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Dual Axis Solar Tracker with PWM Inverter

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Abstract: The dual threats of energy depletion and heating place the event of strategies for harnessing renewable energy resources at the middle of public interest. solar power is one among the foremost promising renewable energy resources. solar power is clean, cheap, renewable, and extravagantly offered supply of energy and therefore several researchers specialise in the techniques of skyrocketing absorption of solar energy for various sensible applications. star trailing system plays a significant role during this field owing to the importance of trailing the sun and increasing absorption of solar power throughout the day lightweight temporal arrangement.

This paper presents a brand new style of twin axis star trailing system that's able to create the solar array turn out most power throughout its operate. Sun trackers will well improve the electricity production of a photograph voltaic (PV) system. This paper proposes a completely unique style of a dual-axis star trailing PV system that utilizes the feedback management theory in conjunction with a four-quadrant lightweight dependent electrical device (LDR) sensing element and easy electronic circuits to produce strong system performance.

The planned system uses Stepper motor for twin axis management and a complete PV electrical converter to accomplish star trailing. The four quadrant LDR sends the star intensities of every quadrant to the small controller. The small controller drives the stepper motor in precise steps to realize equal intensities to any or all four quadrants that provides most solar energy to the PV system. The harvested solar energy is reborn to AC employing a electrical converter to that the masses are often connected.

I.   INTRODUCTION

Energy is that the primary and most universal live of every kind of labor by men and nature. Primarily, it's the gift of the character to the humankind in varied forms. The consumption of the energy is directly proportional to the progress of the humankind. With ever growing population, improvement within the living normal of the humanity, industrial enterprise of the developing countries, the worldwide demand for energy will increase day by day.

The primary supply of energy is fuel, but the finitude of fuel resources and enormous scale environmental degradation caused by their widespread use, significantly heating, urban pollution and air pollution, powerfully suggests that harnessing of non-conventional, renewal and environmental friendly. As the sources of standard energy deplete day by day, resorting to alternative sources of energy like solar and wind energy has become need of the hour. Solar powered lighting systems are already available in rural as well as urban areas. These include solar lanterns, solar home lightning system, solar street lights, solar garden lights and solar power packs. All of them consist of four components; solar photovoltaic module, rechargeable battery, solar charge controller and load.In the solar powered lightning systems, the solar charge controller plays an important role as the system's overall success depends mainly on it. It is considered as an indispensible link between the solar panel, battery and load
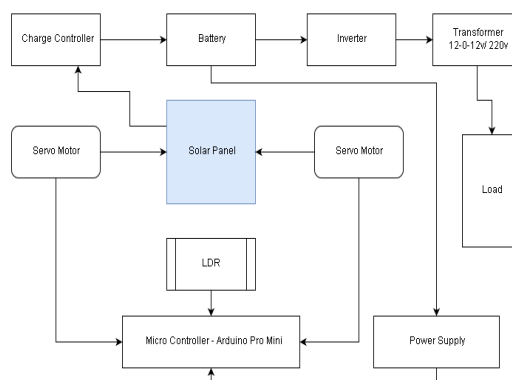
II.   BLOCK DIAGRAM

Fig1.1: Block Diagram.

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A. Block Description

In this project we are using two sub circuits, one is used for tracking the sun light and another for generating PWM inverter Signals. The microcontroller used is Atmega328p on Aurdino pro mini development board which is aHigh Performance Low Power CMOS 8-Bit Microcontroller. eight bit microcontroller means that methoding unit |CPU| central processor| processor| main frame| electronic equipment| hardware| computer hardware} or ALU will process eight bit knowledge at a time. means that it's to require eight bit knowledge from memory (which it's to process). so every location in memory is eight bit and knowledge bus is additionally eight bit. Registers in RAM needs to be eight bit for temporary storage of results. This microcontroller has 32KBytes of In-System Flash program memory. Our program is burned into non-volatile storage. it's having a half dozen channel PWM (Pulse dimension Modulation) channel. one amongst them is employed for LCD back light-weight management. As dimension of pulse changes back candlepower of LCD varies. Atmega328P incorporates half dozen channel ten bit analog to digital convertor. This analog to digital convertor is employed to notice the minor modifications in drop across potentiometer and these modification is chargeable for change in back light-weight of LCD. The small controller receives the info from the LDR (Light dependent Resistor) sensors by that we are able to calculate that direction the sun must rotate for obtaining most sun light-weight for solar battery. once conniving that direction to rotate the small controller rotates the star panels through the 2 vertical and horizontal servo motors. once all the LDRs receive same quantity of sun light-weight then the servo motor stops rotating. so effectively increasing the potency of the solar battery by assembling most sun light-weight all the time. After assembling the solar power it's wont to recharge the Lead Acid battery. From there another small controller is employed to convert the keep energy from batter to AC by PWM electrical converter exploitation N-mosfet that is any Stepped-up through a electrical device and wont to feed the load

