NOVATEUR PUBLICATIONS
International Journal of Research Publications in Engineering and Technology [IJRPET]
ISSN: 2454-7875
VOLUME 3, ISSUE 1, Jan. -2017

A MICROCONTROLLER BASED APPROACH TO THE SOLAR TRACKING CHARACTERIZATION

MR. DEVENDRA D. PATIL
U.G., Student, Department of Electrical Engineering, BATU, Lonere

PROF. R. H. MADHAVI
Assistant Professor, Department of Electrical Engineering, BATU, Lonere

ABSTRACT:

Solar energy is imperative method for growing renewable energy resources. In this paper is portrayed the plan and development of a microcontroller based solar board following system. Solar is a nonconventional wellspring of energy, considering this we have created solar boards with the goal that we can satisfy our electricity required. Be that as it may, because of transformation of the earth, solar source i.e. sun does not confront the board persistently consequently less electricity is delivered. The energy board ought to confront the SUN till it is available in a day. The issue above can be understood by our system via programmed following the solar energy. The block outline beneath shows system design it comprise of a LDR sensor detects max solar power which is being given to the Microcontroller through the ADC which digitizes the LDR output. Controller then takes the choice as indicated by then calculation and tilts the board towards the bearing of the maximum energy given by LDR with the assistance of DC Motor. The Motor is utilized to turn the LDR to detect the maximum solar power. A Solar Tracker is fundamentally a gadget onto which solar boards are fitted which tracks the movement of the sun over the sky guaranteeing that the greatest measure of sunlight strikes the boards for the duration of the day. In the wake of finding the sunlight, the tracker will attempt to explore through the way guaranteeing the best sunlight is recognized. It is totally programmed and keeps the board before sun until that is obvious. Its dynamic sensors always screen the sunlight and turn the board towards the course where the power of sunlight is greatest. Private that utilizations solar power as their option power supply will convey advantages to them. The fundamental target of this venture is to advancement of a programmed solar following system whereby the system will brought on solar boards will keep adjusted to the Sunlight with a specific end goal to amplify in gathering solar power. The system concentrates on the controller plan whereby it will brought about the system can tracks the most extreme force of Sunlight is hit. At the point when the power of Sunlight is diminishing, this system naturally alters its course to get most extreme force of Sunlight. LDR light indicator goes about as a sensor is utilized to follow the arrangement of the Sunlight by identifying shine level of Sunlight. While to turn the fitting position of the board, a DC geared motor is utilized. The system is controlled by two transfers as a DC geared motor driver and a microcontroller as a fundamental processor. This venture is secured for a solitary hub and is intended for low power and private use applications. From the equipment testing, the system can track and take after the Sunlight force keeping in mind the end goal to get greatest solar power at the output in any case motor speed.

KEYWORDS: Solar energy, solar panel, dc motor, LDR, etc.

INTRODUCTION:

In most recent ten years, large portions of residentials around the globe utilized electric solar system as a sub power at their homes. This is on account of solar energy is a boundless energy asset, set to wind up distinctly progressively critical in the more extended term, for giving electricity and warmth energy to the client. Solar energy likewise can possibly be the significant energy supply later on. Solar tracker is a computerized solar board that really takes after the Sun to build the power. The sun's position in the sky shifts both with hardware over any settled position. One surely understood sort of solar tracker is the heliostat, a mobile mirror that mirrors the moving sun to a settled area; however numerous different methodologies are utilized as well.Active trackers utilize motors and rigging trains to coordinate the tracker as told by a controller reacting to the solar course. The solar tracker can be utilized for a few applications, for example, solar cells, solar day-lighting system and solar warm clusters. The solar tracker is extremely helpful for gadget that necessities more sunlight for higher productivity, for example, solar cell. A considerable lot of the solar boards had been situated on a settled surface, for example, a rooftop. As sun is a moving article, this approach is not the best

