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Improvement in Efficacy of Solar System using Dual Axis Solar Tracking System

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Abstract: *Energy is required to all the creature in the world in various form. Human is the most intelligent creature; with this intelligence human invented many novel systems which made our life easy. From many decades; the sources of energy are crude oil, coke, petroleum products etc. They all comes into the categories of conventional sources. With the continues development in various area the consumption of these sources are increased in such a way that in future new generation will know only the name of these sources. Hence it is the requirement of the time to switch towards the non conventional sources of energies. It includes wind energy, solar energy, biomass etc. among all the biggest non conventional energy source is solar energy. From few decades many research have been done in this field. In this paper; hardware implementation of dual axis solar tracking system has been discussed. It is an efficient system as compare to the conventional solar systems.*

Key Word: *Solar energy, solar tracking system, Motor driver LDA2822, LDR, geared motors, efficiency.*

I. INTRODUCTION

Electrical energy plays an important role in are day to day life. Without electricity one can imagine about the life[1-5]. Fossil fuels viz. coal, petroleum etc. are available in limited amount and they also lead to the global warming due the carbon dioxide (CO_2) emission[6-10]. Hence alternate source of energy is needed to reduce the dependency on these products so that harmful byproducts can also be reduced. Solar energy plays a vital role among all the other non conventional sources of energy[11-15]. It is one of the most essential part of modern era. Electricity are generated using conventional methods viz. nuclear energy, geo thermal energy, hydro energy, and using non conventional methods viz. solar, wind etc. Solar power plants are established in many places as sun radiation is available almost everywhere[16-20]. Many research and developments have been done to increase the efficiency of the solar power plants. Efficacy of the system increases with the solar radiation direct to the solar panels. In this way solar tracking systems have been implemented[21]. The solar tracking system helps the solar panels to capture the maximum radiation from the sun[22]. This energy is to be converted into electrical energy which is used in domestic and industrial purposes. Many factors affects the solar radiation throughout the year[23]. However an efficient tracking system may be useful to increase the efficiency of the solar system.

II. PROBLEM IDENTIFICATION

In the context of the earth; solar power is available in the fixed position; which is one of the major problems to convert solar energy into electrical energy[5]. This restriction gave the idea to the researches to do the research in such a manner so that maximum of the sun rays can be utilized to generate electricity. Solar tracking system is one of the outcome in such direction. However solar tracking system increases the price of whole solar panel system[3,4]. In this paper dual axis solar system have been proposed which utilize maximum solar energy to generate maximum electrical system. It is found that as compared to the single axis solar tracking system; dual tracking solar system outperform in terms of efficiency. The other factor is that the solar tracking system's purchase price is very high for a family that uses more electricity than normal, so more than one solar panel will need to be installed to generate enough power. So, this concept is all about solving the problem that is going on at 180 degrees, this solar tracking system will detect rotation. So, compared to where the solar panel stays in just one direction, the solar panel mentioned here is extremely large. Solar energy faces another problem. Usually fixed solar energy panels would not be directly oriented towards sunlight as a result of the continuous motion of the Earth[7-10]. If the consequence of this system is that it does not achieve the highest efficiency[21-23]. The solar tracking device is the larger solution for achieving full output power due to this method.

III. METHODOLOGY

In this section; methodology and design of the system has been discussed. To utilize the maximum radiation of sun; it is desire to track the sun in two directions viz. elevation and azimuth. Fig. 1 depicts two different arrangements of the dual axis solar tracking systems which can be implemented according to our desire. As the position of sun changes over the year hence this system can help to increase the efficiency of the system used to convert the radiation of sun into electrical energy.

Fig. 1 Dual axis solar tracking system

Fig. 2 shows the circuit diagram of the implemented system which requires the following components.

