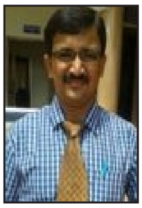
ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Solar Dependent Power Tracking System


Kuruva Veeresh
B.Tech, M.Tech(DSCE),
Department of ECE,
St. Johns College of Engineering & Technology, Kurnool, Andhra Pradesh.

M Sreenivasulu, M.Tech, Ph.D
Associate Professor,
Department of ECE,
St. Johns College of Engineering & Technology, Kurnool, Andhra Pradesh.

K.Sudhakar
Professor & HOD,
Department of ECE
St. Johns College of Engineering & Technology, Kurnool, Andhra Pradesh.

ABSTRACT:

Solar energy systems have emerged as a viable source of renewable energy over the past two or three decades, and are now widely used for a variety of industrial and domestic applications. Such systems are based on a solar collector, designed to collect the 4sun's energy and to convert it into either electrical power or thermal energy. In general, the power developed in such applications depends fundamentally upon the amount of solar energy captured by the collector, and thus the problem of developing tracking schemes capable of following the trajectory of the sun throughout the course of the day on a year-round basis has received significant coverage in this project.

INTRODUCTION:

In Aden city (Yemen), the improvement in the performance of a solar cooker during summer was found to be as much as 40% for higher elevation angle and 70% for lower elevation angle, based on the developed tracking algorithms. Moreover, it was shown that the amount of solar energy captured by a tilted collector could be increased by more than 40% by adjusting the tilt angle on a seasonal basis. This project is designed with ARM7TDMI processor. Depending upon the mode selection the data will be read by the LPC2148 controller and the direction of the motor will be changed. With this direction the solar plates which are fixed to the stand will also rotates to gain the maximum sun rays.The LPC2148 are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty. With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications. In this project we are using LPC2148, Solar panel, a H-Bridge is interfaced to drive 60RPM geared motors and 16X2 LCD is used to display its operation.This project uses two power supplies, one is regulated 5V for modules and other one is 3.3V for LPC2148. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac out put of secondary of 230/12V step down transformer.

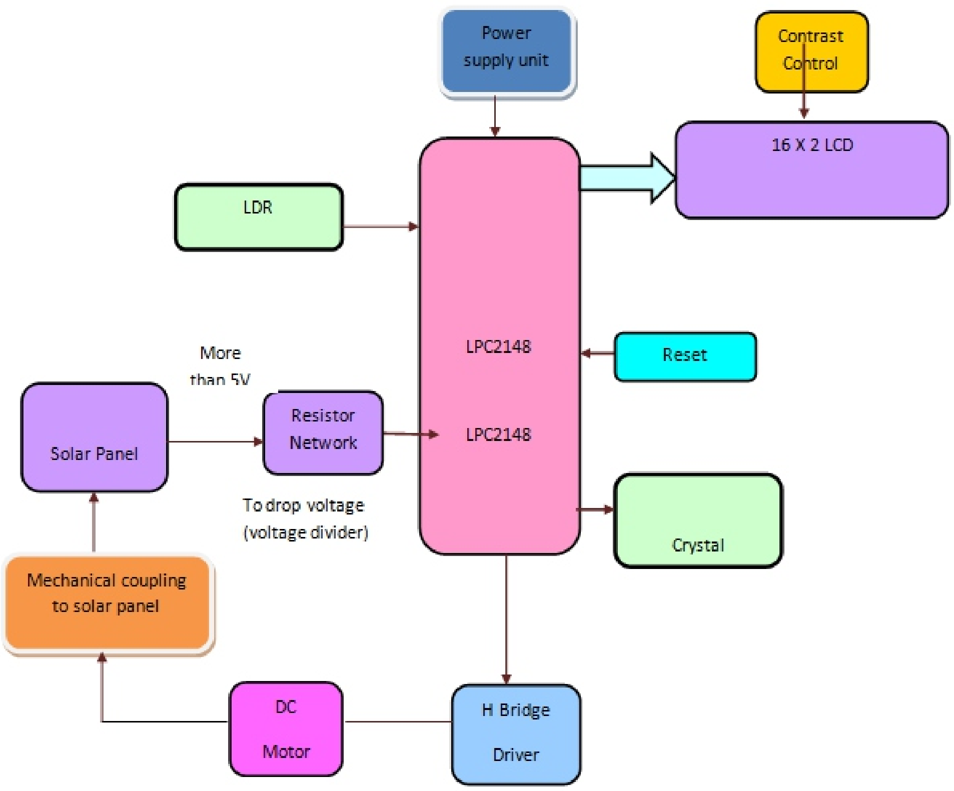
IntroductionA solar tracker is a generic term used to describe devices that orient various payloads toward the sun. Payloads can be , reflectors, lenses or other optical devices.In flat-panel applications trackers are used to minimize the between the incoming light and a photovoltaic panel. This increases the amount of energy produced from a fixed amount of installed power generating capacity. In standard photovoltaic applications, it is estimated that trackers are used in at least 85% of commercial installations greater than 1MW from 2009 to 2012. In and applications trackers are used to enable the optical components in the CPV and CSP systems. The optics in concentrated solar applications accept the direct component of light and therefore must be oriented appropriately to collect energy.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

