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Solar Tracking System Using Reflactor

Ashutosh Mote.
Student 1,
RIT
Rajaramnagar

Rohit Thakar
Student 2,
RIT
Rajaramnagar

Akash Sawant
Student 1,
RIT
Rajaramnagar

Jaydip Yadav
Student 1,
RIT
Rajaramnagar

Vinay Choudhari
Lecturer,
RIT
Rajaramnagar

Abstract - *The designed project aims at tracking the sun to achieve the maximum sun light incident on the solar panel during anytime of the day. The project is useful during cloudy days. The system requires a reflector coupled with a stepping motor to keep tracking the sun and moving according to the maximum sun light received. A microcontroller of 8051 family is used that generates stepped pulses periodically to rotate the panel through stepper motor. The power to the motor is provided by an interfacing IC. Use of solar panel to convert sun's energy to electrical is very popular, but due to transition of the Sun from east to west the fixed solar panel may be able to generate optimum energy. The proposed system solves the problem by an arrangement for the solar panel to track the Sun.*

This tracking movement is achieved by coupling a stepper motor to the reflector such that the reflector maintains its face always in correct angle to the Sun to generate maximum energy. This is achieved by using a programmed microcontroller to deliver stepped pulses in periodical time intervals for the stepper motor to rotate the mounted panel as desired.

To make solar energy more viable, the efficiency of solar array systems must be maximized. A feasible approach for maximizing the efficiency of solar array systems is sun tracking. This is a system that controls the movement of a solar array so that it is constantly aligned towards the direction of the sun. Solar modules are devices that cleanly convert sunlight into electricity and offer a practical solution to the problem of power generation in remote areas.

Keywords: Solar, Storage Battery, Reflator, Solar Energy, Solar Energy

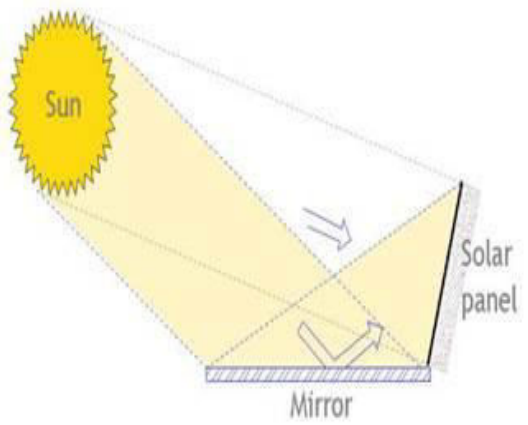
1.Introduction:

In last ten years, many of residentials around the world used electric solar system as a sub power at their houses. This is because solar energy is an unlimited energy resource, set to become increasingly important in the longer term, for providing electricity and heat energy to the user. Solar energy also has the potential to be the major energy supply in the future. Solar tracker is an automated solar panel that actually follows the Sun to increase the power.

The sun's position in the sky varies both with equipment over any fixed position. One well-known type of solar tracker is the heliostat, a movable mirror that reflects the moving sun to a fixed location, but many other approaches are used as well. Active trackers use motors and gear trains to direct the tracker as commanded by a controller responding to the solar direction. The solar tracker can be used for several application such as solar cells, solar day-lighting system and solar thermal arrays. The solar tracker is very useful for device that needs more sunlight for higher efficiency such as solar cell. Many of the solar panels had been positioned on a fixed surface such as a roof.

As sun is a moving object, this approach is not the best method. One of the solutions is to actively track the sun using a sun tracking device to move the solar panel to follow the Sun. With the Sun always facing the panel, the maximum energy can be absorbed, as the panel is operating at their greatest efficiency. The main reason for this project is to get the maximum efficiency for the solar cells. Although there are many solar trackers in the market, the price is expensive and unaffordable because the market for solar tracker is still new and only certain countries use the solar tracker such as USA and South Korea.

The large-scale solar tracker that normally used is not suitable for the residential use. As a result, this project will develop a Sun tracking system specially designed for residential use for a low-cost solar cell. Solar energy is rapidly gaining notoriety as an important means of expanding renewable energy resources. As such, it is vital that those in engineering fields understand the technologies associated with this area. This project includes the design and construction of a microcontroller-based solar panel tracking system. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. This system builds upon topics learned in this course.



The solar tracker includes a solar array, a frame, a base, a pivot frame, and a first and second actuator. The solar array is mounted to the frame and captures sunlight. The base is pivotally connected to the frame and defines a pivot axis for elevational movement of the solar array. The pivot frame is also pivotally connected to the frame and defines a pivot axis for azimuthal movement of the solar array. The base is pivotally connected to the frame and defines a pivot axis for elevational movement of the solar array. The pivot frame is also pivotally connected to the frame and defines a pivot axis for azimuthal movement of the solar array.

The first actuator controls elevational movement of the solar array and the second actuator controls azimuthal movement of the solar array. The solar tracker is pivotable between a raised position and a stowed position.

Sunlight is made of photons, small particles of energy. These photons are absorbed by and pass through the material of a solar cell or solar photovoltaic panel. The photons 'agitate' the electrons found in the material of the photovoltaic cell. As they begin to move (or are dislodged), these are 'routed' into a current. This, technically, is electricity - the movement of electrons along a path. Solar panels made of silicon to convert sunlight into electricity. Solar photovoltaic are used in a number of ways, primarily to power homes that are inter-tied or interconnected with the grid.

2. Problem Definition:

As we can see, there are many problems that occur in the solar tracking system. The problem that we can see here is the solar panel that is use is only in one-way direction. Because of this problem, the power that can be generated is low. The second problem is the price for the solar tracking system is very expensive for the family that use more power than usual because they need to install more than one solar panel to produce enough power. So, this project is to fix the problem that occurs here. This solar tracking system can detect a 180 degree of rotation. So, the solar panel that can be generating here is very high compare to when the solar panel can only stay in one direction. So, the families don't have to install more than one solar panel to generate enough power. One solar panel is enough to produce a lot of power.

