Generation of energy from Solar and its protections

A. Rajkumar 1 J. Nagendran2 J. Subramaniyan3 R. Jai Ganesh4

1 Professor, Department of Electrical and Electronics Engineering, K. Ramakrishnan College of Technology, Trichy, Tamilnadu.
2 Assistant Professor, Department of Electrical and Electronics Engineering, Dhanalakshmi Srinivasan Engineering College Perambalur.
3 Assistant Professor, Department of Electrical and Electronics Engineering, SRM TRP Engineering College, Samayapuram, Trichy
4 Assistant Professor, Department of Electrical and Electronics Engineering, K. Ramakrishnan College of Technology, Trichy, Tamilnadu.

E-mail: arkumar77@gmail.com

Abstract. In this article, a seven-level inverter powered by solar has been proposed to achieve a sinusoidal output voltage with high efficiency and enhanced power quality. This system consists of active inverter and flipped condenser clamping. It gives output voltage level of 2/3. By connecting the switched condenser branch in the front or back end series to the inverter output a seven-level output voltage wave shape can be obtained with ample non-work switching states to match the voltage of switching condensers. The consequence of the proposed method is validated using MATLAB SIMULINK for simulation. Comparing with conventional seven-level inverter topology, the proposed design used a minimal number of switches using a basic modulation process. The demand for electricity that is so high in India might be a key driver for the use of renewable power as an option for energy requirements. To satisfy this need, this article introduces a solar smart flower layout and then modeled using the resources provided in the solid function system. And use a set Photovoltaic panels harvest additional power mostly during 12 pm to 2:00 Pm in Nigeria which resulted in less renewable energy. Consequently, there is a need to increase the energy consumption of PV solar panel by developing a solar tracker cannot be overlooked. Photovoltaic cells must be aligned with the sun in order to just get optimum energy.

The microcontroller is being used to power the motor dependent on information gathered from the LDRs. The findings of this research have clearly demonstrated that the monitoring solar panel generates more electricity compared to a conventional panel. The location of solar panel including voltage was going to monitor by using IoT. Light Dependent Resistors LDRs are being used to detect the strength of lighting and thus the PV solar panel is appropriately addressed to control maximum energy. The system uses motors to regulate the amount of the solar panel. The microcontroller is being used to power the motor centered on signals obtained from the LDRs. The outcome of this work has demonstrated clearly that the monitoring solar panel generates more power compared to a conventional panel. The location of solar panel and volts was going to monitor through using IoT.

1. Introduction

As the energy consumption and the international pollution rises with economic and population growth, the based on energy issues and global reflects light are today a matter of growing concern. It is the whole of the hour to leverage traditional renewable resources that are also abundant that is obtained from assets which are obviously replenished naturally such as sunlight, wind, rain, geothermal and
solar, etc. Solar energy was among the most significant renewable energy potential which is available in nature especially in tropical areas. In particular India has fairly long warm days for even more than ten months and partially cloudy weather for much of the days of the remaining 2 months. Solar cell is an electrical signal that transforms energy from sunlight heat into electricity through photoelectric effect. Solar cells are turning points of photovoltaic (pv) systems, better known as solar panels. Solar panel is a group of photo voltaic panels which is directly attached and positioned on structural support to consume sun rays as sources of energy is a form or heating. The last several years are intelligently advertised via modern electronic display advertising of solar ‘intelligent flower and many aren’t engaged. It may well be due to the really high quality and lack of access of service. This chapter gives some studies that attempt to create a layout for solar smart flower but instead examine it all through simulator using great work before completing the experience of its fabricated. The smart flower has always been a-in-one ground installed solar panel with a monitor that tracks the sun. It nickname came from its architecture the solar cells are mounted on individual “pink flowers”that open at the start of the day. Once the sun sets, the smart flower petals lay flat and a self cleaning cycle steps in. In comparison to solar cells, the intelligent flower device includes a double-axis tracker which makes it easy for its “flowers” to face the sun via the sky during day. Due to this monitoring feature, the smart flower will generate substantially more energy than a similarly sized roof solar array device – up to 51 % more, as per smart flower homepage. The 12-petal, 194 square foot installation of a new with 2.5 kilowatts (kW) of energy production, which is equal to a 4 kW static roof array. There will be two models including its smart flower available in the United States, each of which is produced in Austria: a smart flower and the smart flower-plus. The smart flower plus provides energy storage capabilities through embedded batteries in addition to regular solar energy production that the smart flower provides.

2. Existing System

Existing machine built while using Arduino Uno Microcontroller, four LDRs and three stepper motors. The machine is powered by set of technologies and software coding. In device production, four light based resistors LDRs would be used for collecting peak light intensity. Three drivers are being used to shift the solar array as per the maximum incoming light regulated by LDRs. This same program controls this same vertical tilt and longitudinal motion of the solar panel. And this can obey the position of the sun, not just the longitudinal revolution as well as the horizontal motion as per the incidence natural sunlight mostly on solar panel.

