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Automatic Solar Tracker

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ABSTRACT: The traditional sources of energy in the world are beginning to fade and the issue of finding alternative sources has become an urgent and fundamental. Hence, alternative sources of energy have become the desired solution for a prosperous future and a clean environment. Thus, solar energy is considered one of the most important renewable sources of energy. In order to maximize power output from solar panels, one needs to keep the panels aligned with the sun. This is definitely a more cost-effective solution than purchasing additional solar panels. This project describes an automatic sun tracking system, based on dc motor, and moving solar panel. To gain more energy from the sun, the active surface of the solar cells should be perpendicular to solar radiation, Which means that the panel must follow the path of the sun all the time.

KEYWORDS: Solar Energy, Photovoltaic, Sun Tracker, DC Motor.

I. INTRODUCTION

In remote areas the sun is a cheap source of electricity because it uses solar cells to produce electricity. The output of solar cells depends on the intensity of sunlight to get the maximum efficiency. The solar panel remains according to the position of the sun during the whole day. But due to rotation of earth those panels can't maintain their position always in front of sun. This problem results in decrease of efficiency [3]. In order to get a constant output, an automated system is required which should be able to rotate the solar panel according to sun's position. Automatic solar tracker is made as a prototype to solve the problem that mentioned above. Automatic solar tracker is a prototype which rotates according to the position of the sun. The unique feature of this prototype is that, it takes position of the sun as a guiding source instead of earth's rotation. The solar power is used interchangeably with solar energy but refers more specifically to the conversion of sunlight into electricity by photovoltaic cells. It has become a popular investment for companies as well as for residential users. This demand has stimulated the research for increasing the overall output power of PV system causing people all over the globe to work hard on making the technology more efficient as well as cost effective. Solar panels are photovoltaic cells which gives voltage directly if you place them in sunlight.

Bustling civilization is the vein through which modern civilization is operated. Energy day by day is put to use at its best to fulfil the desires and ambition of the peoples at large. Each and every corner of our life is caged with various layers of impediment and in this response, energy is becoming an indispensable factor. Therefore, the source of energy needs to be endless/ perpetual in order to carry this colossal population ahead. Human beings being evolutionary in nature are perhaps the best ever creation of nature is always in the race of envisaging the probable and available comforts and benefits in every possible angle in this perilous world. The evidential matrix manifests that in a dichotomy of various opinions what options best expedite the scarcity of energy in an immensely heterogeneous society like ours. Our motto is to endeavour in forwarding such noble goal of energy conservation.

Taking a look at the present scenario it is evident that conventional sources of energy such as coal, natural gas, oil, etc. are at the edge of extinction. Being in mortal combat with time itself to fulfil every demand for energy the demand for these resources for energy has escalated to its zenith. The conventional use of energies due to the burning of fossil fuels like coal, oil and natural gas, the whole environment is getting polluted. The present project, therefore, is orchestrated with components like LDR module, DC Motor, Photovoltaic array etc. according to which while the functioning of, unlike other use of the conventional energies, would not emit any pollution and in turn act as a reservoir of energy taken from the Sun itself. As adumbrated no other energy is more abundant than solar energy as per as its availability and freeness are concerned, utilization of which, compounded with rest of the fact of its conversion into electrical energy. Historically if counted, in the year 1881 for the first time ever solar panel was invented. Later on, all through the hands of Russell Ohl in the year, 1941 concept of the solar cell was conceived and subsequently

workability of a solar panel has also advanced in comparison with the earlier span. Though it is improbable still it is not impossible as per as tracking of the mother energy is concerned in furtherance to which attempt has been taken through this project to confine every drop of energy from being left out. The DC Motor adjacent with the system with the help of LDR module by measuring the intensity of the sun rays fixed on the upper edge of the solar panel will help the solar panel to revolve around proportionately with the movement of the Sun itself in order to grab and store the maximum amount of energy as it can. In pursuance of such objectivity, this project comes forth into existence.