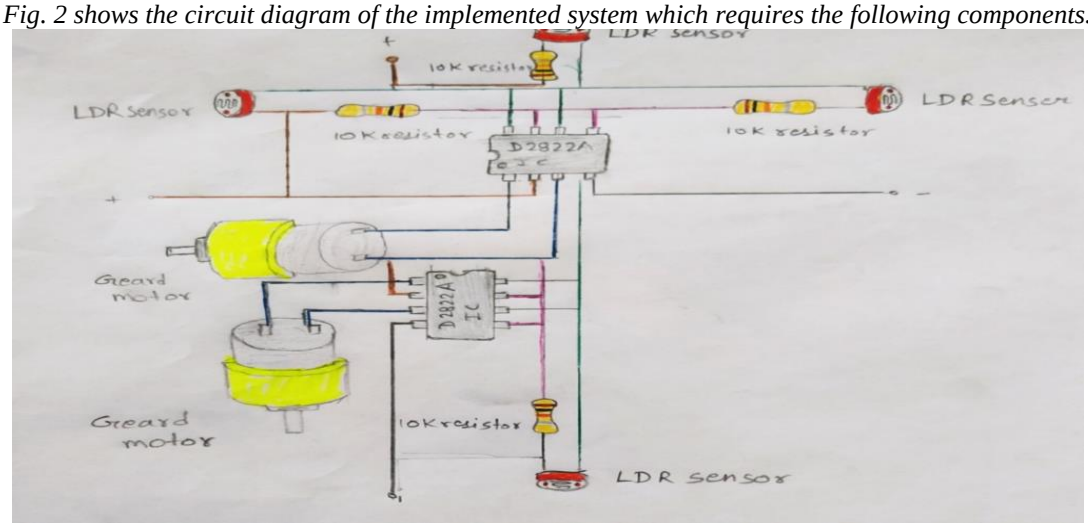

Fig. 2 Dual axis solar tracking system

- Geared Motor
- LDRs
- LDA2822 IC
- Solar panel
- Resistors

Geared motors and used for the movement in azimuth and elevation angle both. IC LDA2822 is a monolithic IC with 8 pins available in dual in line package. LDRs are photo resistors used to sense the intensity of light. The resistance of LDR depends upon the intensity of light. When it absorbs the energy in the form of light; its conductivity increases. Solar panels are used to collects the renewable energy in the form of sun light and converts it into electricity. Fig. 3 Shows our model which is a proto type to understand the working of dual axis solar tracking system.

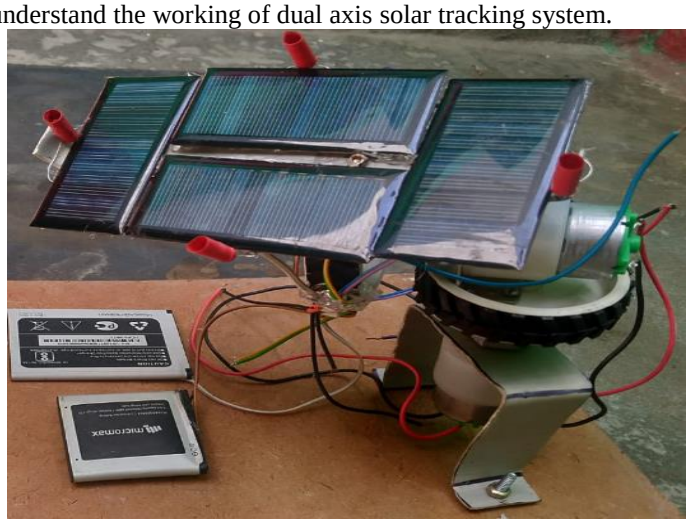

Fig. 3 Proposed model of dual axis solar tracking system

IV. RESULTS AND DISCUSSIONS

Table 1 shows the reading taken for both the LDRs at different time. The time slot have been chosen from morning 8 am to evening 5 pm.