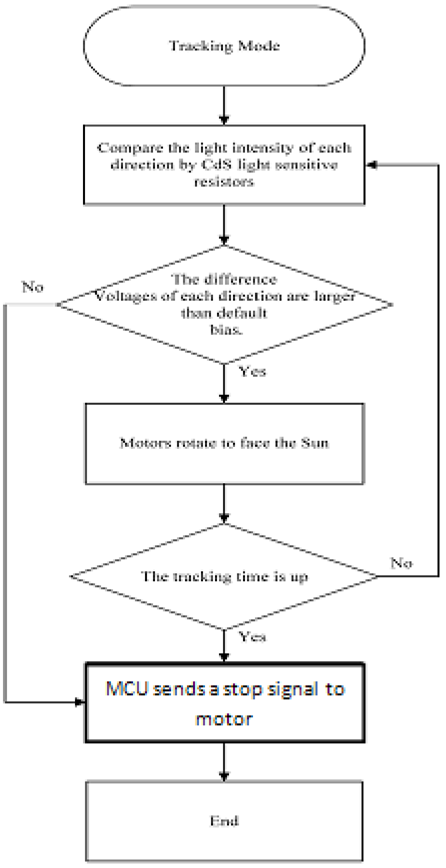
Tracking systems are found in all concentrator applications because such systems do not produce energy unless oriented closely toward the sunTrackersEven though a fixed flat-panel can be set to collect a high proportion of available noon-time energy, significant power is also available in the early mornings and late afternoons when the misalignment with a fixed panel becomes excessive to collect a reasonable proportion of the available energy. For example, even when the Sun is only 10° above the horizon the available energy can already be around half the noon-time energy levels (or even greater depending on latitude, season, and atmospheric conditions).

Thus the primary benefit of a tracking system is to collect solar energy for the longest period of the day, and with the most accurate alignment as the Sun's position shifts with the seasons. In addition, the greater the level of concentration employed the more important accurate tracking becomes, because the proportion of energy derived from direct radiation is higher, and the region where that concentrated energy is focused becomes smaller.The project is built around ARM Technology, in which we are using LPC2148 controller is based on a 16/32 bit ARM7TDMI-S™ CPU. By using GPIO pins of the controller we can receive the signals getting from the LDR sensor and thereby controlling the motor direction and speed by using H-Bridge (L293D) .

Block Diagram:



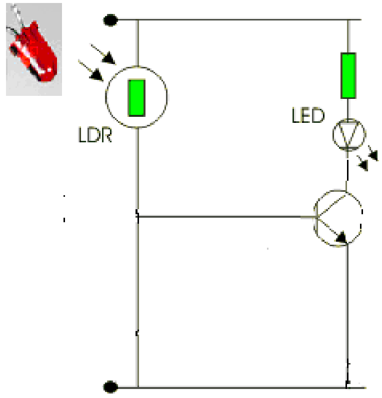
Project flowchart:



. Flow diagram of the tracking control.

