A Review on Solar Tracking System

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Abstract- *Solar energy has been used increasingly in recent years to convert solar energy into electrical energy in order to maximize the conversion of solar to electrical energy, the solar panels have to be placed perpendicular to the sun. thus tracking the sun's location is very important. The tracking system will move the solar panel so that it will positioned perpendicular to the sun for maximum energy conversion.*

Keywords- Solar panels, microcontroller, Sun tracking, light sensing system.

I. INTRODUCTION

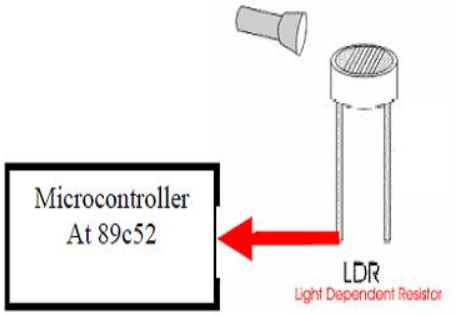
The top three energy sources of electricity are coal at 37%, natural gas at 30%, and nuclear at 19%. These forms of energy are nonrenewable meaning they will eventually be depleted. For this reason, it is important to seek renewable sources of energy for they are cleaner, easier to use, require less maintenance, and will always be available. It is estimated that solar energy will become the largest source of electricity by the year2050.

II. SOLAR SYSTEM TRACKER

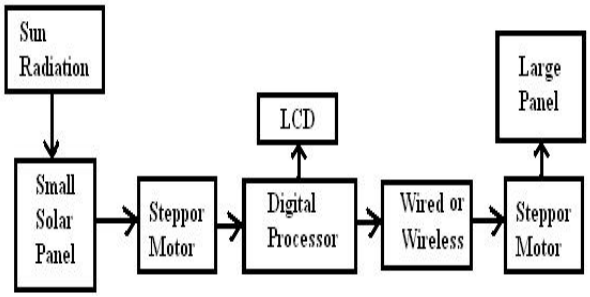
A solar tracker is an electro-mechanical system used on behalf of relating a solar photovoltaic panel in the direction of the sun. It is used in many applications such as the transportation signaling, lighthouses, emergency phones installed in the highways, etc… Its main objective is to find the maximum sun radiations in order to get maximum charge batteries that Electricity can be generated from the sun in several ways.

III. REVIEW OF WORK DONE

Nikesh.D.Watane et.al.[1] studies the hardware design and implementation of automatic solar tracking system so as to increase the efficiency of the solar panel and thus increasing power output. The system takes sun as its reference and the sensor continuously follows the direction of sun thereby acquiring maximum sunlight falling on system. The hardware includes panel, sensor, stepper motor and the microcontroller AT89c52. The microcontroller is programmed in C language and is responsible for output of panel as it controls panel movement. The basic functional blocks of this system are four sensors1, and their operation depends upon the intensity of light falling on solar panel. All sensors (each with different functionality) send their output to microcontroller AT89c52. Then the microcontroller executes predefined duty in its software. This is completely software based control, written in VB 6.0. It incorporates a GUI and a Database, linked with Microsoft Access. Using this software, the computer serially communicates (RS232) with the ASTS. The Slave microcontroller (89c51) of the system makes this communication successful. The result shows that the system ensures 25 to 30% of more energy conversion than the present static solar module system.



A. Kassem et.al.[2] studied how to detect maximum power from sunlight. The position of maximum detection power is stored in memory. The stored data can be applicable for many applications such as Large photo voltaic panels can track the sun all the day light and by that give above 95% efficiency in generating electricity; solar heaters will also track the sun all the day light and by that less panels are required at the initial cost; while in the home automation systems, this system is also required in turning light ON and Off and also for opening and closing the curtains. A digital system is used to calculate the concentrated sun radiation. It is connected to a stepper motor and to photo resistors to redirect the panel to the sun. It sends the received data (position of the sun) to the stepper motors in order to position it toward the sun. The position tangles are protected in the registers of the digital processor such as microcontroller and can be displayed on an LCD or can be transmitted to control a remote system.



