ABSTRACT

SOLAR TRACKER USING ARDUINO

Solar energy is one of the fastest growing industries in the world; today more than 65 GW energy is produced by solar power. Since solar energy is renewable, it is a good power source, especially for developing countries.

This project discusses on the development of single axis solar tracker using Arduino UNO which is cheaper, less complex and can still achieved the required efficiency. For the development of single axis solar tracking system, two light dependent resistors (LDR) has been used for sunlight detection and to capture the maximum light intensity. A servo motor is used to rotate the solar panel to the maximum light source sensing by the light dependent resistor (LDR) in order to increase the efficiency of the solar panel and generate the maximum energy. The efficiency of the system has been tested and compared with the static solar panel on several time intervals. A small prototype of single axis solar tracking system will be constructed to implement the design methodology presented here. As a result of solar tracking system, solar panel will generate more power, voltage, current value and higher efficiency.

The solar panel tracker is designed to follow the sun movement so that maximum light intensity hits on the solar panel, thus increasing the power efficiency. Use of a solar tracker circuit in the field of energy production will increase its efficiency by almost 25%. This system can also be successfully implemented in other solar energy based projects water heaters and steam turbines.Arduino UNO Arduino Cable Servo Motor Solar panel Jumper wire LDR 10k resistor-2

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1.1.INTRODUCTION:

In this globalization era, demand of electricity keeps on increasing year by year .The demanding of electricity gives an impact on the loss of main resources to produce electrical energy. Mankind have explored more ways and technologies for the production of electrical energy using the renewable energy resources. Renewable energy is an energy which generate from natural resources which are naturally replenished. Among all the renewable energy resources that have been discovered, solar energy is the most suitable. The solar energy provides light, heat and energy to all living things. Solar energy is a free energy which does not have any price if using it. Furthermore, solar energy does not produce any pollution, environmental friendly and endless supplies. Solar energy is an energy generated by the sun in the form of solar radiation. Solar radiation from the sun is collected and absorbed by the solar panels and convert into electrical energy..Despite of solar energy being a good source of energy, there is a need to improve the methods to harness this energy. This can be achieved by using solar tracking system instead of fixed system.The circuit is controlled by Arduino UNO, two light dependent resistor (LDR) and a servo motor.

1.2 OBJECTIVES

The main considerations in the present field technologies are automation, power consumption and cost effectiveness. Automation is intended to reduce man power with the help of intelligent systems. Power saving is the man consideration forever as the source of the power(Thermal, Hydro etc..,) are getting diminished due to various reason**s.** The main purpose of this project to detect the sunlight and track the solar panel and increase its efficiency.