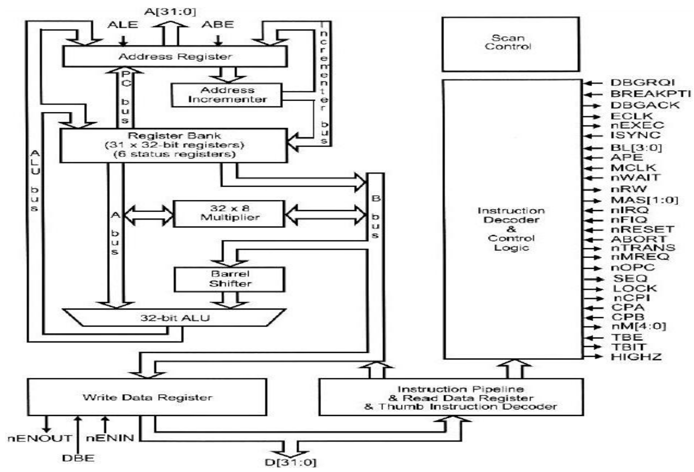
LDR Sensor:

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically.Thus in this project, LDR plays an important role in controlling the electrical appliances based on the intensity of light i.e., if the intensity of light is more (during daytime) the loads will be in off condition. And if the intensity of light is less (during nights), the loads will be switched ON.LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.



When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. Here in our project to avoid the light from led to fall on to LDR we place a box in which we will keep our jewellery. If any one removes the box the light from led falls directly on to the LDR and then the transistor will be on which is monitored by the microcontroller.

ARM7TDMI :



Core Diagram

SOLAR PANEL:

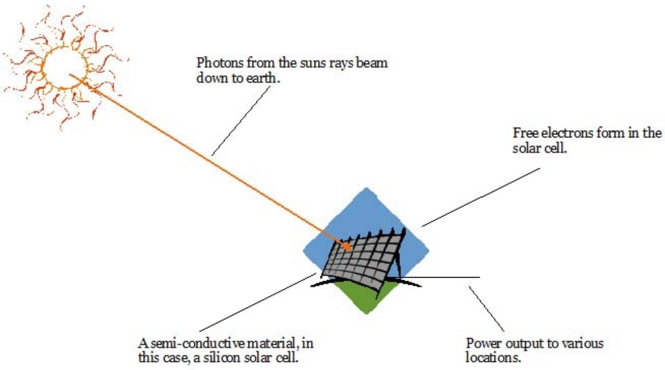
A solar panel (photovoltaic module or photovoltaic panel) is a packaged interconnected assembly of solar cells, also known as photovoltaic cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications.

Because a single solar panel can only produce a limited amount of power, many installations contain several panels. A photovoltaic system typically includes an array of solar panels, an inverter, may contain a battery and interconnection wiring.Solar panels use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The structural (load carrying) member of a module can either be the top layer or the back layer. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The conducting wires that take the current off the panels may contain silver, copper or other conductive (but generally not magnetic) transition metals.The cells must be connected electrically to one another and to the rest of the system. Cells must also be protected from mechanical damage and moisture.