Block diagram of the sun tracker

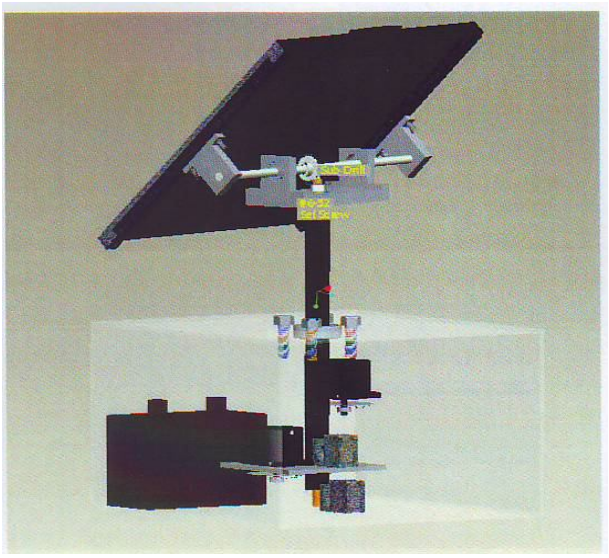
Jeng-Nan Juang et.al.[3] intended solar panel with a tracking mechanism that directs the panel towards the area of high sunlight intensity so as to harness solar energy and convert the energy in a useful form for public domestic appliances and devices. The system responds to its environment in the shortest possible amount of time since it is designed as a real-time system. It is able to make decisions to increase its efficiency and to ensure its safety. It also has a method of concentrating the sunlight onto the photoreceptors on the solar panel. All of these maximize the amount of solar energy collected from the sun within a specific timeframe thus, increasing the efficiency of the solar panel in absorbing solar energy by at least 15%.

Reshmi Banerjee et.al.[4] studies two types of solar tracker: Single Axis Solar Tracker and Dual Axis Solar Tracker. Single axis solar trackers can each have a horizontal or a vertical axle. The horizontal type is used in tropical regions where the sun gets very high at noon, but the days are short. The vertical type is used in high latitudes (such as in UK) where the sun does not get very high, but summer days can be very long.Double axis solar trackers have both a horizontal and a vertical axle and so can track the sun's superficial motion exactly anywhere in the world. This type of system is used to control astronomical telescopes, and so there is plenty of software available to automatically calculate and track the motion of the sun across the sky. Dual axis trackers track the sun both east to west and north to south for added power output (approx. 40% gain) and convenience. Solar tracker drives, can be divided into three main types depending on the type of drive and sensing or positioning system that they combine.

Passive Trackers: Use the sun's radiation to heat gases that transfer the tracker across the sky.

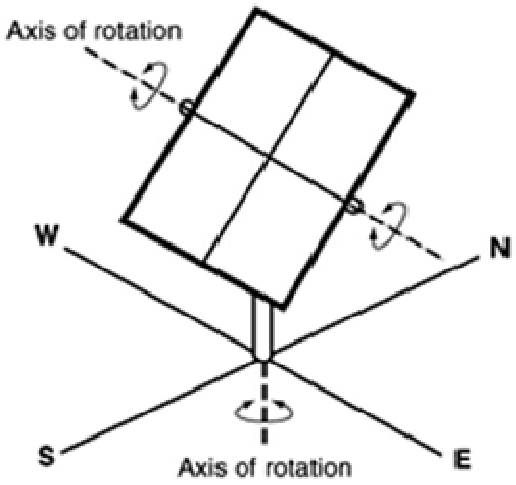
Active Trackers: Use electric or hydraulic drives and some type of gearing or actuator to move the tracker.

Open Loop Trackers: Use no sensing but instead regulate the position of the sun through prerecorded data for a particular site.



