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Dual Axis Solar Tracking System with Weather Sensor

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Abstract: Energy crisis is one in every of the major problems in world developing countries like Republic of India.There's a huge gap between generation and demand of current. Nearly half of the population of the country cannot get the power supply. Renewable energy is one of the answers to solve this issue. Solar power is one in every of the foremost effective resources of the renewable energy that might play a big role to resolve this drawback. This analysis presents a performance analysis of the dual axis solar tracking systemusing Arduino and led & servo motors. The most objective of this research is whether the solar tracker isbetter than a solar panel. This work is split into 2 light dependent resistors (LDR) is employed to observethe almost source of illumination from the sun. Two servo motors put together accustomed move the electrical device to most source of illumination location perceived by the LDRs. In the other half, the software part is written by using C programming language which head towards to the Arduino UNO controller. The result of the solar tracking system has analyzed and compared with the mounted or static solar panel found higher performance in terms of current, power and voltage. Therefore, the solar tracking system is evidenced additional sensible for capturing the most daylight provide for star gathering applications. The result showed dual axis solar tracking system made further 10.53- watt power compared with mounted (fixed) and single axis solar tracking system. Components hardware and computer code.
Keywords: Dual Axis, Stepper Motor, LDR Sensors, Declination Angle

I. INTRODUCTION

As sun is a major source of this renewable energy, a dual axis solar tracker which can track the radiations from the sun in all the directions with maximum intensity is found. This dual axis solar tracker takes the sun radiations as the input and converts to electrical energy this electrical energy which is obtained fulfil majority of the country needs. Energy absorption is maximum when the panel is perpendicular to the sun. Hence we are using a solar tracker to maximize the energy generation and improve the efficiency 40% more than the fixed panel. In general, during the day the single axis tracker moves from east to west with one degree of freedom. While the modem tracker tracks east west and north south movement of the sun. In this project we are integrating dual axis solar tracking.

The demand for reliable source of energy has been increasing day by day. So, government improved the usage of renewable energy sources there by curtailing the usage of conventional source of energy. By using photovoltaic cell we can harness solar energy and later photovoltaic effect can be used to convert solar energy into electrical energy and this energy can be used in wide applications like solar thermal energy, solar heating, photovoltaic, solar architecture etc. The output of photovoltaic cell directly depends on the intensity of light and sun's positions changes continuously in a day. In general, during the day the single axis tracker moves from east to west with one degree of freedom. While the modern tracker tracks east west and north south movement of the sun. In this project we are integrating dual axis solar tracking. The project is designed and implemented using simple dual axis solar tracker system. In order to maximize energy generation from sun, it is necessary to introduce solar tracking systems into solar power systems. A dual-axis tracker can increase energy by tracking sun rays from switching solar panel in various directions.

II. OBJECTIVE

1) The ultimate objective of this project is to investigate whether static solar panel is better thansolar tracker, or the opposite.
2) This project is divided into two stages namely, hardware and software development.
3) A dual-axis tracker allows your panels to move on two axes, aligned both north-south andan east-west.
4) This type of system is designed to maximize your solar energy collection throughout theyear
5) It can track seasonal variations in the height of the sun in addition to normal daily motion.

III. LITERATURE REVIEW

The first solar tracker was a mechanical system by C. Finster, invented in 1962. Though the Finster solar tracker realized insignificant energy gains, years of testing and research have ledto improvement of the conversion output of the PV system and consequently the emergency ofdifferent tracking technologies and applications (e.g. concentrator and non-concentrator). In short, improved solar cells have been developed and the use of solar tracking system over the use of conventional fixed PV system has grown. In fixed photovoltaic system the solar receiver(PV module) is in a stationary position facing the true north. However, with mechanical or electro-mechanical systems, the orientation of the collector change continually in reference to the azimuthal directions (east-west) and also in its elevation. This is dependent on the tracker'sgeometrical capacity.

Classification of solar tracking system Mousazadeh et al, (2009) carried a review study, which resulted in the general categorisation of solar tracking systems (2) according to two maintypologies, namely, Energy source (i.e. passive, active and manual), and Degree of freedom (i.e. single or dual axis). Passive tracking systems- designate all devices that position solar collectors for optimum capture of energy using mechanical potential and thermal energy principles. Passive systems do not use of electrical energy. Some of the typical mechanical working principles are Shape Memory Alloy (SMA), Thermo-fluids, Mechanical potential system (lever, weight and springs).