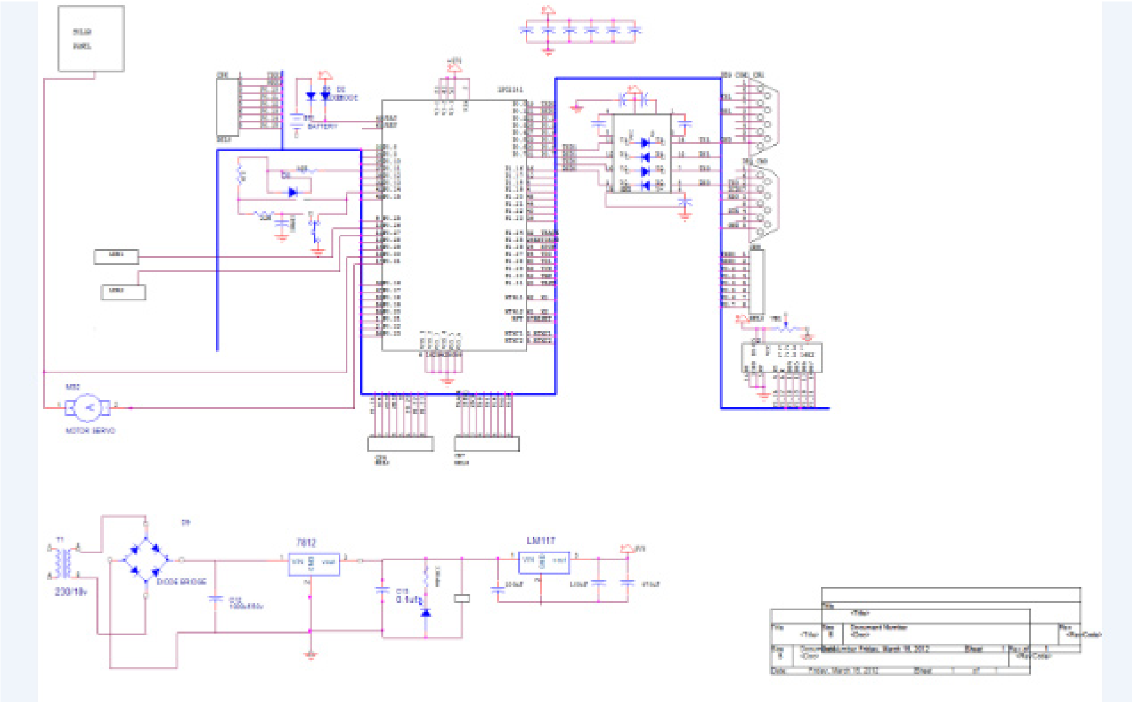
Most solar panels are rigid, but semi-flexible ones are available, based on thin-film cells.Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability.Separate diodes may be needed to avoid reverse currents, in case of partial or total shading, and at night. The p-n junctions of mono-crystalline silicon cells may have adequate reverse current characteristics that these are not necessary. Reverse currents waste power and can also lead to overheating of shaded cells. Solar cells become less efficient at higher temperatures and installers try to provide good ventilation behind solar panels.Some recent solar panel designs include concentrators in which light is focused by lenses or mirrors onto an array of smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way.[citation needed]Depending on construction, photovoltaic panels can produce electricity from a range of frequencies of light, but usually cannot cover the entire solar range (specifically, ultraviolet, infrared and low or diffused light). Hence much of the incident sunlight energy is wasted by solar panels, and they can give far higher efficiencies if illuminated with monochromatic light.

Therefore another design concept is to split the light into different wavelength ranges and direct the beams onto different cells tuned to those ranges. This has been projected to be capable of raising efficiency by 50%. The use of infrared photovoltaic cells has also been proposed to increase efficiencies, and perhaps produce power at night. [citation needed].Sunlight conversion rates (solar panel efficiencies) can vary from 5-18% in commercial products, typically lower than the efficiencies of their cells in isolation. Panels with conversion rates around 18% are in development incorporating innovations such as power generation on the front and back sides. The Energy Density of a solar panel is the efficiency described in terms of peak power output per unit of surface area, commonly expressed in units of Watts per square foot (W/ft2). The most efficient mass-produced solar panels have energy density values of greater than 13 W/ft2.

The solar panel diagram below shows how solar energy is converted into electricity through the use of a silicon cell.



ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal



In the diagram you can see how a solar panel converts sunlight into energy to provide electricity for a range of appliances. This energy can be used for heating, through the use of solar hot water panels, or electricity through the use of regular solar cells.The Use Of Electricity From Solar Panels. As the solar panel diagram shows, you can see how power is sourced out to various locations, this depends on how you plan to use the energy harnessed by a solar cell. Possible uses of solar electricity could be to incorporate the current into an existing power supply, provide a separate power supply dependent upon the solar panel, to charge solar batteries for the storage of solar electricity, or even to sell back to the national grid. Solar panels can even be used to heat water in different designs. Some home swimming pools also use solar energy to heat the water, however this can usually be a very expensive option.Solar energy has a huge advantage for providing electricity in remote locations due to the simple running requirements (i.e. no fossil fuels need to be transported the location).A remote solar panel system can provide electricity for vital tasks where the laying of electricity cable is not practical, a working example of this is on satellites.

