ISSN 2395-1621

Supercapacitor Based Solar Harvesting Using Embedded System

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ABSTRACT

Solar energy is rapidly gaining light as an important means of expanding renewable energy resources. As such, it is vital that those in engineering fields understand the technologies associated with this area. Our project will include the design and construction of a microcontroller-based solar panel tracking system. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. This system builds upon topics learned in this course. A working system will ultimately be demonstrated to validate the design. Problems and possible improvements will also be presented. In this advancing era of technology we are more concerned about the advancements made in technology rather than thinking upon the alternative sources of energy. Energy 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, as solar energy which is also considered 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 nonrenewable 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 accordingly

Keywords: Supercapacitor, Solar Harvesting, Embedded System

ARTICLE INFO

Article History

Received: 8th May 2017

Received in revised form :

8th May 2017

Accepted: 12th May 2017

Published online :

12th May 2017

I. INTRODUCTION

In One of the most promising renewable energy sources characterized by a huge potential of conversion into electrical power is the solar energy. The conversion of solar radiation into electrical energy by Photo-Voltaic (PV) effect is a very promising technology, being clean, silent and reliable, with very small maintenance costs and small ecological impact. The interest in the Photo Voltaic conversion systems is visibly reflected by the exponential increase of sales in this market segment with a strong growth projection for the next decades. A constant research preoccupation of the technical community involved in the solar energy harnessing technology refers to various solutions to increase the PV panel's conversion efficiency. Among PV efficiency improving solutions we can mention: solar tracking, optimization of solar cells geometry, enhancement of light trapping capability, use of new materials, etc. The output power produced by the PV panels depends strongly on the incident light radiation [9].

The continuous modification of the sun-earth relative position determines a continuously changing of incident radiation on a fixed PV panel. The point of maximum received energy is reached when the direction of solar radiation is perpendicular on the panel surface. Thus an increase of the output energy of a given PV panel can be obtained by mounting the panel on a solar tracking device that follows the sun trajectory, especially during the summer when the energy harnessed from the sun is more important. Photo-Voltaic or PV cells, known commonly as solar cells, convert the energy from sunlight into DC electricity. PVs offer added advantages over other renewable energy sources in that they give off no noise and require practically no maintenance.

II. BLOCK DIAGRAM

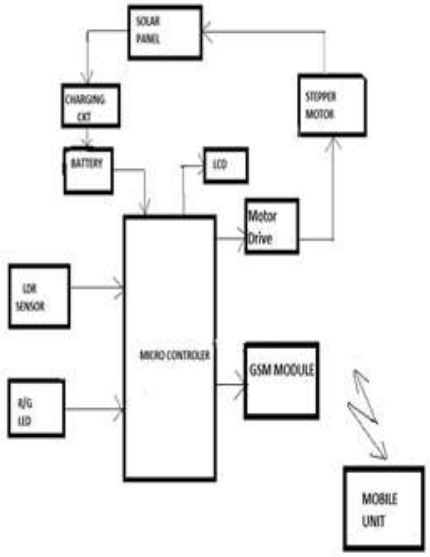

Fig1 Block diagram of solar harvesting using embedded system

In the system sunlight is emitting on solar plate and solar plate to convert the light energy in to electrical energy. A super capacitor is used for auto- wakeup from a state of complete energy depletion. The intensity of sunlight are different in three season, i.e. Winter, Summer, Rainy. In rainy season intensity of sunlight is medium and charging of battery is not possible to need auto-wake up system.To store the maximum charging use battery. In system micro-controller controls the solar panel according to maximum sunlight intensity. In GSM model is used for information about overall system by using mobile. The LED shows the battery states of system, i.e. Red- full charge, Green- Low charge. In the Figure 1 shows the connection interfaces between the UR-Solar Cap system and user supplied components. The user-supplied components include:

1. A Solar Panel that supplies energy to the system.

2. Super capacitors that buffer energy for the system.

3. A Computational Device that is powered by the system. Typically this is an embedded system that runs the Application for which the overall system is deployed.

4. An optional GSM Module that provides a communication interface for exchanging information with the harvesting system. The size of the solar panel and size and configuration of the Super capacitors can be chosen by the end user to prioritize cost, footprint, capacity or power. The system operates automatically and autonomously once the solar panel and super capacitors are connected. Primary control, harvesting, and communication functions of the system are achieved by software running on a microcontroller.

III. RESULT ANALYSIS

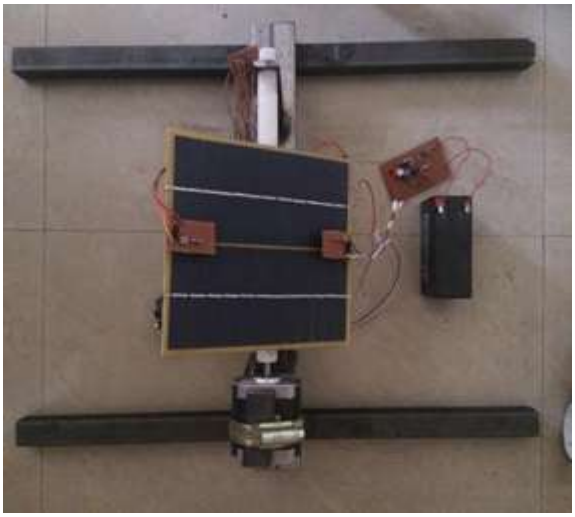

Fig 2. Solar harvesting system

In the super capacitor based solar harvesting system we have observed. that solar plate tracking is possible due to the tracking of sun path the maximum light intensity is achieved using light dependant Resister. By using LDR sensor the solar plate track the sun path. In without solar tracking system the battery is full charge in seven hour when solar plate is track according to sun path the battery is full charge in five hour. The efficiency is increased by 30 %. In this system the battery charging status and solar plate Direction is send by using GSM to the mobile user. By using GSM the SMS (short message service) is send to the user. The received Information is observed by the user. In this system no need of manual operating of solar plate position and receive all information about solar tracking system in anywhere user can access all the information.

IV. CONCLUSION

From the design of experimental set up with Micro Controller Based Solar Harvesting System Using Stepper Motor. If we compare Tracking by the use of LDR with Fixed Solar Panel System we found that the efficiency of Micro Controller Based Solar Tracking System is improve and it was found that all the parts of the experimental setup are giving good results. Moreover, this tracking system does track the sun in a continuous manner. And this system is more efficient and cost effective in long run. From the results it is found that, by automatic tracking system, there is 30% gain in increase of efficiency when compared with non-tracking system. The solar tracker can be still enhanced additional features like rain protection and wind protection which can be done as future work.

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