In Shape Memory Alloy, cylindrical actuators to change the shape the SMA receivers throughmirrors until an optimum orientation is achieved (3) Recent developments, among others by Kusekar et al (2015), have seen the use of high pressure fluids to convert the potential energy in the mechanical structure that hold up the PV panel into kinetic energy, which is then used tomove the panel toward the sun. (4) Active tracking systems- use electrical energy as their source. A number of categories exist such as; Electro-optical based tracker, Auxiliary bifacialsolar cell and chronological (time and date based) tracker. At some instances, a combination ofthese different systems may be realised and the resulting system will be referred to as Hybrid.

Of all active trackers, electro-optical basedtrackers are is generally more popular.For improvedphotosensitivity, the sensor can be mounted on a pyramidal structure (in the figure 2b outlinesthe photo-diode mounted on pyramid) or use of collimator tube might be vital as it prevent diffuse irradiation from reach the sensors therefore ensuring precise measurement of the position of the sun. Fig.1c is a system made up of four mini- solar module positioned on the North- south and east-west that detect the light intensity, this is system also use the Programmable Logic Controller (PLC) manipulate the two positioning mechanism through twoDC motors (5)

IV. SOLAR TRACTING SYSTEM DESCRIPTION

1) *Schematic Arranging:* The main goal of this project is to design a very precise solar tracker. The project is divided into two parts; hardware and software. The main constituents of the tracking system are shown in Figure2. Hardware part generally composed of solar panel, two-DC motors with gearbox, LDR sensor module and electronic circuit. Software part represents the thinking behavior of the system, that is how the system acting under several weather conditions.

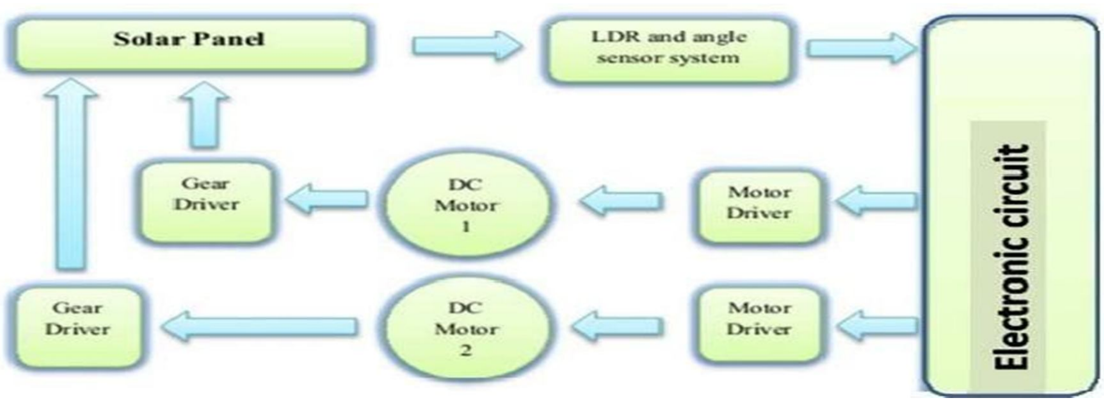

Fig. 1 System Design Block Diagram

2) Sun position sensing method used in the control circuit To track the sun it is vital to locate the position of the sun accurately. In this work sensing of the sun position carried out in two stages primary and secondary. Primary stage or indirect sensing performed via sun-earth relationship as a coarse adjustment and second stage or direct sensing performed via set of LDR sensors as output tuning to trims the azimuth and altitude angles.

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If the weather is cloudy or dusty, the tracking system uses primary stage or sun-earthgeometrical relationships only to identify the location of the sun; so the system tracks the position of the sun regardless the weather condition. LDR sensor module consists of four lightdependent resistor or cadmium sulphide cell; LDR is a resistor whose resistance decreases withincrease in light intensity. These four LDR are placed on a circular plate and separated by 90 degree space rotation through perpendicular rectangular plastic sheets.