When heat is the source of every creation, Sun produces the biggest ever energy in this solar system to produce and transcend life from one organism to the other. In this response, the project called "Automatic Solar Tracking System" serves the purpose of utilizing the maximum amount of energy taken from the Sun and to convert such energy into some other production. The basic endeavour is crooned to scoop out from this project in making this system an economically convenient subject, accessibility of which is easy and functioning of which is optimum in the end. In the wake of technological advancement when the pace of time is at its best to pass by, this system is a time worthy production, produced to create the best of its kind. In a stretch, it could be signified that this project which is an extension of solar energy, is a renewable source of energy, never-ending phenomena. It's only 10 to 20 per cent of the solar cells that are being used commercially out of which the best potential of the cells gets reflected and therefore scope for better use of the solar cells exist.

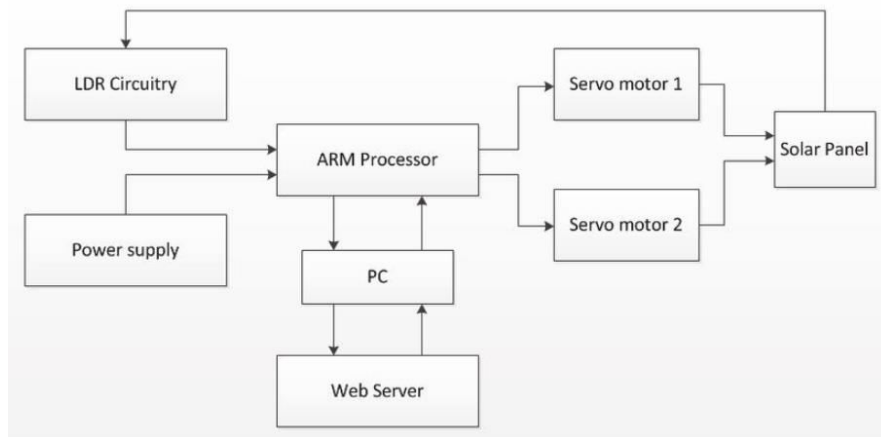
In the world of pollution, this system is an eco-friendly alternative, hence a valuable asset. When the ocean of pollution is encumbering every corner of life, this system would be able to create ripples of hope in the midst of this bustling civilization. The survivability of this system lies upon its workability. In the trend of comparison with other mind-boggling systems, it could be a trailblazer.

