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SOLAR TRACKING SYSTEM FOR OPTIMAL POWER GENERATION

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Abstract—**Solar energy with solar tracking, will become possible to generate more energy since the solar panel depends on the sun. Even though the initial cost of setting up the tracking system is considerably high, there are cheaper options that have been proposed over time. Light Dependent Resistors (LDRs) are used for sunlight detection. The control circuit is ATMega 328P microcontroller. The solar panel is positioned where it is able to receive maximum light. As compared to other motors, the servo motors are able to maintain their torque at high speed. They are also more efficient with efficiencies in the range of 80-90%. Most of the panels still operate at less than 40%. One of the ways to increase the efficiency of solar panels while reducing costs is to use tracking. Through tracking, there will be increased exposure of the panel to the sun, making it increased power output. The trackers can either be dual or single axis trackers. Dual trackers are more efficient because they track sunlight from both axes.**

INTRODUCTION

A.General Background

This paper seeks to identify a way of improving efficiency of solar panels. Solar panel tracking is used to improve the condition. The tracking mechanism moves and positions the solar array such that it is positionedfor maximum power output. Others ways include identifying sources of losses and finding ways to migrate them.
There are various types of trackers that can be used for increase in the amount of energy that can be obtained by solar panels[1]-[3]. Dual axis trackers are among the most efficient, though this comes with increased complexity. Dual trackers track sunlight from box axis. They are the best option for places where the position of the sun keeps changing during the year at different seasons.[4]-[6] 1.2 Problem statement.
A solar tracker is used in various systems for the improvement of harnessing of solar radiation. The problem that is posed is the implememtation of a system which is capable of enhancing production of power by 30-40%. The control circuit is implemented by the micro controller.

B.Project justification

The paper ensures that the sun rays are falling perpendicularly on the solar panel to give the maximums solar energy. This is harnessed into electrical power. Maximum energy is obtained between 1200hrs and 1400hrs,with the peak being around mid day. At this time, the sun is directly overhead. At the same time, the least energy will be required to move the panel, something that will further increase efficiency of the system. The method was designed to address the challenge of low power, accurate and economical micro controller based tracking system which is implemented within the allocated time and with the available resources.There is implementation of an algorithm that solves the motor control that is then written into C-programme.

C.Objective

The main objective of the research work is to detect and compare the intensity of the light and to move the motor accordingly.

D.Scope of the Topic

The solar project was implemented using a motor. The choice was informed by the fact that the motor is fast, can sustain high torque, has precise rotation within limited angle. The design in limited to Single Axis tracking because the use of a dual axis tracking system.

MOTIVATION

Nowadays constant solar panels are used which do not move according to the sun rays, So it receives only a limited sun rays.
To overcome this problem we are using a sun tracking system which can rotate in all directions and absorb

maximum direction. It generates a high efficiency of power.

METHODOLOGY

The circuit of the solar tracker system is divided into three sections. There is in input stage that is composed of sensors.
A program in embedded software in the microcontroller and lastly the driving circuit that has the motor.
Whenever the sun light falls on the solar panel it accumulates the radiation and stores in it. It will send the messsge to themicrocontroller about the power differences which stored in it. Microcontroller will receive this information and pass the message thethe dc motor drive. As the time passes the panel rotates with the help of motor.

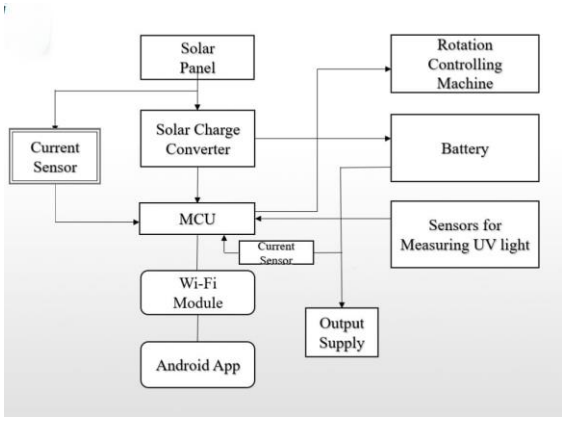

Figure 1. Block diagram for Solar tracking for optimal power generation

In this proposed methodology light intensity sensors are placed on the solar panels. In this system, we are using two sensors to capture the light intensity according to angle variations. The solar panel rotates to the direction in which the intensity is detected with the help of the motors and gears attached to the solar panel frame.
The motor is controlled using a microcontroller, the microcontroller collects the light intensity details from the two sensors using analog channels and processes the data.
When more intensity of light is observed by the sensor is detected then the microcontroller sends the signal to the motor to rotate the panel using a gear mechanism. Rotating according to sun direction is a secondary operation of the system.
The primary operation of the system is to collect the solar power from the panel and store the power on the battery charge controllers and microcontroller.
In this operation the microcontroller measures the input current from the solar panel andsends the details to the android app using wi-fi module. It will receive this information and display on LCD. then the solar panel is transferred to solar charge converter modules to convert the unregulated voltages to regulated voltage from to charge the battery.

RESULT

With this project we can implement a system with which we can grasp the maximum power from the sun by continuous tracking and can use this energy for future puposes which is cost effective and easy maintainable.

Time of day	Fixed Mount System		Proposed System	
	Open-circuit Voltage [V]	Short-circuit Current [mA]	Open-circuit Voltage [V]	Short-circuit Current [mA]
09:30	13.28	61.30	13.52	103.0
11:30	13.60	79.00	13.86	115.0
13:30	13.30	77.00	13.50	102.5
15:30	13.28	58.50	13.60	105.5
17:30	13.01	32.00	13.73	87.60
19.30	12.39	9.400	13.81	46.00

OUTCOME OF THE PROJECT

i. Solar Panel generated power and data will show in the app.
ii. Power consumed details by the output.
iii. Ultraviolet light intensity data on the app.
iv. Battery status on the app.
v. Ambient light source detailson the app.
vi. Power generated and power consumed analytics graph on the app.

APPLICATIONS

1. For controlling Renewable Energy sources.
2. For House hold purposes.
3. For industrial requirements.

DISCUSSION AND COMPARISION

The objective of the project was to design a system that tracks the sun for a solar panel. This was achieved through using light sensors that are able to detect the amount of sunlight that reaches the solar panel.

CONCLUSION

The proposed sun tracking solar system is a practicable and more efficient method of maximizing the energy received from the sun's radiation. Hardware design was carefully done to ensure use of minimum number of components for implementation.
The design of microcontroller based an efficient solar tracking system with real time clock is developed and described. The proposed system provides variable

indication of their relative angle to the sun by comparing with pre defined measured readings. By using this method,the solar tracker was successfully maintained a solar array at a increase gained over a fixed horizontal array was in excess of 40%. The proposed design is achieved with low power consumption, high accuracy and low cost

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