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Embedded solar tracking system using arduino

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Abstract
This paper describes a systematic approach to building an intelligent solar Tracking system (ISTS), for improving the performance of solar panels. The ISTS is a hybrid hardware / software prototype, which automatically provides best alignment of solar panel with the sun, to get maximum output (electricity). This method is increasing power collection efficiency by developing a device that tracts the sun to keep the panel at a right angle to its rays.The Embedded solar tracking instrumentation system by using microcontroller. The system consists of Light Dependent Resistor (LDR) sensor, DC motor .Arduino UNO microcontroller is the main component for controlling the system. The solar system will track the location of the sun to ensure the solar panel is always perpendicular with the sun therefore optimizing power output. The operation of the system on sunny and bad weather condition has been presented in this paper. The solar tracking prototype has been stated for future works.

I. INTRODUCTION

The use of fossil fuels as a means of generating electricity has become expensive making cost of living very high, especially in the rural part of the country. Also the use of fossil fuel has brought about pollution to the environment which in turn is not safe for our health. It releases carbon dioxide which causes the greenhouse effect. This brings about the deforestation of land and also the pollution of air and water. Solar energy is gotten solely from the sun and as a result does not emit carbon dioxide which prevents the green-house effect. The development of solar energy in Nigeria has the potential to create jobs. Employment in renewable energy industry would reduce occupational hazards especially when compared to coal mining and the extraction of oil. Nowadays solar energy is becoming one of the most reliable source of energy as a result of its surplus and environmental friendly [1]

II. LITERATURE REVIEW

According to reference [2] a system that tracks the sun will be able to know the position of the sun in a manner that is not linear. The operation of this system should be controlled independently [3]. Maximum energy is produced by a solar PV panel when it is positioned at right angle to the sun. Therefore, the aim of this research is to develop an Arduino based solar tracking for energy improvement of solar PV panel. A solar cell is a device which converts light energy to electrical energy through photovoltaic effect. Solar cells are the building blocks of photovoltaic modules known as solar panels. In solar tracking system, the module's surface tracks the position of the sun automatically as the day runs by. The position of the sun varies as the sun moves across the sky. For a solar powered

equipment to work best, it must be placed near the sun and the solar tracker can increase the efficiency of that equipment at any fixed position. Based on sophistication, costs and performance. One common type of tracker is the heliostat, a movable mirror that reflects the position of the sun to a fixed location. A solar trackers accuracy depends on the application. Concentrators, especially in solar cell applications, require a high degree of accuracy to make sure that the concentrated sunlight is directed exactly to the powered device, which is close to the focal point of the reflector or lens. Without tracking, concentrator systems will not work at all, therefore single-axis tracking is mandatory [4]. Non-concentrating applications require less accuracy, and many are likely to work without any tracking. However, tracking with great effect can improve both the amount of total output power produced by a system and that produced during critical system demand periods (usually late afternoon in hot climates) [5]. Researches have been done to improve the energy production of solar panels. These researches include; double-sided panels [6], conversion stages improvement [7], building panels integration geometrically [8] and so on. Maximum energy is produced by a solar PV panel when it is positioned at right angle to the sun. For this reason, several researches developed different types of solar panel tracking systems [9 and 10]. Therefore, the primary purpose of this work is to develop a solar panel tracker based on Arduino advances so as to enhance the energy production of solar panel.

III. RESEARCH METHODOLOGY

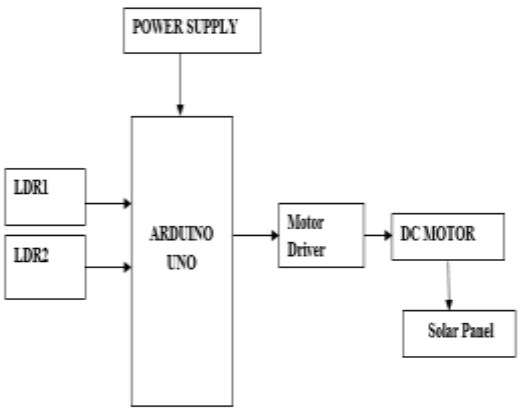
EXISTING SYSTEM:

One common type of tracker is the heliostat, a movable mirror that reflects the position of the sun to a fixed location. A solar trackers accuracy depends on the application. Concentrators, especially in solar cell applications, require a high degree of accuracy to make sure that the concentrated sunlight is directed exactly to the powered device, which is close to the focal point of the reflector or lens. Without tracking, concentrator systems will not work at all, therefore single-axis tracking is mandatory.

PROPOSED SYSTEM:

The Embedded solar tracking instrumentation system by using Arduino microcontroller. The system consists of Light Dependent Resistor (LDR) sensor, DC motor. Arduino microcontroller is the main component for controlling the system. The solar system will track the location of the sun to ensure the solar panel is always perpendicular with the sun therefore optimizing power output. The operation of the system on sunny and bad weather condition has been presented in this paper. The solar tracking prototype has been stated for future works

BLOCK DIAGRAM:



Advantages:

1. Effectively receive maximum energy from sun towards earth rotation.
2. More useful to save energy from sun and intelligent tracking solar energy.

Applications:

1. Solar Systems
2. Power Management systems
3. Industrial applications

IV. FINDING AND DISCUSSION

V. CONCLUSION AND FURTHER RESEARCH

A solar panel tracking system was designed and implemented. The aim of the solar panel tracking system is to track the positon of the sun for better efficiency of the solar panel has shown in the experimental results. This work can be executed on an industrial scale which be beneficial to developing countries like Nigeria and Sub-Sahara Africa countries. Our recommendation for future works is to consider the use of more sensitive and efficient sensors which consume less power and which are also cost effective. This would increase the efficiency while reducing cost.

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