III. CIRCUIT WORKING

Below figure is the basic circuit diagram of dual axis solar tracker and pwm inverter. It consists ofsix main components like a microcontroller, Lead acid battery, step-down transformer, N-Mosfets,Servomotors0 etc. The two Microcontrollers are the brain and most important part of our circuit. Each and every part iseither directly or indirectly connected to the microcontrollers. The servo motors are connected to tracking micro controller through pins D6 and D9. The micro controller takes the sunlight data from the LDR sensors arranged in such a manner to accurately provide amount of sun light on top, bottom, left and right of the solar panel. These sensors are connected to analog pins A0-A3. Whenever there is a difference of light intensity between these sensors the micro controller adjusts the position of servo to get equal light intensity between these sensors

The inverter circuit consist of two N-Mosfets forming the Inverter circuit connected to a center tap transformer which steps-up the inverter output. The PWM signal is generated by the micro controller and given to the Mosfets through transistors acting like a switch. The Battery provides supply for the Inverter Circuit.
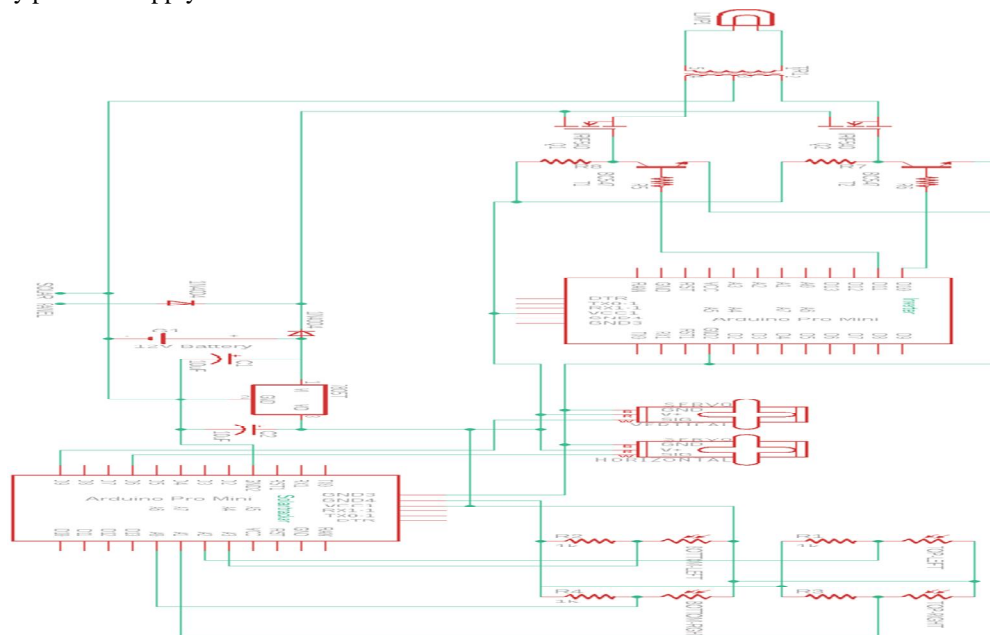

Crcuit Diagram

IV. RESULT

In this Dual Axis Solar Tracker, when source light falls on the panel, the panel adjusts its position according to maximum intensity of light falling perpendicular to it.

The objective of the project is completed. This was achieved through using light sensors that are able to detect the amount of sunlight that reaches the solar panel. The values obtained by the LDRs are compared and if there is any significant difference, there is actuation of the panel using a servo motor to the point where it is almost perpendicular to the rays of the sun.This was achieved using a system with three stages or subsystems. Each stage has its own role. The stages were;

A. An input stage that was responsible for converting incident light to a voltage..
B. A control stage that was responsible for controlling actuation and decision making.
C. A driver stage with the servo motor. It was responsible for actual movement of the panel.