S. No.	Time	Voltage output (LDR 1)	Voltage output (LDR 2)
1	8.00 am	0.68 V	0.65 V
2	9.00 am	0.72 V	0.77 V
3	10.00 am	0.88 V	0.83 V
4	11.00 am	1.57 V	1.58 V
5	12.00 noon	2.56 V	2.54 V
6	1.00 pm	2.89 V	2.79V
7	2.00 pm	3.44 V	3.42 V
8	3.00 pm	3.67 V	3.71 V
9	4.00 pm	3.34 V	3.43 V
10	5.00 pm	2.42 V	2.35 V

From the above discussion it is clear that the dual axis solar tracking system gives better efficiency as compared to the non rotating and single axis solar tracking system. The proposed technique requires more hardware hence it would be costlier as compare to single axis or non rotational system. Proposed technique utilizes maximum solar radiation and converts it into electrical energy hence its efficiency is higher.

V. CONCLUSION AND FUTURE SCOPE

It may be concluded that the proposed system performs better than the other existing techniques. However it is not widely used due tom many reasons. Many more research must be done in the same area. Once it is found suitable in term of practicability, installation cost and utilization it may be used worldwide.

References

[1]. *F. I. Mustafa, S. Shakir, F. F. Mustafa and A. T. Naiyf, "Simple design and implementation of solar tracking system two axis with four sensors for Baghdad city," 2018 9th International Renewable Energy Congress (IREC), 2018, pp. 1-5, doi: 10.1109/IREC.2018.8362577.*

[2]. *H. A. E. Salama and A. T. Mohamed Taha, "Practical Implementation of Dual Axis Solar Power Tracking System," 2018 Twentieth International Middle East Power Systems Conference (MEPCON), 2018, pp. 446-451, doi: 10.1109/MEPCON.2018.8635197.*

[3]. *F. I. Mustafa, A. S. Al-Ammri and F. F. Ahmad, "Direct and indirect sensing two-axis solar tracking system," 2017 8th International Renewable Energy Congress (IREC), 2017, pp. 1-4, doi: 10.1109/IREC.2017.7926026.*

[4]. *L. Ngan, C. Jepson, A. Blekicki and A. Panchula, "Increased energy production of First Solar horizontal single-axis tracking PV systems without backtracking," 2013 IEEE 39th Photovoltaic Specialists Conference (PVSC), 2013, pp. 0792-0796, doi: 10.1109/PVSC.2013.6744267.*

[5]. *Xing Zhikun, "Research and design of control system of the solar panel tracking," 2016 IEEE Advanced Information Management, Communicates, Electronic and Automation Control Conference (IMCEC), 2016, pp. 1384-1388, doi: 10.1109/IMCEC.2016.7867440.*

[6]. *Y. M. Safan, S. Shaaban and M. I. A. El-Sebah, "Hybrid control of a solar tracking system using SUI-PID controller," 2017 Sensors Networks Smart and Emerging Technologies (SENSET), 2017, pp. 1-4, doi: 10.1109/SENSET.2017.8125035.*

[7]. *K. Mao, F. Liu and I. R. Ji, "Design of ARM-Based Solar Tracking System," 2018 37th Chinese Control Conference (CCC), 2018, pp. 7394-7398, doi: 10.23919/ChiCC.2018.8483773.*

[8]. *Z. ER and S. Marangozoglu, "New Design for Solar Panel Tracking System Based on Solar Calculations," 2018 IEEE 61st International Midwest Symposium on Circuits and Systems (MWSCAS), 2018, pp. 1042-1045, doi: 10.1109/MWSCAS.2018.8624061.*

[9]. *W. X. García-Quilachamin, J. Evangelina Sánchez-Cano, F. Ulloa, E. Velesaca-Zambrano and J. Herrera-Tapia, "Analysis of the parameters of a solar tracker system, based on movements of a power generation system," 2021 16th Iberian Conference on Information Systems and Technologies (CISTI), 2021, pp. 1-6, doi: 10.23919/CISTI52073.2021.9476478.*

[10]. *M. I. Neacă, "Solar Tracking System for Several Groups of Solar Panels," 2021 International Conference on Applied and Theoretical Electricity (ICATE), 2021, pp. 1-4, doi: 10.1109/ICATE49685.2021.9465057.*