3.Objectives:

This research study intends to plug the research gap and will demonstrate the development of the techniques to get maximum solar energy parameter by:

1.To develop a tracking system that constantly tracking the sun during daytime.
2.To develop a tracking system that maximize the solar panel power generation.
3.To develop a tracking system that control and monitor the movement of reflector based on the intensity of light.
4.To increase efficiency of solar panel for domestic use.
5.To develop a tracking system based on displacement of sun per 15 degree.

4. Proposed Methodology

Proposed panel sun tracking methodology can be divided into three main stages of entire methodology in sensing stage, second one maximum power detection stage and third is to obtain best power point sector. This topic concerns about methodology of the system with explanation of different stages of working operation. The proposed system consists of different components like solar panels, sensing modules, charge controller, stepper motor, microcontroller board and DC battery.

The solar tracking system comprises of a solar panel, Arduino microcontroller and sensors. For this system to operate there must be emission of light through the sun. The servo motor circuit is then constructed. The servo has 3 pins of which the positive side is connected to the +5v of the Arduino microcontroller. The negative of the servo is connected to the ground. The data point on the servo is connected to the analog point on the microcontroller. A potentiometer is connected so as to regulate the speed of the servo motor.

5. Scope:

1. Improving the mechanical structure
2. To impact the more radiation on solar panel
3. Adjusting the gear ratio of reflector to decrease power loss
3. Topping the motor when there is no need of movement
4. Automatic sun tracking without interfaces of human
4. More power generation of domestic solar panel

Increase the power generation in all seasons

A. COMPONENTS:

• Arduino UNO:

The digital and analog input/output pins equipped in this board can be interfaced to various expansion boards and other circuits. A serial communication interface is a feature in this board, including USB which will be used to load the programs from computer.

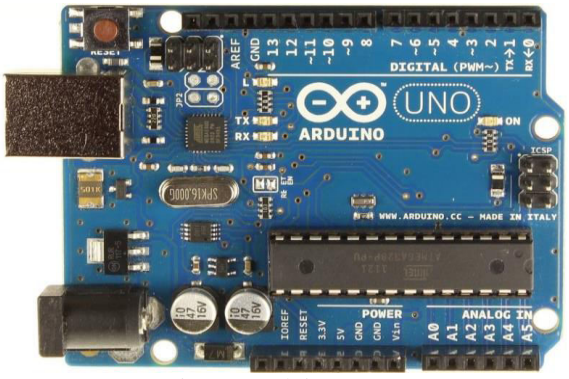


Fig. 1 - Arduino UNO

• Solar Panel:

The way the solar power is collected is from the radiant heat of the sun. The function of solar panels is to gather that energy and convert it to electricity to bring power to industry, homes and small businesses. The function of solar panels occurs because of the components of what makes up a solar power system.

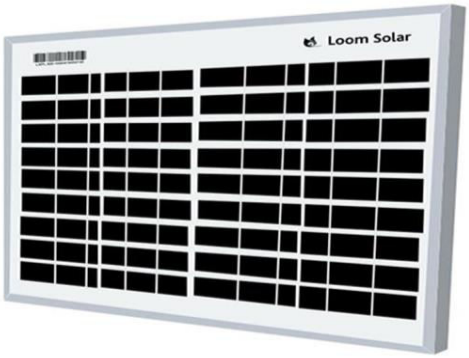


Fig. 2 - Solar Panel

• Battery:

To store the energy and provide whenever needed is the function of battery. Usually this type of batteries is used for small applications. The battery life is good for use and they are rechargeable.

Fig. 3 –Battery

• Berge Strip:

Berg Strip is a commonly found connector in all kind of circuit boards. It is also called as Berg Stick because of its stick like structure. Berg Strip is designed by the Berg Electronics Corporation at Missouri.

Fig. 4–Berge Strip

• PCB:

PCB or Printed Circuit Board is the traditional name for the bare board of which you supply us with the layout data and which you use to mount your components on once we have delivered it to you. A printed circuit board, or PCB, is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate.

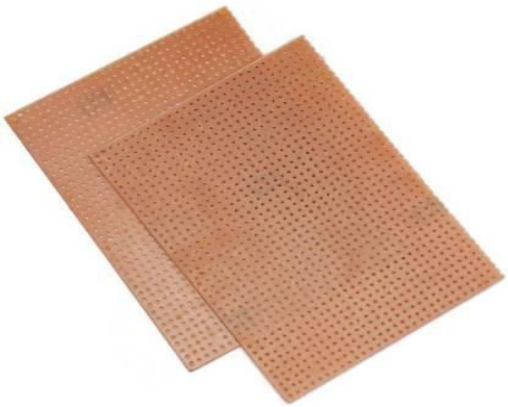


Fig. 5–PCB

•Wire Sleeves:

Most electronics constructional projects involve at least some degree of soldering and wiring. Many projects have a printed circuit board, PCB, forming most of the project, but it is necessary to connect the PCB to other controls and sockets, etc.

Fig. 6 –Wire Sleeves

6. Conclusion:

The aim of the project is to utilize the solar energy using reflator that has been for irrigation.With the current solar electricity generation system, the highest production is only a few fixed times, mostly at the noon. So, to utilize this energy at times when it is needed, such as during the night, a battery is used to store the energy at night, when there is no sun, to use the solar energy for producing electricity.

Through our project, we would like to use solar energy to the fullest, by using a reflator. With the help of which there would not be need for a multiple number of solar panels to cover the position of the sun throughout the day.

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