable energy sources that can power the future sufficiently. The silicon cell having the efficiency of about 20 %. Also the solar panel cost is much higher than other renewable energy sources. So the main factors that influence in decreasing the panel efficiency are whether condition, dust and other particle deposition on panel, much more heat produced on the panel. Three ways of increasing the efficiency of the solar panels are through increase of cell efficiency, maximizing the power output and the use of a tracking system together with the cleaning system. Dual trackers track sunlight from box axes. Dual axis tracker is the best option for places where the position of the sun keeps changing during the year at different seasons. Single axis sun trackers are a better option for places around the equator where there is no significant change in the apparent position of the sun. The level to which the efficiency is improved will depend on the efficiency of the tracking system and the weather coditions. Very efficient trackers will offer more solar output because they are able to track the sun with more precision. There will be bigger increase in power output in cases where the weather is sunny and thus favorable for the tracking system [1].

Fig.1: Prototype Solar Monitoring System

1.2 SOLAR POWER

Solar power is nothing but energy received by the sun . We know that two types of solar power generation . One is solar thermal power plant and second one is solar pv power generation. Solar thermal power plant use heating of water and passing this water on turbine. Photovoltaic cells convert light into an electricity using the photovoltaic effect. Photovoltaic cells were initially used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system.

1.3 SOLAR IRRADIANCE

Solar irradiance is defined as the power received from the Sun in the form of radiation in the wavelength range of the measuring instrument. This is per unit power. This radiations are electromagnetic radiations. The solar irradiance reached over time is called solar irradiation, insolation, or solar exposure, however, insolation.

1.4 SOLAR TRACKER

In photovoltaic systems, sun trackers help to increase output by minimizing the angle of incidence (the angle that a ray of light makes with a line perpendicular to the surface) between the incoming light that is sunlight and the panel, which increases the amount of energy the installation produces. Concentrated solar photovoltaic and concentrated solar thermal have optics that directly accept sunlight, so solar trackers must be angled correctly to collect energy. All concentrated solar systems have sun trackers because the systems do not produce energy unless they are directed correctly toward the sun. is often used interchangeably with irradiance in practical applicational.

2. OBJECTIVE

Stationary solar panels are unable to catch maximum sunlight in complete daytime. This cause to reduce the utilization of conventional stationary solar panels. Proposed system will satisfy the objective of increase the overall efficiency& utilization factor of solar panel system by implementing following techniques:

- Will track the sun all day along one axis.
- Maintain the solar panel surface clean using the wiper arrangement.
- In high temperature situations, spray water on panel to protect from degradation.
- Increase the efficiency with better design & low cost electronic system.

3. DESIGN AND MODEL

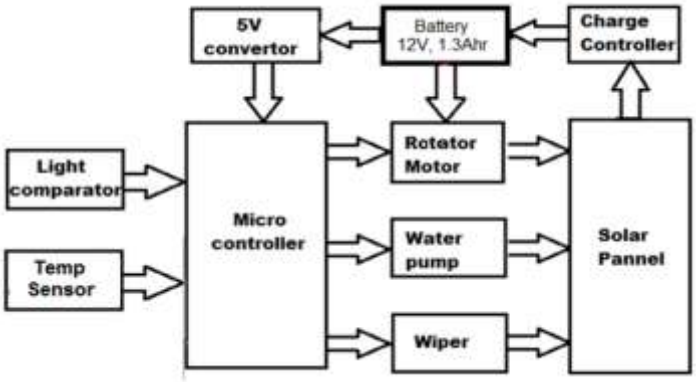
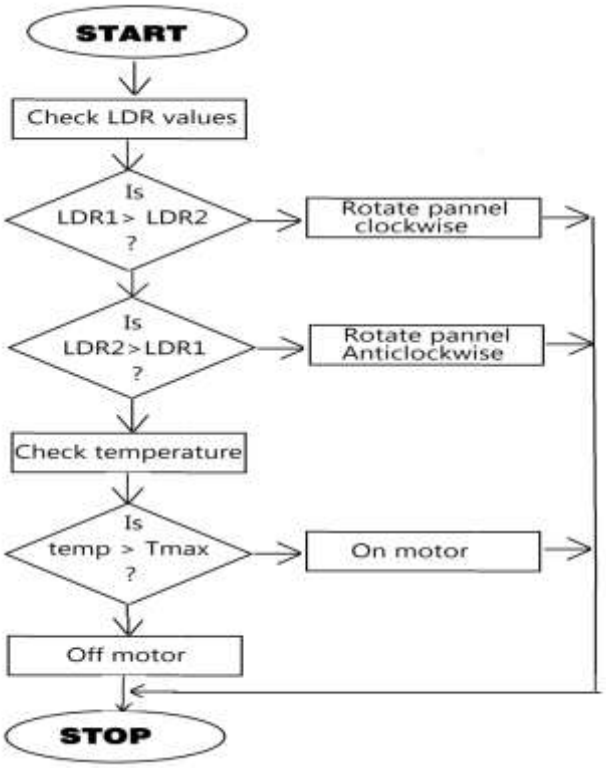