II. RELATED WORK

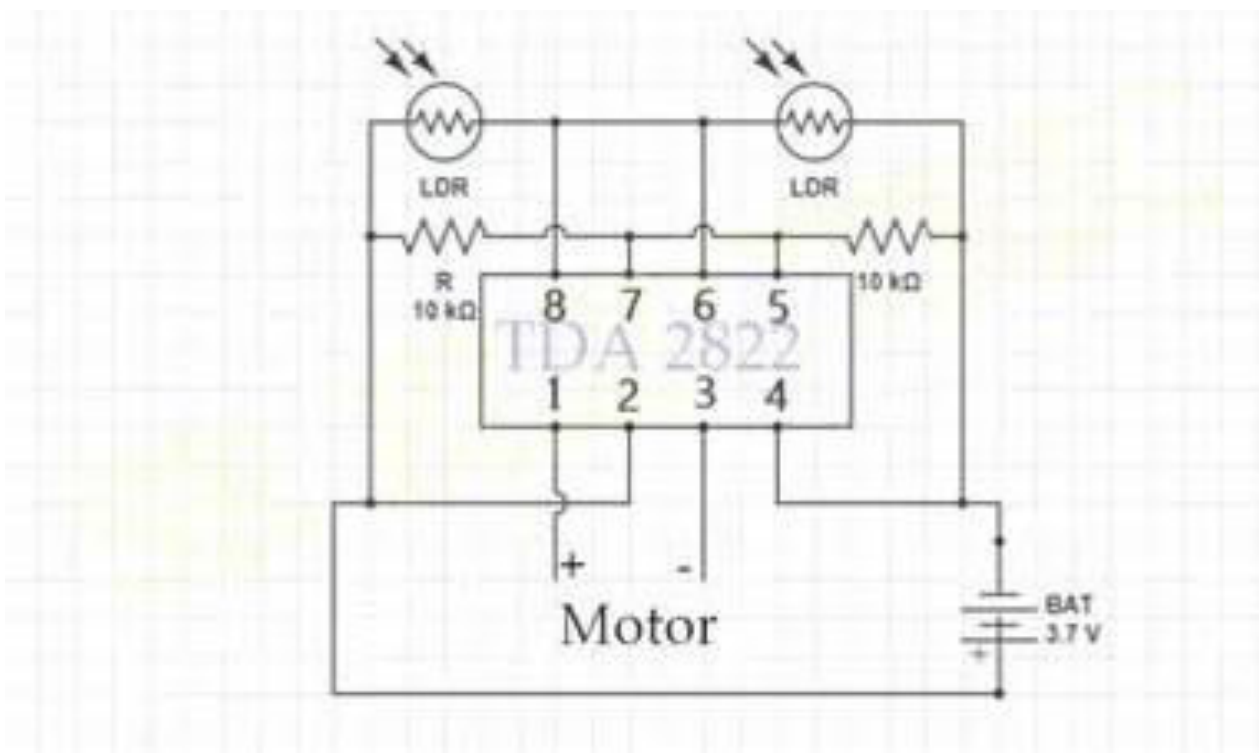
Modeling and Designing of Solar Tracking System using Arduino. [1]. This paper describes the complete design and construction of a microcontroller based automatic solar panel tracking system. The solar panel is fixed and no automatic tracking of sun light based on its intensity. The System architecture made up of a LDR sensor senses max solar power which is being given to the Arduino which digitizes the LDR output. Its active sensors constantly monitor the sunlight and rotate the panel towards the direction where the intensity of sunlight is maximum. Due to rotation of earth, panels can't maintain their position always in front of sun. An automated system is required which should be capable to constantly rotate solar panel. A unique feature of this system is that instead of taking the earth as its reference, it takes sun as a guidance. A Fast and Accurate Maximum Power Point Tracker for a Multi-Input Converter with Wide Range of Soft- Switching Operation for Solar Energy Systems. [2]. This paper includes a solar array, solar frame and two actuators, and also it is a dual-axis solar tracker capable in extreme weather conditions. It has mechanically linked solar trackers in a large configuration of solar array, so that they can operate in unison way. This solar observe the radiation and send to the photovoltaic cell to convert the power from AC to DC. And it as a moveable technology of solar panels to expose with sun throughout the day. Design, implementation and performance analysis of a dual-axis autonomous solar tracker. [3]. Besides being a great alternative to increase the Brazilian energy matrix, PV can also be a good way to generate energy in difficult access places or without access to electricity. Therefore, it is interesting to think of ways to maximize energy based on the production of the photovoltaic modules. When mounted over fixed structures the efficiency of photovoltaic systems is not fully utilized. The way to improve this production is through also has the use of a solar tracking system, which ensures the maximum incidence of solar radiation on the modules, thus increasing the energy production of the system. Simulations through SAM (System Advisor Model) software, to the city of Santa Maria in South Brazil, show that is possible to increase in around 30% the amount of energy produced during a year using a commercial polycrystalline solar panel, when it is mounted over a DAST.

III. METHODOLOGY

solar tracker, a system that positions an object at an angle relative to the Sun. The most-common applications for solar trackers are positioning photovoltaic (PV) panels (solar panels) so that they remain perpendicular to the Sun's rays and positioning space telescopes so that they can determine the Sun's direction. The solar tracker well build uses the LDRs, resistors, and TDA2822 IC to sense changes in the intensity of sunlight. By measuring the difference in voltage between the LDRs, the circuit can be determine the direction of the sun and automatically adjust the position of the solar panel or array to face it. This can significantly increase the efficiency of a solar energy system.



