DUAL AXIS SOLAR TRACKING SYSTEM

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Abstract: Solar energy is one of the most effective resources of the renewable energy which could play a significant role to solve this energy crisis. This research presents a performance analysis of dual axis solar tracking system using Arduino. The main objective of this research is whether static solar panel is better than solar tracker or not. This work is divided into two parts, hardware and software system. In hardware part, four light dependent resistors (LDR) is used to detect the utmost light source from the sun. Two servo motors conjointly used to move the solar panel to maximum light source location perceived by the LDRs. In software part the code is written by using C.programming language and has targeted to the Arduino UNO controller. The outcome of the solar tracker system has analyzed and compared with the fixed or static solar panel found better performance in terms of voltage, current and power. Therefore, the solar tracker is proved more practical for capturing the maximum sunlight supply for star harvesting applications. Result showed dual-axis solar tracking system produced extra 10.53 watt power compared with fixed and single axis solar tracking system.

Key Words: Dual Axis Solar Tracker Renewable Energy, LDR, Uno Arduino Kit.

1. INTRODUCTION:

The demand and need for clean and renewable energy is becoming more urgent as earth undergoes global climate changes. Generation of electricity from coal produces over 50% of the carbon dioxide released into the atmosphere each year. Coal and other fossil fuels will also eventually run out. Nuclear energy for the creation of electricity has the drawback of creating nuclear waste. However, one type of clean renewable energy is solar energy or sunlight. Solar energy is a constant source of clean energy that can shine on all areas of the surface of the planet. Solar energy or sunlight can be converted into electricity by a photovoltaic cell. This system is powered by arduino, consists of D.C motor, stepper motor.

1.1 Dual Axis Solar Tracker Block Diagram

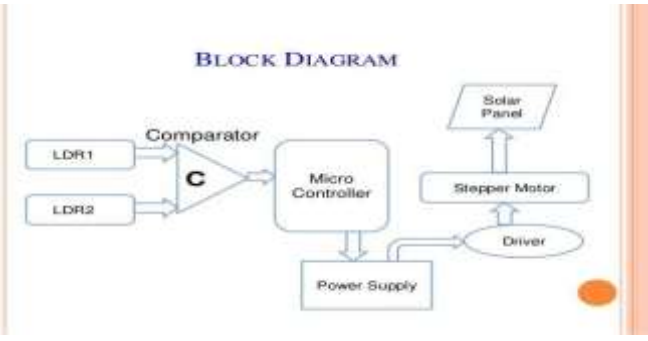

Fig. 1.1 Block Diagram of Dual Axis Solar Tracker

As we see in the block diagram, there are two light dependent resistors (LDR) which hare place on a common plate with solar panel. Light from a source strike on them by different amount. Due to their

inherent property of decreasing resistance with increasing incident light intensity Each LDR sends equivalent signal of their respective resistance value to the microcontroller which is configured by required programming logic. One of the two dc servo motors is mechanically attached with the driving axle of latter one. The axle of the former servo motor is to drive a solar panel. These two servo motors are arranged in such a way that the solar panel can move along x-axis as well as y-axis.

2. COMPONENTSUSED

2.1Solar Plate

A solar cell or photovoltaic cell is an electrical device. It converts energy of lights directly in to electricity by the photovoltaic effect.A solar cell or photovoltaic cell is an electrical device. It converts energy of lights directly in to electricity by the photovoltaic effect.

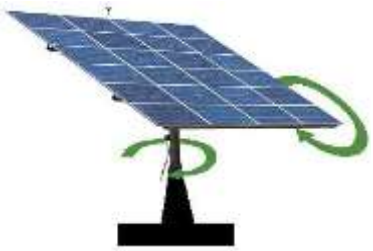

Fig.2.1- Solar Plate

2.2LDR

LDR stand for light dependent resistor this resistor are light sensitive they activate when light falls on the surface of LDR and they are often used to measure the intensity of light.

Fig-2.2 LDR

2.3ArdiunoKit

Arduino board unit control the movements of solar panel that rotates and traces the direction of the sun. Arduino board is equipped with board analog and digital signal it has 14 digital input and output pins of which 6 pin is used as pwm output and 6 pin analog input, 16 mhz crystal oscillator, usb connection, power jack and a reset button is used.

Fig.2.3.1 Arduino kit

3. WORKING OFPROJECT:

Resistance of LDR depends on intensity of the light and it varies according to it. The higher is the intensity of light, lower will be the LDR resistance and due to this the output voltage lowers and when the light intensity is low, higher will be the LDR resistance and thus higher output voltage is obtained. A potential divider circuit is used to get the output voltage from the sensors (LDR).

The LDR senses the analog input in voltages between 0 to 5 volts and provides a digital number at the output which generally ranges from 0 to 102

Now this will give feedback to the microcontroller using the arduino software (IDE). The servo motor position can be controlled by this mechanism which is discussed later in the hardware model.

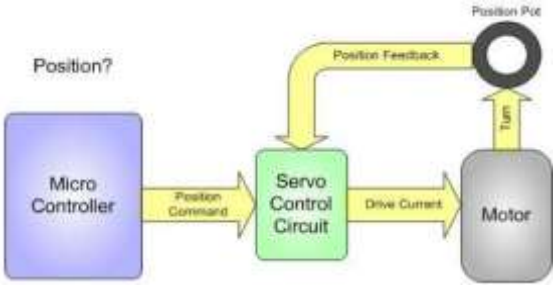

Fig-servo motor controller

the tracker finally adjusts its position sensing the maximum intensity of light falling perpendicular to it and stays there till it notices any further change. The sensitivity of the LDR depends on point source of light. It hardly show any effect on diffuse lighting.

3.1. ADVANTAGES

- Higher degree of flexibility, allowing for a higher energy output on sunny days.
- High degree of accuracy in directional pointing solar energy is pollution free from source.
- There is no noise pollution as in wind energy.

3.2. DISADVANTAGES

- Higher mechanical complexity, making it more likely for something to go wrong.

- Lower lifespan and lower reliability.
- Unreliable performance in cloudy.

4. Result

This paper helps for the implementation of the sun tracker and it employed dual axis dc motor with the help of arduino kit which follows the sun.

At the maximum, the solar tracker is perpendicular the light source, and its efficiency increases by 48% as compared to the standstill solar panel and its annual energy gain increases by up to 36%.

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