technique. One of the arrangements is to effectively track the sun utilizing a sun GPS beacon to move the solar board to take after the Sun. With the Sun continually confronting the board, the most extreme energy can be consumed, as the board is working at their most noteworthy effectiveness. The fundamental purpose behind this venture is to get the most extreme productivity for the solar cells. In spite of the fact that there are numerous solar trackers in the market, the cost is costly and exorbitant in light of the fact that the market for solar tracker is still new and just certain nations utilize the solar tracker, for example, USA and South Korea. The huge scale solar tracker that typically utilized is not reasonable for the private utilize. Subsequently, this venture will build up a Sun following system uniquely intended for private use for a minimal effort solar cell.Previous specialists and utilized LDR and photodiode as sensors individually. In the interim and utilized DC motor with rigging and more extreme motor separately. Those ventures have burdens and a portion of the detriments are high cost amid improvement, hard to control motor speed and hard to plan since utilizing microchip. The primary goal for this venture is to build up the sun following solar system show which is a gadget that take after the development of the Sun paying little mind to motor speed. Besidesthat, it is to enhance the general electricity generation utilizing single pivot sun following system and furthermore to give the outline to private utilize. LDR or light ward resistor has been picked as the sensor on the grounds that LDR is ordinarily utilized as a part of sun following system. This is on the grounds that LDR is touchy to the light. The resistance of LDR will diminishes with expanding episode light force. For the controller, AT89S52 had been picked. This ATMEL programming will give the beat to the driver to move the motor. For the driver, bidirectional DC motor control utilizing transfer has been utilized. The motor controller had been picked on the grounds that it can control the motor to pivot clockwise and counter-clockwise effectively. DC geared motor likewise been picked in light of the fact that it has a hold torque up to 24 kg.cm and low rpm. Last however no minimum, LM7805 is utilized to change over the inpu voltage from the source to 5 V output in light of the fact that incorporated circuit just need 5 V to operate.

PROPOSED METHOD MICROCONTROLLER BASED SOLAR TRACKER:

In the microcontroller based solar tracker systems, a controller is associated with DC motors. For the most part to monitor the power generation, they additionally associated this GPS beacon to a PC by a code written in Assembly or Embedded C language. In this solar tracker outline, sensors are utilized. For instance, a light sensor or photo sensor called light-subordinate resistor (LDR) to demonstrate the force of the radiation (that progressions its electrical resistance from a few thousand Ohms oblivious to just a couple of hundred Ohms when light falls upon it). The signs were then caught by the microcontroller that gives a flag to the motors to turn the board so as to track the solar energy for greatest power output. Subsequently, the primary distinction between the dynamic trackers is the capacity to diminish the directing blunder utilizing outside sensors, in this manner expanding the every day irradiation the solar cells get and the electric energy that they delivered. A similar review demonstrates that, the power utilization by the GPS beacon is just 2-3 % of the expanded energy. The yearly energy accessible to the two hub tracker was 72% higher than a settled surface and 30% for single pivot East-to-West tracker.

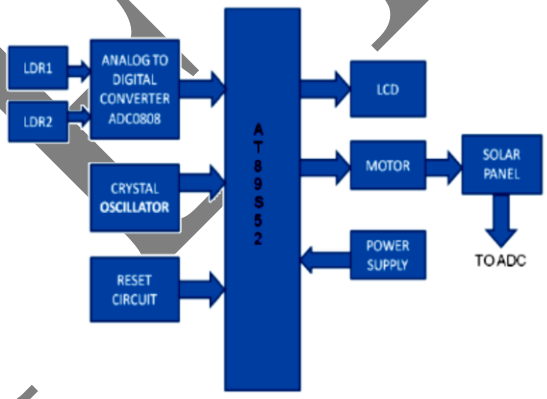

Fig 1: Block Diagram of automatic solar tracker system

AT89S52 is 8-bit microcontroller from Atmel Semiconductors. This comes into 8051 family microcontroller. This is the heart of the venture. The entire control rationale program is put away in this microcontroller. It sends and gets control and information signals to LCD, Stepper motor and to alternate Devices in view of the program logic.ADC0808 gets the simple output from LDRs and solar board. It changes over them to advanced shape. These advanced signals are given to the microcontroller. SOLAR PANEL is a photo voltaic cell and this believer's light energy into electrical energy. The output voltage of the solar board relies on upon the measure of light falling on the board.

LDR SENSORS-This is a light ward resistor. The resistance of the gadget is contrarily corresponding to the measure of light falling on its surface. On the off chance that light falls on the gadget, its resistance drops significantly bringing about electron flow. LDRs are utilized as light sensors.

L293D MOTOR DRIVER - L293D Driver looks at the LDR values and the motor is turned in like manner.

The solar board that is connected to the motor will be turned by the heading of motor.

DC MOTOR-The DC motor is utilized to pivot the solar board. The DC motor makes genuine and correct numbe of turns or degrees of pivot trained by the microcontroller. LIQUID CRYSTAL DISPLAY-16 X 2 LCD is utilized to display the status of the output. HD44780U is utilized as a part of the venture. A solitary HD44780U can display up to one 8-character line or two 8-character lines. The HD44780U has stick work similarity with the HD44780S which permits the client to effectively supplant a LCD-II with a HD44780U. The HD44780U character generator ROM is stretched out to generate 208 5X8 dab character text styles and 32 5X10 dab character textual styles for an aggregate of 240 diverse character textual styles. CRYSTAL OSCILLATOR-A crystal is utilized to supply clock recurrence to the microcontroller. The clock recurrence is 11.0592MHz. 11.0592 MHz crystals are frequently utilized on the grounds that it can be partitioned to give you correct clock rates for a large portion of the basic baud rates.