2.CIRCUIT DIAGRAM

Figure – Circuit diagram of solar tracker using arduino

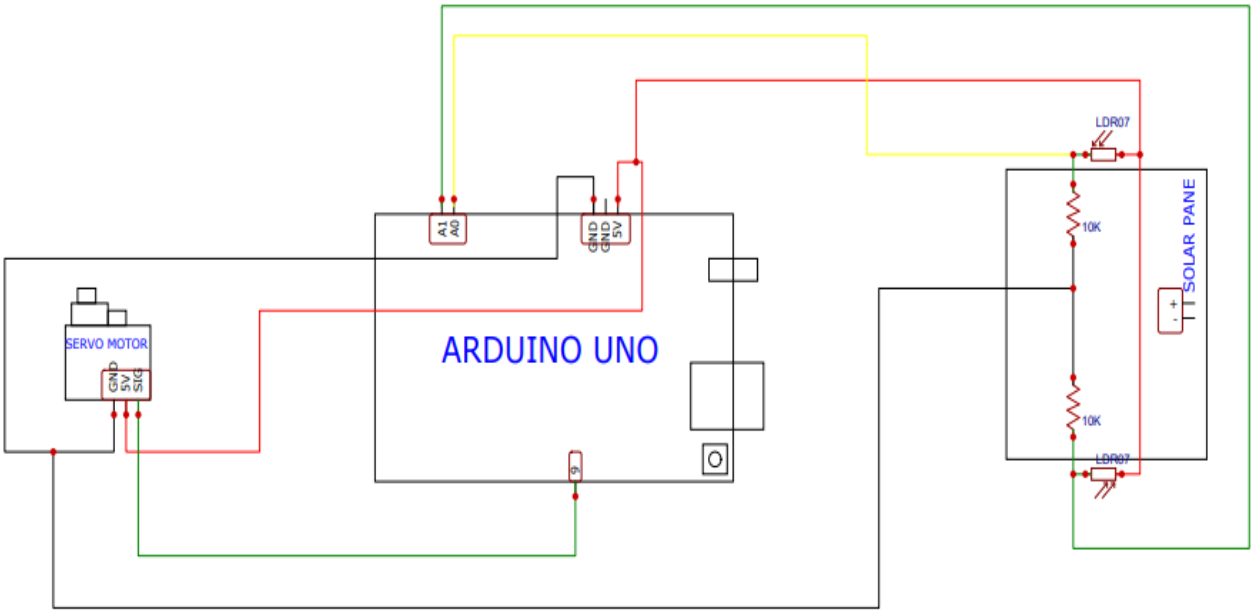

Figure 1.1

2.1 COMPONENETS SPECIFICATION AND EXPLANATION

Components:

- Arduino UNO
- Arduino Cable
- Servo Motor
- Solar panel
- Jumper wire
- LDR
- 10k resistor-2

SPECIFICATION OF COMPONENTS

LDR (LIGHT DEPENDENT RESISTER)

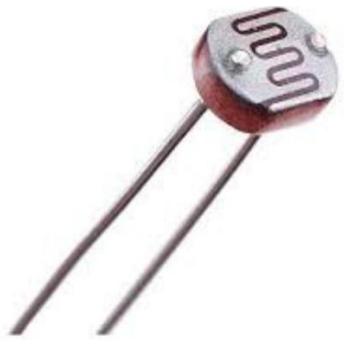

Figure 2

LDRs or Light Dependent Resistor are very useful especially in light/dark sensor circuit.

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 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.

Photoresistor is a passive component that decreases resistance with respect to receiving luminosity on the components sensitive surface

RESISTORS

Resistor is an electrical component that reduces the electric current. The resistor's ability to reduce the current is called resistance and is measured in units of ohms (symbol: Ω).If we make an analogy to water flow through pipes, the resistor is a thin pipe that reduces the water flow.

Figure 3

Arduino UNO

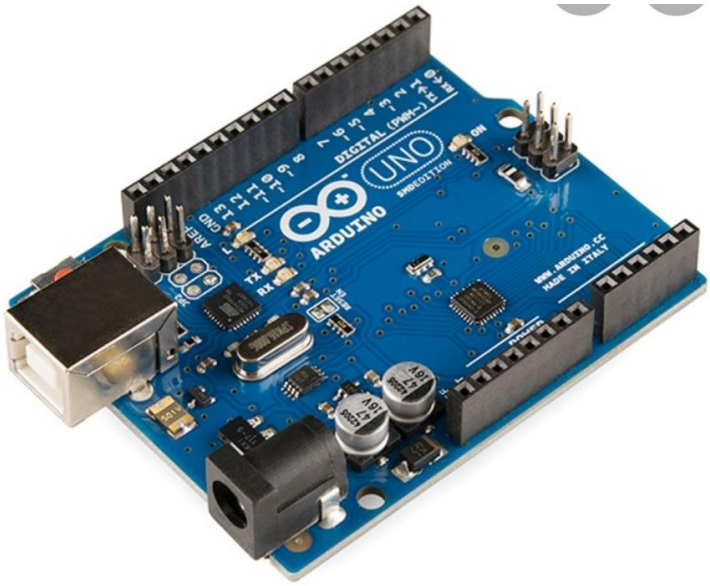

Figure 4

The Arduino UNO is an open source microcontroller board based on the microship atmega 328 microcontroller and developed by Arduino.cc.The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansions boards and other circuits It has fourteen digital input/output pins (of which six of it can be used as PWM outputs), six analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the micro-controller; it can simply connect to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Connecting Wires

Connecting wires provide a medium to an electrical current so they can travel from one point on a circuit to another.In case of computers ,wires embedded into circuit boards to carry pulses of electricity

Figure 5

Servo Motor

Servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position,velocity and acceleration.its consists of suitable motor coupled to a sensor for position feedback.

