International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 04 | Apr-2018 www.irjet.net p-ISSN: 2395-0072

AUTOMATIC CLEANING SYSTEM OF SOLAR PANEL WITH DUAL AXIS TRACKING SYSTEM

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Abstract - *The aim of this paper is to solve the problem of energy crisis which is considerably serious issue in today's period. It is becoming essential to increase use of renewable sources of energy namely solar energy as compared to conventional sources for energy generation. A technology namely solar tracking system is introduced to improve efficiency of solar cells by tracking sun's energy. It uses 8051 microcontroller and stepper motor to move solar panel according to position of sun. Photo resistors are also used to detect light intensity.*

Key Words: Solar energy, Photo resistors, Solar panel and ARDUINO.

1. INTRODUCTION

This solar tracking system is a power generation method of solar energy. One of the most promising technologies of converting solar energy to electrical energy is Photovoltaic effect. A solar tracker is a device in which solar photovoltaic panels are mounted towards the sun by using photo sensors connected with motor. It is one of the simple and cheaper way for producing electricity. This structure of solar tracker moves with position of sun over the course of day in order to produce maximum KW

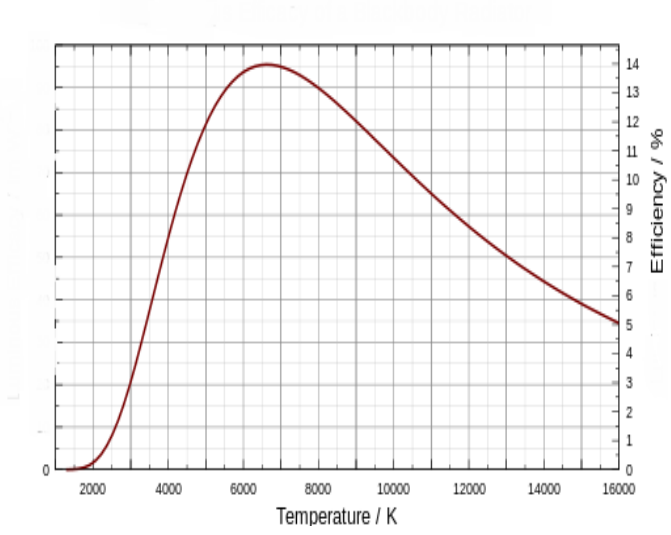
1.1 Functional Principle:

This tracking movement is achieved by coupling a stepper motor to the solar panel such that the panel maintains its face always perpendicular 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. The microcontroller used in this project is from 8051 family. The stepper motor is driven by an interfacing IC as the controller is not capable of handling the power requirements of the stepper motor. The project is provided with a dummy solar panel which can be used for demonstration purpose only.

Trackers are used to keep solar collectors/solar panels oriented directly towards the sun as it moves through the sky every day. Using solar trackers increases the amount of solar energy which is received by the solar energy collector and improves the energy output of the heat/electricity which is generated. Solar trackers can increase the output of solar panels by 20-30% which improves these economics of the solar panel project.

1.2 Objectives

Purpose of Solar Tracker: As we know, the angle of incidence lies between -90 degrees after sunrise and 90 degrees before sunset passing zero degrees at noon. This makes the solar radiations to be 0% during sunrise and sunset and 100% during noon. This variation causes solar panel to lose more than 40% of the collected energy. Fig. shows sun's path yearly at a latitude of 30 degrees. From the fig. we can estimate the exact position of the sun.



At any time of the month or a day, the position of the sun is decided by two angles in the spherical co-ordinate system- the Altitude angle which is the angle of the sun n the vertical plane in which the sun lies and the Azimuth angle which represents the angle of the projected position of the sun in the horizontal plane. Above figure shows that the sun rays received are maximum when the angle of incidence is 0 degrees i.e. the solar panel is perpendicular to the sun. The Dual Axis Solar Tracker used to solve this problem consists of two essential parts:

