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Micro-Scale Solar Energyharvesting System from Low Over-Head Maximum Power Point Tracking Technique

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Abstract: Now a day's non renewable energy resource are declining rapidly. To save this resource for our future generation we should move toward the use of renewable energy resource. Therefore solar energy is the energy which will provide the high optimum output with very less time. So this paper consist of the solar energy harvesting system with MPPT technique to achieve the maximum output or maximum output w.r.t other renewable energy resource. So through this technique the solar panel will be rotate towards high intensity of light. The MPPT workon the principle of high intensity of light, i.e. instead of taking earth as the reference point we take the sun as the reference or guidance source. Thus through this system we can get the 30%-40% extra power than the previous existing system.

Key words: MPPT · Solar panel · Light intensity

INTRODUCTION

Intoday's world conservation of energy is the main goal of every human being after realization of fossil fuels exhaustion in the upcoming years. So, the renewable energy resources are getting more popularity. Renewable energy in the form of electricity has been in use from long period of 75-100 years. Among the non-renewable, renewable energy resource, i.e solar energy affords great potential for conservation. So, solar energy comes from the sun & the conversion principle of solar light into electricity is called photo-voltaic conversion which is one of the most promising & challengingenergetic technologies with continuous development, beingclean, silent&reliable, with very low maintenance cost. But before installing a solar panel or setup of any solar power plant the knowledge of the quality and quantity of solar energy are very important. The largest solar energy generating plant in the world produces about 354mega watt of electricity &is located at the Kramer junction in California. This paper makes the innovation so, that the use of maximum power point tracking system will be more convenient to anyone to installed with very less investment [1-3].

Principalof the System: In this paper MPP tracker unit consist of sensor i.e. LDR (light detecting resistor) connected with the solar panel and this LDR sense the intensity of the light from morning to till evening. This will help the solar panel to rotate according to the intensity of light with the help of stepper motor [4-7].

Working of the Circuit Panel: The panel is being divided into three subdivision based upon their working.

- Sensing unit
- Processing unit
- Maintenance unit

Sensing Unit: This unit consists of LDR sensor connected with the solar panel and gives the information to the microcontroller through analog to digital converter.

Processing Unit: This unit consists of microcontroller which will take the action against every reaction, i.e[8]. whenever the LDR sense the intensity of light and give the information to microcontroller to order the stepper motor to rotate the solar pannel as desired with proper step.

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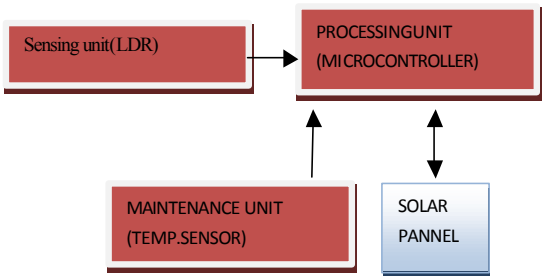

Fig. 1: Block diagram of the proposed system.

Maintenance Unit: This unit consist of temperature sensor and lcd these both are connected with the processing unit and work properly, i.e. temperature sensor (LM35) is used to detect the temperature of the solar panel and this temperature is being showed in the lcd screen and if any change (decrease) in temperature is shown in the lcd screen then it is understood that the time for maintenance of solar panel has come and we should clean the apparatus properly[9].

Solar Panel: Solar cells are system that are composed of semiconductor materials and which convert solar energy directly into the current. When lights falls on the device the light photon are absorbed by semiconductor material and electric charge carriers are generated. Silicon is the mostly used semiconductor which is used to fabricate them. Given equation gives the out put current I and out put voltage V:

$$I = npI_{ph} - npI_{sat}[exp(qV/kTA\ ns)-1] \quad (1)$$

Where np represents the parallel integer of the solar cell;ns represents the series connected integer of the solar cell;q represents the contained electricity in an electron (1.6×10^{-19} columbic); k is the Boltzmann constant(1.38×10^{-23} J/K);and A is the ideal factor of the solar cell(1~5)[10]. The current Isat in equation (1) represents the reversion saturation current of the solar power further, Isat can be determine by using the following equation.

$$I_{sat} = I_{rr}[T/Tr]^3 exp[qE_{Gap}/KA(1/T_r - 1/T)] \quad (2)$$

where T_r represents the refrence temperature of the solar cell;I_{rr} is the reversion saturation current at the time when the solar cell reaches its temperature T_r and E_{Gap} is the energy needed for crossing the energy band gap for the semiconductor materials [2].

Table I: Efficiency of the proposed system

Time	intensity	Desired voltage	proposed system o/p	Efficiency
6am-10am	700LUX	300mv	296mv	98.00%
10am-2pm	1400	325mv	295mv	98.50%
2pm-6pm	2100	350mv	292mv	98.00%

Table II: Difference between existing system and proposed system

System	For MPPT and OVER-HEAD
[1]	Negative-feedback automatic tracking, polynomial VCO(no sensor).
[2]	Fractional open circuit, PVmodule used as pilot cell.
This system (proposed system	LDRsensor, solar panel connected with stepper motor.

RESULT

This project consist of sensor in the maximum power point tracker unit, stepper motor for proper rotation of solar panel and Atmel microcontroller for the proper processing of the project and can be easily adopted by any small electronics shop which will make this project and can be used in houses, factories, harvesting purposes. Table I shows the efficiency of the proposed system [8-11].

DISCUSSION

This project consists of only sensor which gives the correct output for getting the high intensity of light without fail. This will reduce the amount of the overall circuit. This will give around 30%to 40% extra energy in the field of solar energy setup. Thus let us see the major differences in the existing system and the proposed system in the Table II.

CONCLUSION

By using this type of technique solar panel can be rotated in the direction of high intensity of light which we get from the sun. With the help of this circuit the efficiency of the solar panel would be increased. For this reason the use of solar energy in the field of non-conventional energy will increase, which is very good for our future power sector.

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