A servo motor can be operated with power supply from 4.8V to 6V. Normally voltage of 5V with operating frequency, f0 = 40Hz is used. Servo motor is used to give accurate angle control such as 45 degrees,
90 degrees. The angle can be hold continuously. It can rotate from 0 degree to 180 degrees when the pulse duty ration changed.

Figure 6

2.2.Working Explanation

The solar tracker tracks the sun with help of LDR placed on both sides of solar panel. If the value of right LDR goes high the servo motor will rotate right side ,if the left LDR goes high servo will rotate left side .If both sides are same value the servo will stop rotating.

Two LDR's (Light Dependent Resistor) LDR1 & LDR2 are connected to Analog pins of the Arduino. A solar plate is attached in parallel to the axis of the servo motor and both the sensors are kept on the solar plate as shown in the figure above.

The design & the arrangement is done in such a manner that the movement of the sun is from LDR1 to LDR2

There are three cases that are to be followed:-

Case 1: Sun is in the left side
Light on LDR1 is high because the shadow of barrier falls on LDR2 so solar plate moves clockwise.

Case 2: Sun is in right Side
Light on LDR2 is high because the shadow of barrier falls on LDR1 so solar plate movie anticlockwise.

Case 3: Sun is in the Center

Light on both LDR’s is equal so, plate will not rotate in any direction.

3.1 Result And Discussion

Application

Solar tarcker devices used to orient photovoltanic panels, reflectors,lenses,or otheroptical devices towards the sun.Since the sun position in the sky changes wit the season and the time of day ,trackers are used to align the collection system to maximize energy production