Block Diagram



Circuit Diagram

IV. EXPERIMENTAL RESULTS

The existing system is a fixed solar panel. These Solar panels convert the solar energy into electrical energy. There is a key component of the solar panel system. Most commonly available panels of today are either polycrystalline or mono-crystalline solar panels. The cells in solar panels collect the solar energy and turn it into direct current (DC) electricity. Most homes and businesses, however, use alternating current (AC). Inverters change the DC electricity from your panels into usable AC electricity. Racking and mounting systems are used to affix your solar

panels either to your roof or to the ground. They also allow you to position your panels at an angle that is best for capturing the sun's rays.

An automatic solar tracker helps by allowing the solar panel to automatically shift with sunlight. An automatic solar tracker senses the sun's position and moves accordingly. This means the solar panel moves from east to west with respect to sun. These solar trackers increase solar panel's efficiency than the fixed panel. Solar trackers generate more electricity in roughly the same amount of space needed for fixed tilt systems, making them ideal optimizing land usage.

HARDWARE IMPLEMENTATION

The figure (a) (b) (c) and (d) depicts the hardware implementation of the proposed concept.



(a)



(b)



(c)



(d)

A solar tracker was proposed, designed and constructed. The final design was successful, in that it achieved an overall power collection efficiency increased to a fixed panel for the same panel on the tracking device. the solar energy capture is maximized by a 2-axis tracking system because the solar energy is greatest on cloud-free days when there is ample direct sunshine, and response of a solar module to a ray of light is proportional to the cosine of the angle between a line perpendicular to the module surface and a direct solar ray impinging on the surface. In terms of real value, this means that the overall cost of a system can be reduced significantly, considering that much more power can be supplied by the solar array coupled to a solar tracking device. By extracting more power from the same solar panel, the cost per watt is decreased, thereby rendering solar power much more cost-effective than previously achieved using fixed solar panels. A single axis tracker offers a great power increase over a fixed solar panel, but a two-axis tracker would provide more power still. This could be a subject for further development. Solar tracking is by far the easiest method to increase overall efficiency of a solar power system for use by domestic or commercial users.

V. CONCLUSION

Solar tracking systems are one of the most used forms to increase energy production. Also the device is made location-independent by implementing LDR based detection instead of open loop heuristics positioning algorithms. This fact allows the system to be built and installed in any geographical location. This estimation takes into account the costs with all the base and structure materials as well as all the electrical and electronic components present in the system. Sun tracking technology can be used to get maximum efficiency from moving panel. Today in the world of rampant productivity, energy is the fundamental source upon which the whole civilization is based upon. As it is said that energy can neither be created nor be destroyed and, in that response, it can be signified that it can somehow be stored. The attempt towards making such goal substantiated, this project has been endeavoured towards unravelling the path of such objectivity. It is quite natural that constant utilisation of energies somehow opens the door of scarcity as per as earthly sources are concerned. Sun, in the stand of which, the tallest source, spiked over for age's right from the origin of the whole universe, through which life has been conceived, is the basic and the mother source of all the energies. Considering the very fundamental from the viewpoint of storing such energy, the project has been unravelled. Energies other than from the Sun, are the process from which such are been produced through the burning of various materials, involving emission of a large amount of pollution, causing the environment and the atmosphere sick day by day. Fastness and smartness of the world's current behavioural visibility, where easy access of every sphere of life is in need of the acute comfortability, every day is a new challenge of hatching something new and unique which makes an energy to be the ultimatum source behind all the hard work exists. In that regards it would be worthier to reveal that commercialisation has boomed its wings to such an extent in the need of money and power that we are somehow present in the pool of acute ignorance of the world's resources scarcity, in consequence of which the whole world is wounded. Healing the world is the basis cultivation with which the hour clock is calling and this project presents the eye, therefore, to open the corridors of reducing the amount of pollution in storing of energy culled out from the Sun and also to make the pace of advancement revved around.

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