![Block diagram of the existing system](image)

**Figure 1.** Block diagram of the existing system

2.1 Drawbacks of Existing Systems

- Solar trackers are usually designed for climatic conditions with next to no winter wanting to make someone to a much more effective analysis in hotter areas. Set racking incorporates harsh climatic conditions quite effectively than tracking devices.

- Fixed monitoring systems offer the most ground adaptability unlike single-axis tracking systems.
For existing solar panels, that were without control systems typical level of efficiency ranges from 10 percent to 4 percent-a level it should increase markedly if the current concern persists.

For hydraulic monitoring system we had also chosen a single - axis solar mechanical tracking system that used an Electric motors for our layout.

3. Proposed system

The components consists of a solar panel, physical system for installing panel, Motor controller for spinning the physical set up, analog to digital, Micro control,, communication and transport, Level connector and a IOT unit. The solar monitoring system consists of a solar panel, microcontroller and indicators. For this device to work there has to be energy released through the sun. The LDRs act as the detectors to measure the strength of light reaching the photovoltaic power. The LDR instead sends details to the microcontroller. The motor, relay circuit is then formed. The rain sensor will detect the rain so if rainfall arrive that perhaps the time instantly solar cell shuttered and switch to the way down. Voltage divider is used to screen the reference voltage with battery. The location of solar array and volt was tracking by using IoT .Light Dependent Resistors are used to feel the strength of daylight and therefore the PV solar cell is modified accordingly to control additional power.

Figure 2. Block Diagram of Proposed System

In this article is developed mainly in to the 3 ca tegories, building of hardware, monitoring system and device control module. This solar tracker utilizes the pic controller panel, dc motor, 3 LDR and, 3 resistors as well as adjust the solar array towards to the heat or a sky light. The solar panels have the benefit of improving the utilization of collecting solar energy while the planet begins its noble revolution. The triple LDRs are acting as light sensors. They are positioned for each sides of solar array and three dc motors are being used to adjust the solar panel. Since the same intensity of daylight falls on LDRs, then electric motors do not turn. Solar panel will still follow a direct sunlight and therefore will look toward this sun to even get charging all the period and provide the output maximum capabilities. The power
density can be did receive from either a static array of solar panels at a particular time. The figure 3 shows the schematic diagram of the proposed system.

Figure 3. Schematic Diagram of Proposed System

4. Results and Discussion

Based on the above discussion the solar PV panel has been protected from the many environmental changes such as rain, humidity and other natural disturbances. Based on the LDR and rain sensor rating the sensor will senses the temperature and irradiance or humidity level from the environment. A DC motor was proposed to control the PV panel to fold and rotate to prevent from water other environmental factors. The hardware of the proposed work is shown in the figure 4 and figure 5. The figure 4 will represent the controller parts and sensors arrangements. In the figure 5 represent the physical look of PV panel arrangements.
Figure 4. Controller parts and sensors arrangements

Figure 5. Physical look of PV panel arrangements
5. Conclusion

Using this approach, the solar tracker can be victorious in maintaining a solar panel at a perpendicular angle to the sun. In addition, precipitation sensors can be navigated to maintain the device working during raining. Other than, in hereafter, because once standard energy may not have been adequate for us, there will also be an actually constitute of trying to manipulate alternative energy source. Through using this immediate management, it is possible for a single individual to construct the device directly.