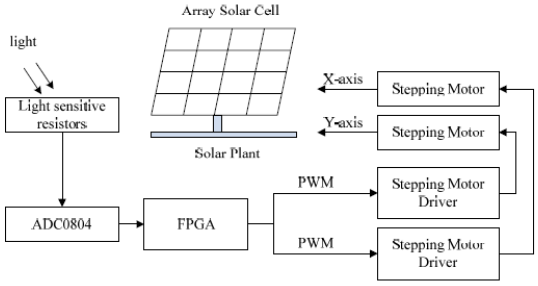
Solar tracking system

S. Gayathri, et.al.[5] monitored feasible approach to make the most of the efficiency of solar array systems. So that there is a constant power supply without any difficulty. which is attained by applying the measurements using Mathematical Morphological Operators. The stepper motor used for controlling the axis helps in directing the rays and is connected with a computer. Where the conversion technique is applied to the system. Morphological operator is used to calculate the even distribution of energy, the rays once it reaches the panels is saved and stored form which the stepper helps to convert the energy and the values are stowed in the system as "0's and 1's" and for further evaluation and it includes the computing through applying the morphological operator. The 0's and 1's are imaged and these images are evaluated using operator. To evaluate the energy flow in the edges edge detection method is applied. Which has much bigger efficiency than the existing ones.



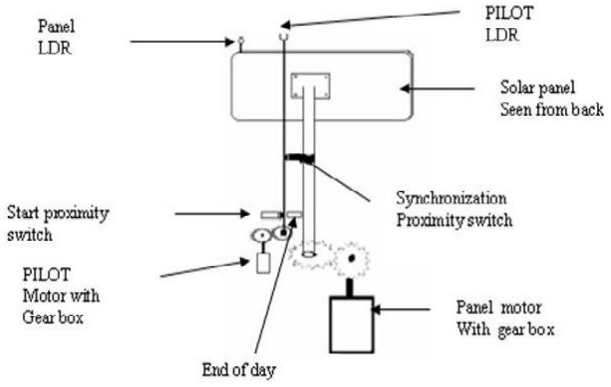
Two-axis tracking system

Y. J. Huang et.al.[6] studies the design and implementation of a solar tracking power generation system. Light sensitivity is dogged with the help of CdS (Cadmium Sulfide) light sensitivity resistors thus to increase its efficiency the solar system can track the sun light automatically. The system includes analog/digital convertor (ADC0804) can read different output voltages, a chip to deliver output, stepper motor. There are three modes as follows: balancing mode, automatic mode and manual mode. The array solar tracking system architecture contains two motors to initiative the platform The two motors are decoupled This implementation lessens the system's power consumption during operation and increases efficiency. The result shows that higher generating power efficiency is certainly achieved using the solar tracking system.



System architecture of the solar tracking system.

Mostefa Ghassoul et.al.[7] studies the the design of a solar tracking system driven by a microchip PIC 18F452 micro controller. For better competence the system is designed around two sub-systems. The first sub-system is for detecting the position where maximum energy can be extracted and is known as the PILOT, and a second sub-system is made up of the solar panels with the control scheme and is known as panels. where maximum possible energy could be extracted. A light dependent resistor (LDR) detects the sun rise and a proximity switch detects the east position. The proper and well-organized use of LDR also reduces the overall cost and barrier of the system. On sun rise, the pilot starts rotating through a fixed angle determined by the micro controller internal timer0. Timer0 is programmed with its pre- scalar dividing the system clock (500KHz obtained from the 4 MHz crystal oscillator) by 1:256, and is used to count the clocks produced by the pre-scalar. when the PILOT comes to a standstill, the panels and PILOT voltages are associated If the panel voltage is not as much of than that of the PILOT by the predetermined threshold then the panels start moving to align themselves with the PILOT until the proximity switch is activated when it comes near to the reflector attached on the PILOT. If this condition is not met, then the system moves to the next scan. The results showed that a cost effective intelligent sun tracking system to extract maximum solar energy was possible.



IV. CONCLUSION

From this review, we come to know about the various tracking solar tracking system that can be used to enhance the level of solar absorption thereby helping us to increase the performance as well as economic feasibility of solar energy. With the help of dual axis automatic sun tracking system large amount of sun's energy can be extracted and the efficiency can be increased to a greater extent.

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