Fig.2: Block Diagram

3.1 FLOWCHART



3.2 ALGORITHM

1. Initialize the Timer, LDR.
2. Check LDR signal and decide the condition for starting submersible pump.
3. Check timer delay and decide time of operation of submersible pump.
4. Initialize the dc gear motor signal and check time delay and to rotate dc gear motor anticlockwise and clockwise.
5. Compare the LDR signal and decide the servomotor to rotate clockwise or anticlockwise.
6. Check the condition of T_{max} and heat water 80% Of T_{max}.
7. Compare T_{max} and T_{set} and decide whether to start or stop pump.
8. End.

3.3 SOFTAWRE DESCRIPTION

For programming of Arduino IDE software is use. Arduino integrated development environment (IDE), which is across platform application written in the programming languages processing and wiring. It has a code editor with tool like a text cutting and pasting, searching and replacing text automatic indenting, brace matching, and syntax highlighting and provides very easy one click process to compile and upload programs to an Arduino board. It also includes a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. A

program written with the IDE for Arduino is termed a sketch. Sketches are saved on the development computer as text file extension. ino. The Arduino IDE supports the languages C and C++ using particular rules of code structuring. The Arduino IDE supplies a software library from the wiring projects, which provides many common input and output procedures.

4. ADVANTAGES

- Propose system will collect more energy with the help of rotating solar panel
- Since system has water sprinklers for dust cleaning on panel surface, it will increase the panel efficiency in low light.
- Proposed design will be mounted under the panel, so no extra floor space is required for mechanism.
- System will operate in the presence of sunlight. While existing solar panel provides power to the system. So no energy required from outside.
- Panel will rotate only when there is sufficient change in the direction of sun. So no continue energy is used.

5. LIMITATIONS

- Due to glass properties at higher temperature when the cold water is spread the glass breaking occurs.
- Cost of tracking system is higher.
- Due to high weight the stability is not maintain.
- Arduino and other component require 5V DC supply for its application.

6. CONCLUSION

"High efficiency solar monitoring system" proposes the efficient system for electricity generation using solar energy. In this system, sun tracking solar panel is proposed, which will collect the maximum amount of sunlight all over the day. The proposed system is a single axis tracker with the wiper arrangement. System consists of LDRs as primary sensing elements & water spray to cool down panel temperature. The wiper assembly is use to clean the panel. This project is proposed with minimum resources. The circuitry was kept simple, while ensuring that the efficiency is not affected.

7. FUTURE SCOPE

This project is use to track the solar panel towards the sun in perpendicular manner. This project is use for residential as well as commercial purpose. In future solar tracking is use in combination with hydraulic system for sun tracking.

REFERENCES

[1] Debadyoti Ghosh, Rahul Basu, Sreemoyee Madhura Karmakar "Grid-Tie Rooftop Solar System Using Enhanced Utilization of Solar Energy" ICCTA 2017, ©2017 IEEE.

[2] Asmarashid Ponniran, Ammar Hashim in "A Design of Single Axis Sun Tracking System", the 5th International Power Engineering and Optimization Conference (PEOCO2011), Shah Alam, Selangor, Malaysia: 6-7 June 2011.

[3] Zhou Yan, Zhu Jiaxing in "Application of Fuzzy Logic Control Approach in a Microcontroller-Based Sun Tracking System". 2010 WASE International Conference on Information Engineering.

[4] Vasudha Sharma, Vijay Kumar Tayal in "Hardware Implementation of Sun Tracking Solar Panel Using 8051 Micro-Controller", Department of Electrical and Electronics Engineering Amity University Uttar Pradesh, Noida, India.