References

[1] Sustainable Energy Development Authority (SEDA) Malaysia. Available: http://seda.gov.my. Accessed: [05 June, 2016].
[2] G. K. Singh, "Solar power generation by PV (photovoltaic) technology: A review," Energy, vol. 53, pp. 1-13, 2013.
[3] S. Kucukkurt, A. M. Khaleghi, M. Hamidi, Y. Zhang, F. Szidarovsky, G. Bayraksan, and Y.-J. Son, "An Integrated GIS, optimization and simulation framework for optimal PV size and location in campus area environments," Applied Energy, vol. 113, pp. 1601-1613, 2014
[4] R. Al Abri, E. F. El-Saadany, and Y. M. Atwa, "Optimal placement and sizing method to improve the voltage stability margin in a distribution system using distributed generation," IEEE Transactions on power systems, vol. 28, pp. 326-334, 2013.
[5] B. Vonk, M. Gibescu, E. Veldman and J. Sloothweg, “Automatic PV productions profile generation using geographic and historical weather data”, in 19th International Universities Power Engineering Conference (UPEC), 2014, pp. 1-6
[6] H. Rowlands, B. P. Kemery, and I. Beausoleil-Morrison, "Managing solar-PV variability with geographical dispersion: an Ontario (Canada) case-study," Renewable Energy, vol. 68, pp. 171-180, 2014.
[7] S. Sharma, K. Kumar Jain, A. Sharma, “Solar cells: In research and Applications – A review”, Materials Science and Applications, vol. 6, pp. 1145-1155, 2015
[8] O. Ellabban, H. Abu-Rub, and F. Blaabjerg, "Renewable energy resources: Current status, future prospects and their enabling technology," Renewable and Sustainable Energy Reviews, vol. 39, pp. 748-764, 2014.
[9] E. Romero-Cadaval, G. Spagnuolo, L. G. Franquelo, C. A. Ramos-Paja, T. Suntio, and W. M. Xiao, "Grid-connected photovoltaic generation plants: Components and operation," IEEE Industrial Electronics Magazine, vol. 7, pp. 6-20, 2013.
[10] R. Vieira, F. K. O. M. V. Guerra, M. R. B. G. Vale, M. M. Araujo, “Comparative performance analysis between static solar panels and single-axis tracking system on a hot climate region near to the equator”, Renewable and Sustainable Energy Reviews, vol. 6-4(2016), pp. 672-681, 2016
[11] R. Kansal, "PIC based automatic solar radiation tracker,” Asian Journal of Chemistry, pp. 21-28, 2009. [12] R. A. Ferdaus, M. A. Mohammed, S. Rahman, S. Salehin, and M. A. Mannan, "Energy efficient hybrid dual axis solar tracking system," Journal of Renewable Energy, vol. , 2014.
[12] Dr. A. Rajkumar, R. Jai Ganesh, V. Suresh Kumar, T. Vishnu Kumar and T. Ram Kumar," Implementation of High Efficient Single Input Triple output DC-DC Converter,” Biosc.Biotech.Res.Comm. Special Issue Vol 13 No (3) 2020 Pp-48-55.
[13] A. T. Sankara Subramanian, P. Sabarish, M. D. Udayakumar and T. Vishnu Kumar,” Performance Analysis of Various Photovoltaic Configurations Under Uniform Shading and Rapid Partial Shading Formations”, Biosc.Biotech.Res. Comm. Special Issue Vol 13 No (3) 2020 Pp-185-192.
[14] P. Sabarish et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 623 012011
[15] A T Sankara Subramanian et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 623 012012
[16] M. Pradeep et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 623 012017
[17] M D Udayakumar et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 623 012018
[18] P. Thirusenthil Kumaran, P. Pushpakanthick, G. V. Chidambaramthanu, M. Venkatachalam, Xavier Raja Dural, R. Jaiganesh, “Power quality in distribution grids ,” International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9, Issue-1, November 2019.
[19] S. Vijayalakshmi, P. Sabarish, S.R.Paveethra, Dr.P.R.Sivaraman, Dr.V.Venkatesh, “Exploration And
Applications Of Electronic Balance For High Power Discharge Lamps At High Frequency Through Power Factor Modification”, INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9, ISSUE 02, FEBRUARY 2020 ISSN 2277-8616.

[20] C. Kalavalli, S.R. Paveethra, S. Murugesan, Dr. A. Nazar Ali, Dr. V. Venkatesh, “Design And Implementation Of High Efficiency H6 PV Inverter With Dual Axis Tracking”, INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9, ISSUE 02, FEBRUARY 2020 ISSN 2277-8616.

[21] S. R. Paveethra, C. Kalavalli, S. Vijayalakshmi, Dr. A. Nazar Ali, D. Shyam, “Evaluation Of Voltage Stability Of Transmission Line With Contingency Analysis”, INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9, ISSUE 02, FEBRUARY 2020 ISSN 2277-8616.

[22] R. Jai Ganesh, S. Kodeeswaran, M. Kavitha, T. Ramkumar, Performance analysis of piezoelectric energy harvesting system employing bridgeless power factor correction boost rectifier”, https://doi.org/10.1016/j.matpr.2020.02.085.

[23] Murugesan, S., and M. V. Suganyadevi, “Hybrid Renewable Energy Parameter Monitoring and Control of Smart Street Light Using IoT.” International Journal of Scientific and Technology Research(IJSTR), ISSN: 2277-8616, Volume 8, Issue 10, pp.645–651, October 2019.

[24] Praveen, A. Anton Amala, and S. Murugesan. “Integration of Hybrid Energy Sources for Grid Connected AC Distribution System.” Proceedings of the 4th IEEE International Conference on Advances in Electrical and Electronics, Information, Communication and Bio-Informatics, AEEICB 2018. Institute of Electrical and Electronics Engineers Inc., 2018. Proceedings of the 4th IEEE International Conference on Advances in Electrical and Electronics, Information, Communication and Bio-Informatics, AEEICB 2018. Web.