3.2.Output Snapshots

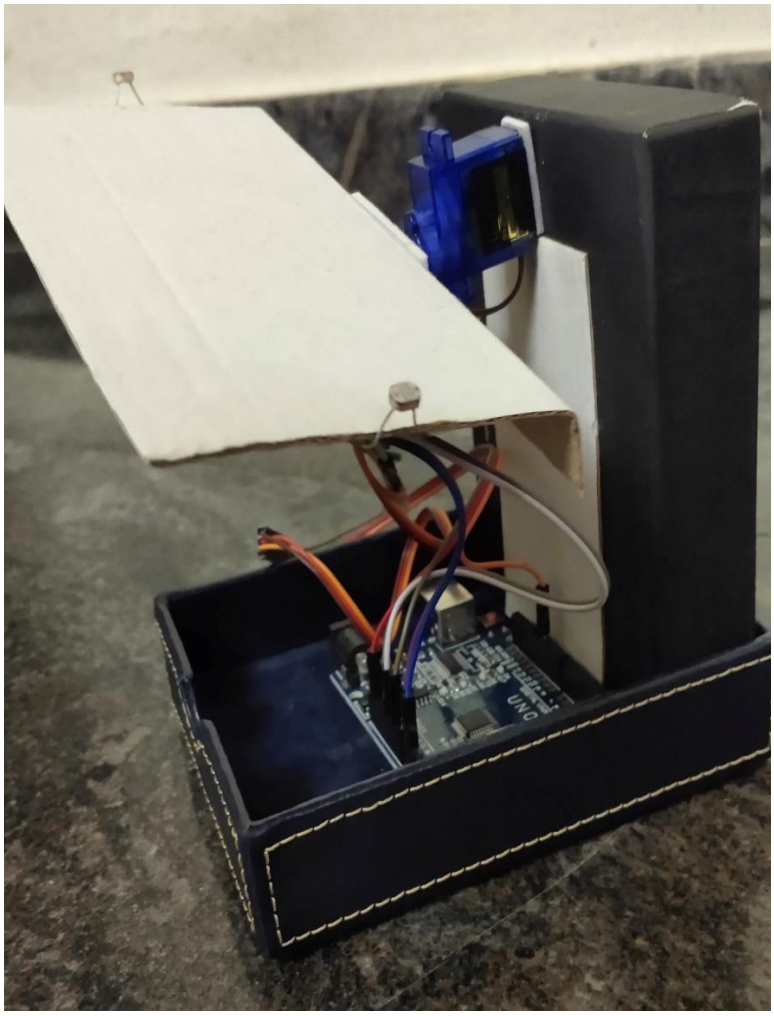

Figure 7

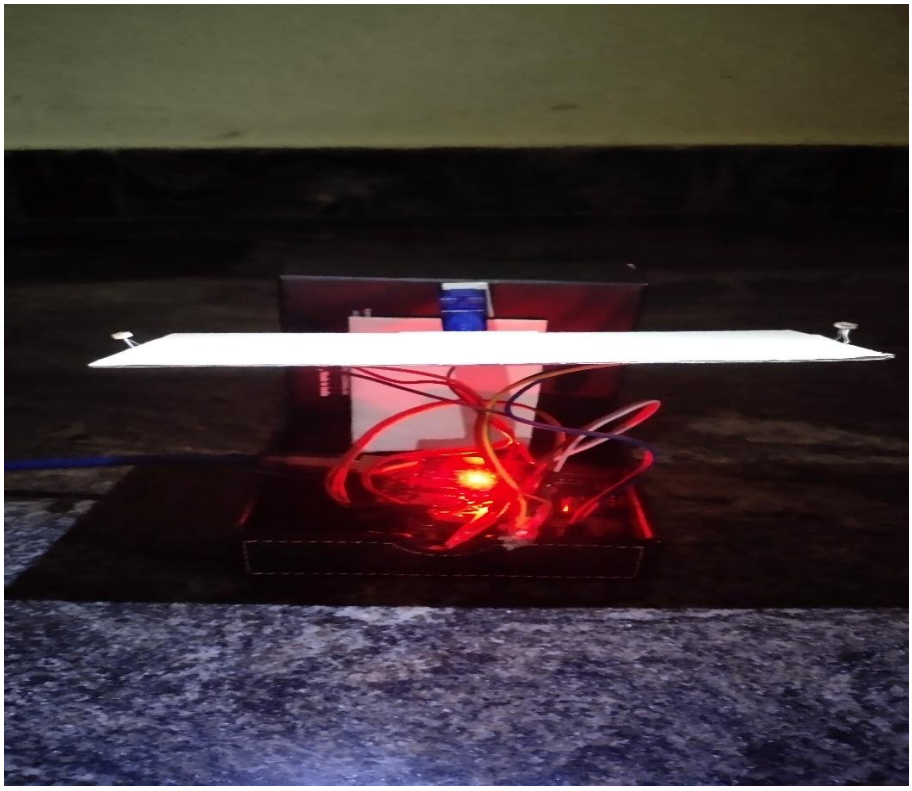

Figure 8

Future Work

Firstly, the quality of having a solid, almost unyielding structure should be put as one of the main characteristics of a solar tracker. Hard and solid material need to be used as the main material for the solar tracker structure in order to withstand extreme weather condition such as strong windy day. Secondly, build a solar tracker that can be monitored from long range, by adding Global System for Mobile Communication (GSM) or build an application software. Lastly, maximizing the solar-system energy production and produce more energy by upgrading the single axis solar tracker to dual axis solat tracker. More power means a greater return on the solar investment, and greater energy savings.

4.Conclusion

An application of solar tracker using arduino approach has been presented in this study. As a conclusion, firstly the development of tracking system to control and monitor the movement of solar panel
based on the intensity of the light is achieved. The solar panel will face the sun perpendicularly to absorb more solar energy. Secondly, solar tracking systems generate more output during the hours while fixed solar panel installation generates least power. However, shading effect give a slightly impact for solar panel to produce the output value. Thirdly, the percentage efficiency of the system in energy conversion increase when implemented the tracking system. The efficiency gain varies significantly with altitude and the orientation of a fixed solar panel installation in the same location.

The project was concluded to be innovative for the improvement of day today life.This is device is applied to maximize the energy production.The cost of implementing this circuit is also very less - an added advantages in using this circuit

Thus the implementation this circuit to be a cost effective and compared application ,its promotion would lad to the environment of the future environment

Reference

- Gagari Deb, Arijit Bardhan Roy. Use of Solar Tracking System for Extracting Solar Energy. International Journal of Computer and Electrical Engineering, 4(1), 42–46.

- Siti Amely Jumaat, Mohammad Hilmi Othman, Solar Energy Measurement Using Arduino, MATEC Web Conf. 150, 2018, 01007, p. 6