V. DUAL AXIS SOLAR TRACKER CIRCUIT DIAGRAM

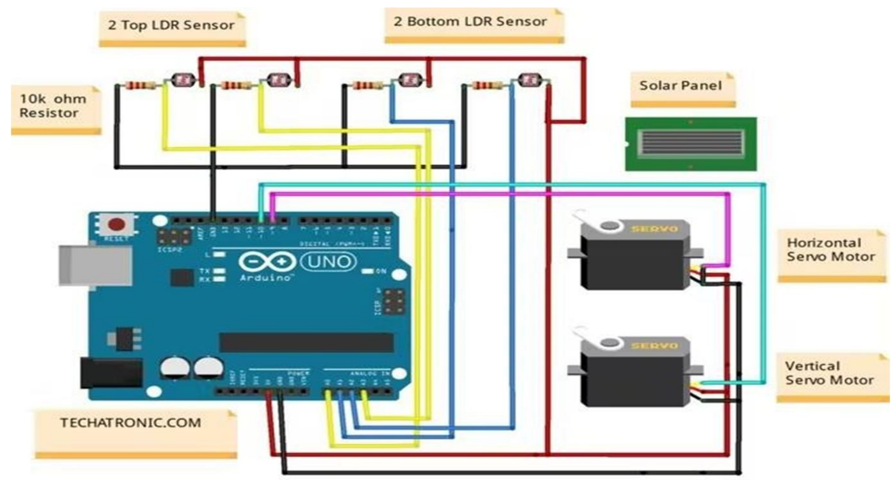


Fig. 2 Cicuit Diagram Of Dual Axis Solar Tracking

A. *Movement Controlling Unit*

The movement controlling unit comprises of two servo motors.
One of the motor controls the horizontal rotation while the other controls the vertical rotationonly.