POWER SUPPLY-this venture need 5V controlled DC power supply. This power supply is worked with a full wave connect rectifier, C-channel and a three terminal voltage controller. A LED is accommodated visual distinguishing proof of the power supply. 230V/12V stage down transformer is utilized to venture down the AC 230 V to 12V AC.

TRACKING PRINCIPLE:

An automated solar tracker permits the board to play out an estimated 3-dimensional (3-D) hemispheroidal turn to track the sun's development amid the day keeping in mind the end goal to amplify in gathering solar power. Light assembling is subject to the edge of frequency of the light source giving power (i.e. the sun) to the solar cell's surface. Day sunlight will have a point of occurrence near 90°in the morning and the night. At such an edge, the light assembling capacity of the cell is basically zero, bringing about no output. As the day advances to noontime, the edge of rate methodologies 0°, bringing about an enduring increment in power until at the point where the light episode on the board is nearer to opposite and most extreme power is accomplished. From this foundation, we see the need to keep up the most extreme power output from the board by keeping up an edge of rate as near 0° as would be prudent. By tilting the solar board to persistently confront the sun, this can be accomplished. This procedure of detecting and taking after the position of the sun is known as Solar Tracking.Two LDR light identifiers go about as sensors to follow the arrange of the Sunlight by identifying brightness level of Sunlight. When LDR1 has higher light force than LDR2 then the resistance of LDR1 is littler than that of LDR2 then voltage at CH-1 is higher than that of CH-2 and the DC motor turns the solar board in the counter clockwise course. When LDR2 has higher light force than LDR1 then the resistance of LDR1 is bigger than that of LDR2 then voltage at CH-1 is littler than that of CH-2 and the DC motor pivots the solar board in the clockwise heading. The stable position is the point at which the two LDRs having a similar light force. The system is controlled by a microcontroller as the primary processor. At the point when the force of Sunlight is diminishing, this system consequently alters its course to get most extreme power of Sunlight and generate greatest power at the output.

CONCLUSION:

Single Axis Solar Tracking System model is effectively created. The planned system is spotlights on outlining controller part and the primary concern is to configuration proper circuits and the circuits assume to have the capacity to control DC outfit motor turn course without considering motor speed. The system can track and take after Sunlight force so as to gather most extreme solar power paying little heed to motor speed.The extraordinary of created system, motor speed is not basic consideration because the DC geared motor offers low output appraised speed and high output evaluated torque.Therefore any sorts of DC geared motor can be utilized for this system paying little respect to motor speed controller unit the length of the speed and torque of the motor are taking after the given detail. The built system model can be connected in the local location for option electricity generation particularly for non-basic and low power apparatuses.

REFERENCES

1) Fahrenburch, A. and Bube, R. 1983, *Fundamentals of solar cells*, Academic Press, New York.
2) Partain, L.D. 1995, *Sollar Cells and their applications, John Wiley & Sons.* New York.
3) E Weise, R Klockner, R Kniel, Ma Sheng Hong, Qin Jian Ping, *"Remote Power Supply Using Wind and Solar energy – a Sino-German Technical Cooperation Project*", Beijing International Conference on Wind Energy, Beijing, 1995
4) Wichert B, Lawrance W, Friese T, *First Experiences with a Novel Predictive Control Strategy for PV-Diesel Hybrid Energy Systems,* Solar'99.
5) Duryea S, Syed I, Lawrence W, *An Automated Battery Management System for Photovoltaic Systems*, International Journal of Renewable Energy Engineering, Vol 1, No 2, Aug 1999.

6) Twidell J, Weir J, *Renewable Energy Systems*, Chapman and Hall, 1994
7) Centre for Resources and Environmental Studies, ANU, *Sustainable Energy Systems – Pathways for Australian Energy Reforms*, Cambridge University Press, 1994
8) Damm, J. Issue #17, June/July 1990. *An active solar tracking system*, HomeBrew Magazine.
9) A.K. Saxena and V. Dutta, "*A versatile microprocessor based controller for solar tracking,"* in Proc. IEEE, 1990, pp. 1105 – 1109.
10) Tamara A. Papalias and Mike Wong, "*Making Sense of Light Sensors",* Application notes, CA: Intersil Americas Inc. 2007.
11) David Appleyard, "*Solar Trackers: Facing the Sun*", Renewable Energy World Magazine, UK: Ralph Boon, June 1, 2009.