Design an Efficient System for Improving Solar Power Utilization

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Abstract: The aim of this paper is to present a prototype for better efficiency and proper utilization of solar energy which would be good alternative for generation of electricity. The prototype is designed to overcome all the disadvantages of the single axis solar tracking system and the purpose is to design dual axis solar tracking system for using clean and renewable energy from sun.

Keywords: Atmega328p Microcontroller, DC motor, Solar panel, Stepper motor, LDR sensor, ADC.

I. INTRODUCTION

With the increase in population there is great crisis of energy and so one of the best alternative to meet this crisis and overcome it, is more and more use of renewable energy. Solar energy (energy obtained from sun rays) is better solution as it is clean, Abundant, and cheap available energy.

In this paper, we proposed the concept of obtaining maximum energy from sun rays and increase the efficiency of solar panel by rotating it exactly with the movement of sun and track the position of sun. The concept explains that the solar panels will rotate dually i.e it will rotate North-South as well as East-west as per daily rotation of sun. So with help of this solar panels will remain perpendicular to the sun. So that maximum harvesting of solar energy can be obtained.

II. LITERATURE SURVEY

In [1], the author describes the advancing era of technology we are more concerned about the advancements made in technology rather than thinking upon the alternative sources of energy. Energy costs and decreasing supplies of fossil fuels, emphasis on protecting the environment and creating sustainable forms of power have become vital, high priority projects for modern society.

Since, solar energy which is a renewable form of energy can be used to offset some of the power coming from the main grid that is generated by let us say non renewable sources of energy. And creating these renewable sources in such a way that these provide us with the maximum efficiency is our main goal.

This paper proposes a solar tracking system designed with microcontroller and LDR's that will actively track the sun and change its position accordingly to maximize the energy output. The ldr's incorporated on solar panel helps to detect sunlight which in turn moves the panel.

In [2], sun is an abundant source of energy and this solar energy can be harnessed successfully using solar photovoltaic cells and photovoltaic effect to convert solar energy into electrical energy. But the conversion efficiency of a normal PV cell is low. One of the main reason for this is that the output of PV cell is dependent directly on the light intensity and with the position of the sun in the sky changing continuously from time to time; the absorption efficiency of an immobile solar panel would be significantly less at certain time of the day and year; for the solar photovoltaic cells are maximum productive when they are perpendicular to the sun and less productive otherwise. So to maximize the energy generation and improve the efficiency; solar trackers come into play.

This paper presents the design and construction of an inexpensive active dual-axis solar tracking system for tracking the movement of the sun so as to get maximum power from the solar panels as they follow the sun.
It uses Light Dependent Resistors to sense the position of the sun which is communicated to a Arduino Uno microcontroller which then commands a set of two servo-motors to re-orient the panel in order to stay perpendicular to the sun rays. Evaluation results show that the new system performs 13.44% better than the immobile solar PV system.

III. METHODOLOGY

There are three sections in which the circuit of solar tracker is divided. First is input stage which comprises of sensors and potentiometers. The second program in embedded software in the microcontroller and lastly the driving circuit contain the servo motor. The input stage consists of two LDRs that is arranged to construct a voltage divider circuit. AC program loaded into the Atmega 328P forms the embedded software. There is a metallic frame that houses the components. This approach, similar to stepwise refinement in modular programming, has been employed as it ensures an accurate and logical approach which is straightforward and easy to understand. If there are any errors, they are independently considered and corrected.
VI. CONCLUSION

A dual axis tracker that tracks the sun will be used to implement which require the program which was written by specifying the different actions for the project to work. As a result, tracking can be easily complete. The system designed will be efficient and accurate for tracking the sun position. By using dual axis solar tracking are more efficient in tracking the sun position, the additional circuitry and complexity was not required in this case. Dual trackers are most suitable in areas where there is a change in the position of the sun.

This project will be implemented with less resources. The circuitry will kept simple, while ensuring efficiency is not affected. We will try to increase the efficiency up to 44%.

REFERENCES