ADVANTAGES:

•Highly sensitive
•Works according to the sun direction
•Fit and Forget system
•Night – Day mode sensing
•Low cost and reliable circuit
•Complete elimination of manpower.

APPLICATIONS:

•Street lights
•Garden Lights
•Solar water heater
•Hotels, hostels and house hold applications
•Offices

References:

1.M. ElBaradei (2013) IAEA Bulletin. [Online]. Available: http://www.iaea.org/Publications/Magazines/Bulletin/Bull501/Energy-Crisis.html.

2.H. Mousazadeh, A. Keyhani, A. Javadi, H. Mobli, K. Abrinia, and A. Sharifi, “A review of principle and sun-tracking methods for maximizing solar systems output,” Renewable and Sustainable Energy Reviews, vol. 13, pp. 1800-1818, Oct. 2009. E. Basher, M. H. Tania, and S. Alam, “A microcontroller based automatic solar tracking,” in Proc. ICETCESD’11, 2011, p. 384.

3.M. E. Haque, E. Asief, R. M. T. Islam, A. B. Ahsan, and R. Islam, “Automatic Double Axis Solar Tracker,” B. Eng. thesis, Ahsanullah University of Science and Technology, Dhaka, Bangladesh, Feb. 2011.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

4.T. Markvart, Solar Electricity, 2nd ed., John Wiley and Sons Inc. New York, USA, 1996.

5.(2007) Tracstar. Should you install a solar tracker? [Online]. Available: http://www.helmholz.us/smallpowersystems/Intro.pdf

6.C. Lee, P. Chou, C. Chiang, and C. Lin, "Sun tracking systems: A review," Sensors, vol. 9, pp. 3875-3890, May. 2009.

7.N. Barsoum, "Implementation of a prototype for a traditional solar tracking system," in EMS'09, 2009, IEEE Computer Society, p. 23.

8.AVR 8- and 32 bit microcontroller (ATmega32), Atmel, 2011.

9.H.R. Ghosh, N.C. Bhowmik, and M. Hussain, "Determining seasonal optimum tilt angles, solar radiations on variously oriented, single and double axis tracking surfaces at Dhaka," Renewable Energy, vol. 35, pp. 1292-1297, Dec. 2010.

Author,s Details:

Kuruva Veeresh born in Kambadahal(v), Kurnool, A.P. He received his B.Tech degree in Electronics and Communication Engineering from S.V.U, Tirupathi in 2013. Presently he is pursuing M.Tech in Digital Systems and Computer Electronics at St.Johns College of Engineering and Technology, Yemmiganur, Kurnool, A.P(India) affiliated to JNTU, Anantapur .

M.Sreenivasulu received his B.Tech degree in Electronics and Communication Engineering from S.V.U, Tirupathi in 2001. Then he received his M.Tech in Digital Electronics & Communication Systems from JNTU in 2006 and pursuing PhD in Micro electromechanical Systems at JNTU Hyderabad. He started his career as an Assistant Professor in 2002 and currently he is working as an Associate Professor in the Department of ECE at St.Johns College of Engineering and Technology, Yemmiganur, Kurnool, A.P(India). He published 15 papers, 5 International Journals and he attend 2 National Conferences and 8 International Conferences.

K.Sudhakar received his B.Tech degree in Electronics and Communication Engineering from JNTU in 1999. Then he received his M.Tech in Communication Systems from JNTU in 2006 and pursuing PhD in Electromagnetic waves in JNTU Hyderabad. He started his career as an Assistant Professor in 2000 and as Associate Professor and Professor. Presently he is working as a Professor and Head of the Department of ECE at St.Johns College of Engineering and Technology, Yemmiganur, Kurnool, A.P(India). He is guided several B.Tech Projects, M.Tech dissertations and published several research papers in National/International Journal/Conference