1. The solar panel

2. The tracking system.

2. BLOCK DIAGRAM

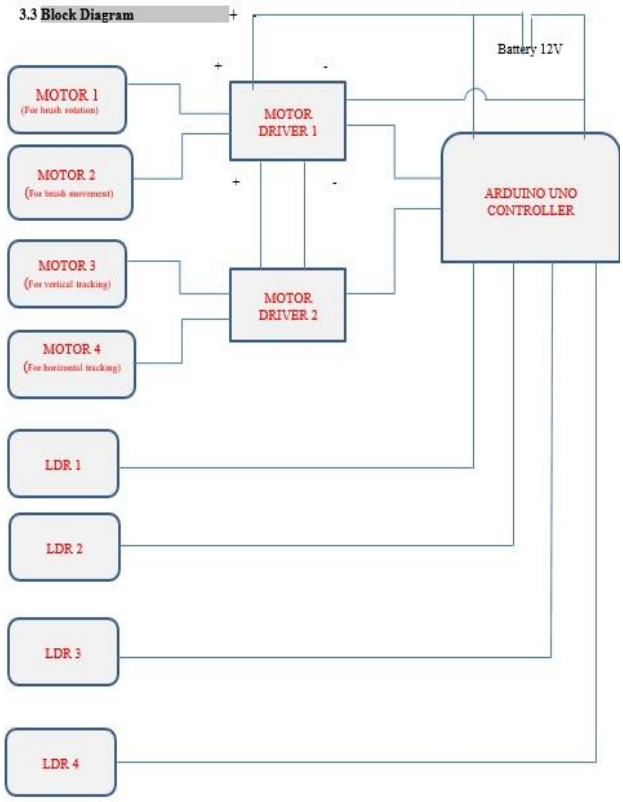
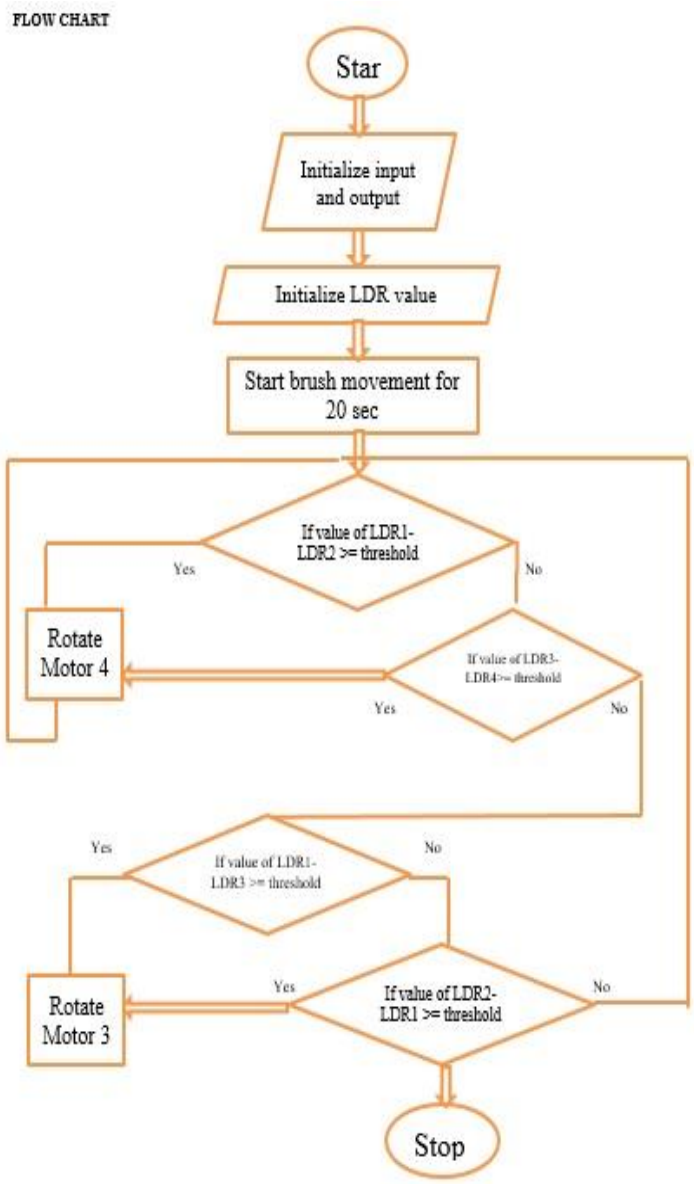


Fig shows the block diagram which uses ARDUINO Uno for controlling purpose.

Motor 1 and 2 are connected to driver circuit1 at the same time motor 3 and 4 are connected to driver circuit 2 and that both driver circuits are connected with each other. 12v DC supply is given to the driver circuit and also to the ARDUINO controller. Both driver circuits are connected to ARDUINO controller. We have also connected 4 LDR sensors to ARDUINO and linked to the model. Whenever LDR will detect any light intensity, the motor will work as per program.

3. FLOW CHART



The authors can acknowledge any person/authorities in this section. This is not mandatory.

First of all we are initializing input and output pins of ARDUINO Controller. LDR are connected ARDUINO and interface with motor through ARDUINO Controller. Whenever LDR!-LDR2 or LDR3-LDR4 value get at that time Motor 4 and Motor 3 will run when LDR1-LDR3 or LDR2-LDR1 will get value from them.

4. RESULTS

The upper part of our mechanical structure is as shown in the figure. In this the Johnson motor is used with rating of 60 rpm and 12 volt and the solar panel is mounted on the horizontal axis with the motor as shown in figure. The whole structure is made up of iron and at the end the structure is made up of iron and at the end the structure will rotate only at single axis that is mounted on the plate where it will be rotate 360 degree.

6. CONCLUSION

Solar radiation Tracker has played a vital role in increasing the efficiency of solar panels in recent years, thus proving to be a better technological achievement. The vital importance of a dual axis solar tracker lies in its better efficiency and sustainability to give a better output compared to a fived solar panel or a single axis solar tracker. The tracking system is designed such that it can trap the solar energy in all possible directions. Generally, in a single axis tracker that moves only along a single axis it is not possible to track the maximum solar energy. In case of dual axis trackers, if the solar rays are perpendicular to panel throughout the year. Hence, maximum possible energy is trapped throughout the day as well as throughout the year. Thus, the output increases indicating that the efficiency more than a fixed solar panel (about 30 -40% more) or a single axis solar tracker (about 6-7% more).

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