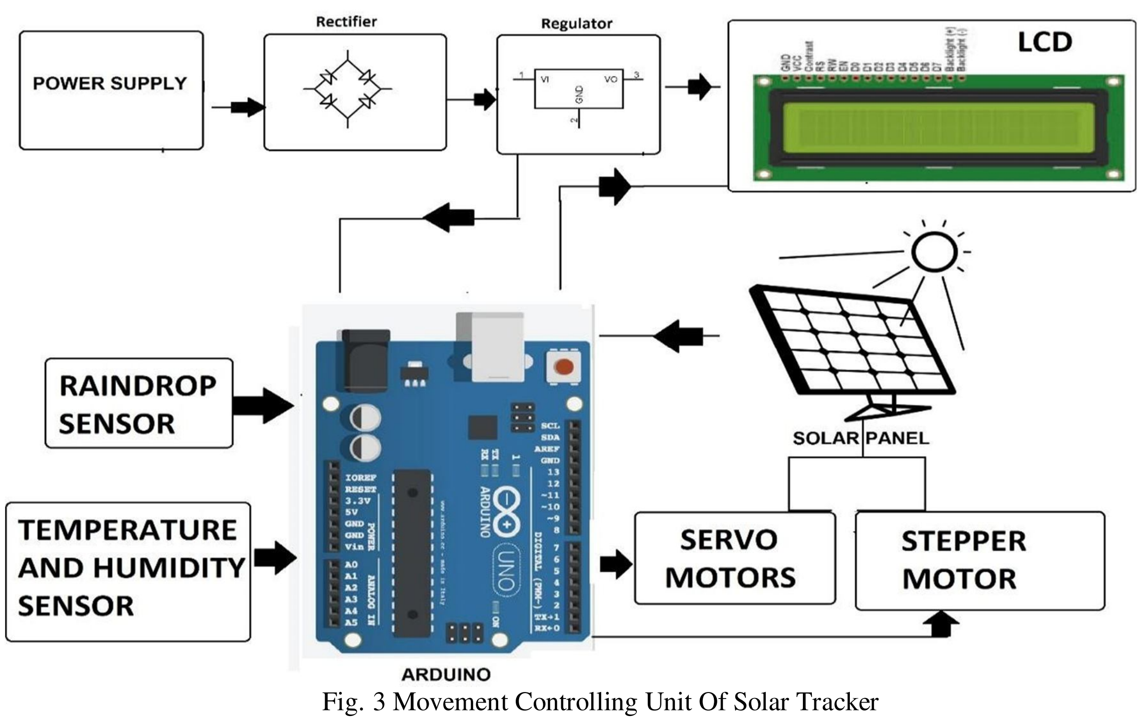


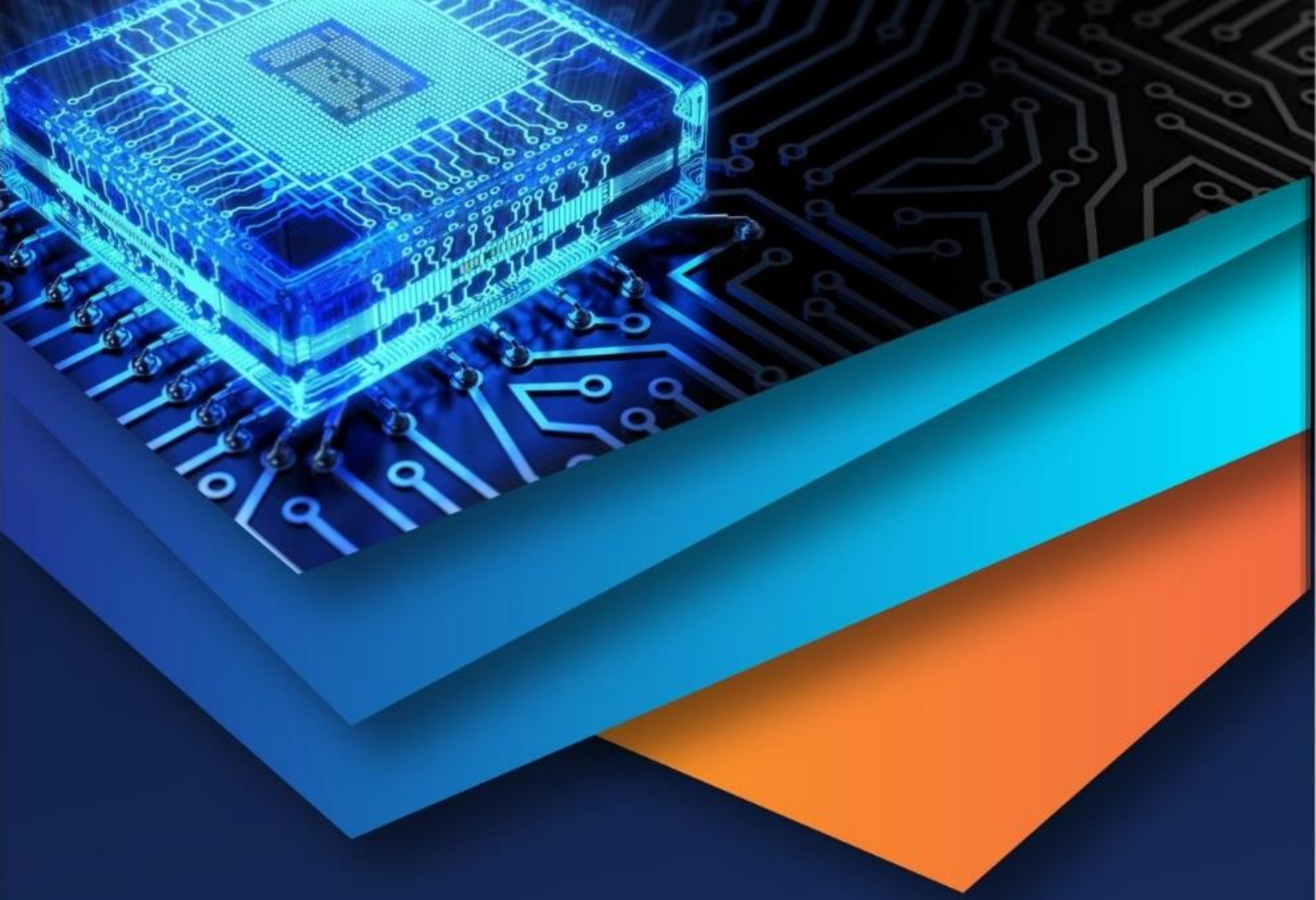
Fig. 3 Movement Controlling Unit Of Solar Tracker

VI. CONCLUSION

As solar energy is considered one of the main sources of energy in the near future, In this paper, we give a simple and concise overview of the solar tracking mechanism to improve the solar gain energy, also the costs of the solar tracker operation and cost maintenance is relatively low. In this paper, Design and implementation of solar tracker with two axes that Use in motor satellite dish to track the sun accurately and use LDR sensor to determine the intensity of falling sunlight. We found that the solar tracking system is more effective than the fixed solar panel. The energy gained from the solar panel with the dual tracker exceeds 35% of the energy gained from the fixed solar panel, Inanalyzing the data, the energy gained from the solar tracker is mostly in the morning and in the evening because at noon time there is little difference and this proves that the fixed solar panel is efficient during noon time only. The dual-axle solar tracking system is efficient as it can be placed anywhere and ensure a high energy gain.

REFERENCES

[1] Falah I. Mustafa Sarmid Shakir; Faiz50F.Mustafa; AthmarThamer Naiyf2018 9th InternationalRenewable Energy Congress (IREC)
[2] T. Zhan, W. Lin, M. Tsai, G. Wang, "Design and Implementation of the Dual-axis Solar Tracking System IEEE", 37th Annual Computer Software and Applications Conference, pp. 276-277, 2011.
[3] M. Zolkapli, S. A. AI-Junid, Z. Othman, A. Manut, MohdZulkifli, "IEEE", International Conference on Technology Informatics Management Engineering & Environment, pp. 43-47, 2013.
[4] Nabeel Abid Al-Sahib, Falah I. Mustafa, Ayad M. Kwad, The Fourth International Renewable Energy Congress, December 20-22, 2012.
[5] Power from the sun. (n.d.). Retrieved from http://www. powerfromthesun.net/Book/
[6] The Sun's Position. (2013, March 28). In Photovoltaic Education Network, from http://pveducation.org/pvcdrom/properties-ofsunlight/suns-position.



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