[11]. *N. Kuttybay et al., "An Automated Intelligent Solar Tracking Control System With Adaptive Algorithm for Different Weather Conditions," 2019 IEEE International Conference on Automatic Control and Intelligent Systems (I2CACIS), 2019, pp. 315-319, doi: 10.1109/I2CACIS.2019.8825098.*

[12]. *A. Masih and I. Odinaev, "Performance Comparison of Dual Axis Solar Tracker with Static Solar System in Ural Region of Russia," 2019 Ural Symposium on Biomedical Engineering, Radioelectronics and Information Technology (USBEREIT), 2019, pp. 375-378, doi: 10.1109/USBEREIT.2019.8736642.*

[13]. *Zhang Bao-jian, Gao Guo-hong and Zhu Yan-li, "Designment of automatic tracking system of solar energy system," 2010 The 2nd International Conference on Industrial Mechatronics and Automation, 2010, pp. 689-691, doi: 10.1109/ICINDMA.2010.5538213.*

[14]. *Y. Dong, H. Ma, X. Hu, Y. Sun and Y. Zhu, "Design and Production for Automatic Tracking System of Portable Solar Panel," 2019 International Conference on Robots & Intelligent System (ICRIS), 2019, pp. 18-21, doi: 10.1109/ICRIS.2019.00014.*

[15]. *P. Sahu, N. S. Maurya and S. Sahu, "Automatic Sun Tracking for the Enhancement of Efficiency of Solar Energy System," 2018 International Conference and Utility Exhibition on Green Energy for Sustainable Development (ICUE), 2018, pp. 1-4, doi: 10.23919/ICUE-GESD.2018.8635594.*

[16]. *A. Venkatesh and R. Karthik, "Investigation on enhanced performance of solar tracking through dual reflective system," 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS), 2017, pp. 417-419, doi: 10.1109/ICECDS.2017.8390200.*

[17]. *A. A. Smirnov, S. A. Malugin and A. V. Bakanov, "Designing integrated PV facility with dual-axis solar tracking system mounted on the south building face," 2017 International Conference on Industrial Engineering, Applications and Manufacturing , 2017, pp. 1-4, doi: 10.1109/ICIEAM.2017.8076254.*

[18]. S. V. Mitrofanov, D. K. Baykasenov and A. U. Nemaltsev, "Development of Automated System for Remote Control and Diagnostics of Solar Power Plant Parameters with Dual-Axis Solar Tracker," 2019 International Conference on Industrial Engineering, Applications and Manufacturing (ICIEAM), 2019, pp. 1-5, doi: 10.1109/ICIEAM.2019.8743004.

[19]. P. Fuke, A. K. Yadav and I. Anil, "Techno-Economic Analysis of Fixed, Single and Dual-Axis Tracking Solar PV System," 2020 IEEE 9th Power India International Conference (PIICON), 2020, pp. 1-6, doi: 10.1109/PIICON49524.2020.9112891.

[20]. K. Plachta, "Autonomous Tracking Controller for Photovoltaic Systems Using Global Positioning System," 2018 IEEE International Conference on Environment and Electrical Engineering and 2018 IEEE Industrial and Commercial Power Systems Europe, 2018, pp. 1-5, doi: 10.1109/EEEIC.2018.8494576.

[21]. Rizvi. T.,Dubey. S. P. and Tripathi. N.2021.Designing of a Feasible Low Pollutant Grid Integrated System for Steel Plant. CSVTU Research Journal, 10(02):144-154.

[22]. Rizvi. T.,Tripathi. N. and Dubey. S. P. 2020 Feasibility Analysis of a Grid Integrated Renewable Energy Systems in Heavy Industries. Jour of Adv Research in Dynamical & Control Systems (JARDCS),12(06):2289-2302.

[23]. Rizvi. T.,Dubey. S. P. and Tripathi. N.2022.Reconceptualizing the Application of Renewable Energy Sources in Industry: A Review. International Research Journal of Engineering and Technology (IRJET),09(01):514-518.