The input stage is designed with a voltage divider circuit so that it gives desired range of illumination for bright illumination conditions or when there is dim lighting. The potentiometer was adjusted to cater for such changes. The LDRs were found to be most suitable for this project because their resistance varies with light. They are readily available and are cost effective. Temperature sensors for instance would be costly. The control stage has a microcontroller that receives voltages from the LDRs and determines the action to be performed. The microcontroller is programmed to ensure it sends a signal to the servo motor that moves in accordance with the generated error. The final stage was the driving circuitry that consisted mainly of the servo motor. The servo motor had enough torque to drive the panel. Servo motors are noise free and are affordable, making them the best choice for the project.
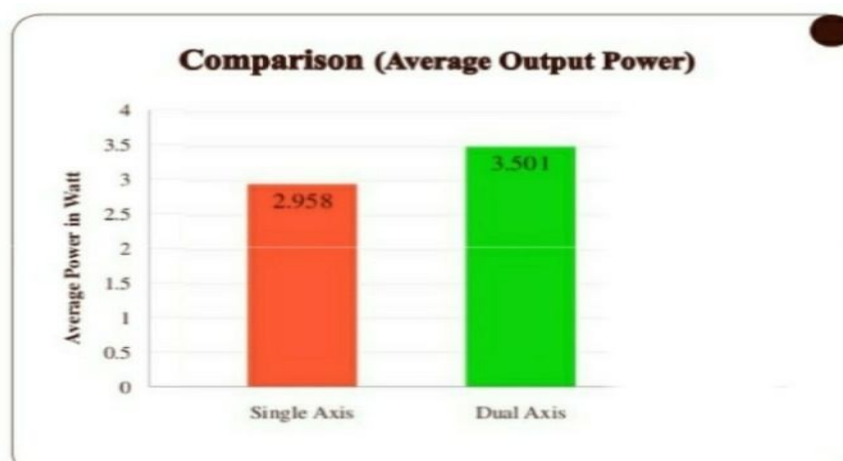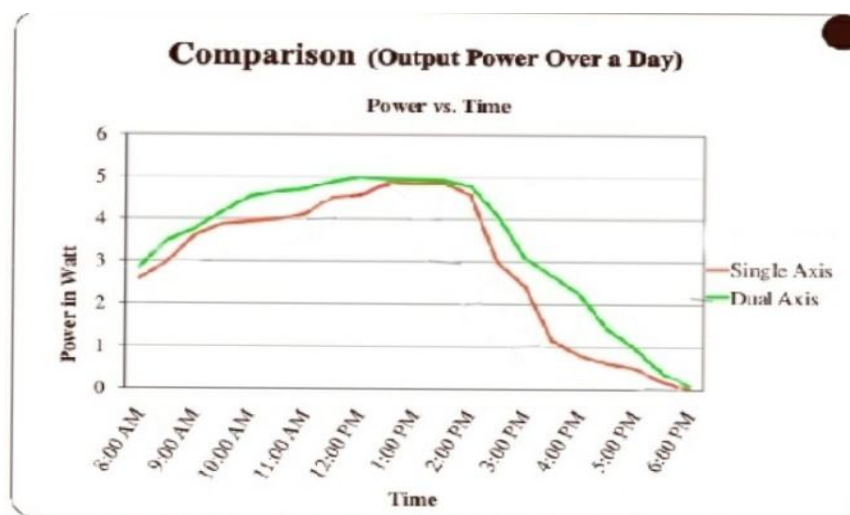
V. CONCLUSION

In this project, the sun pursuit system was enforced that is predicated on ATMEGA328 microcontroller. once examining the {data} obtained within the data analysis section, it are often aforesaid that the projected sun pursuit electrical device system may be a possible methodology of increasing the energy received from radiation. The controller circuit accustomed implement this method has been designed with a minimal variety of parts and has been integrated onto one PCB for easy assembly. the employment of servo motors permits correct pursuit of the sun whereas keeping track of the array's current position in reference to its initial position. the automated radiation huntsman is Associate in Nursing economical system for solar power assortment. it's been shown that the sun tracking systems will collect regarding V-day additional energy than what a set panel system collects and so high potency is achieved through this huntsman.

 V-day increase in potency isn't the foremost vital figure; it are often additional outstanding in concentrating kind reflectors.The storage and conversion of solar power into AC power for utilization of native power wants can any facilitate in rising the potency of the system. The sine-PWM electrical converter has heap of benefits when put next to standard PWM inverters that offer sharp edges and voltage harmonics, so the dependability of the system is sweet.

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