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Automatic Solar Panel Tracker Using Artificial Intelligence and Data Science

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ABSTRACT: This paper deals with the design of automatic dual axis solar panel tracking system is used to change the direction of panel and consume the maximum solar energy in the panel. These energies are stored in a battery and distributed in smart grid. It is a simple and low cost and this tracker is constructed using the Arduino microcontroller. The aim of the controller is to confirm the position of the panel continuously adjusted going along with the sun's position. Artificial intelligence is nothing but to think like a human to control the direction of the panel. The algorithms which are used to identify the accurate position of sun light intensity and change the direction. The controller handles light dependent resistor sensors as the input sensor that senses the light intensity comes from the sun. The difference in the resistance data are predicted by the artificial intelligence. After the prediction of maximum intensity the solar panel will automatically rotate towards the direction with the help of servo motor.

KEYWORDS: Solar panel, Light Dependent Resistor (LDR), Artificial intelligence, dual axis solar tracking, Servo motor.

I. INTRODUCTION

Nowadays, the non-renewable energies are decreasing due to the growth of the population. After decades, the non-renewable energy is available to us in a very small quantity and slowly drops the rate. So, we are using more renewable energy resources in our day to day life. We have possibility to save the non-renewable energy for upcoming generations. Renewable energies like sunlight, wind, rain, tides which are called natural resources. Solar energy is one the most important renewable energy resources which is plenty in nature generally in the world. The solar energy comes from the sun, it converts the heat. Solar energy which converts the sun light into the electricity. Nowadays, the panels are more popular. The position of the sun with respect to the solar panel is not fixed due to the rotation of the earth. For an efficient usage of solar energy, the panel absorbs energy to a maximum extent and the energy stored in a battery. Currently use the fixed solar panel to produce the electricity. The working of the solar system is described. The panel made of the silicon and it placed on the rooftops or lands. The sunlight absorbed by the solar cells during the day and evening. The energy from the cells, it generates the electricity and stored in a battery to use the house appliances. In our project is automatic in this we use the artificial intelligence and it is a branch of computer science which is capable of performing the task as the human intelligence.

II. PROPOSED SYSTEM

Solar power is the fastest growing renewable energy. In this proposed work is the implementation of dual axis solar panel tracker to control and change the direction of the panel to maximize the output power. A dual axis tracker can increase energy by tracking sun rays from switching solar panel in various directions. This solar panel can rotate in all directions. This dual axis solar tracker project can also be used to sense weather, and it will be displayed on LCD. This system is powered by Arduino, consists of servo motors, LDR sensor and LCD and also the Artificial intelligence algorithms are included in the controller. In this proposed work the LDR act as sensor to sense the sunlight intensity.

Initially give the 5v power supply to the controller. Power supply is applied to the implementation 230v is pass through the circuit. It affects the entire system. So, here use the rectifier and regulator which are used to convert the ac voltage to dc voltage and limit the fixed voltage below the 5v and passed to the controller. Artificial intelligence technique is used to analyze maximum intensity from different LDRs and the data are stored in the data structure.

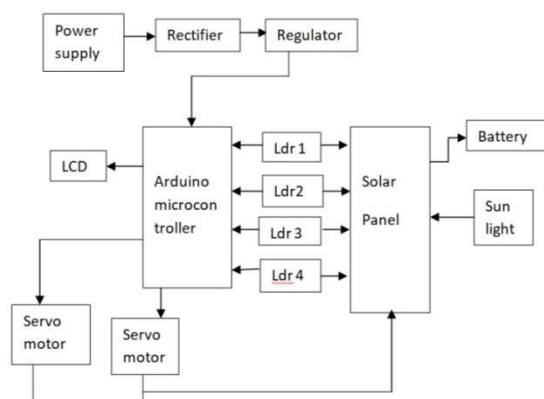


Fig:1. Block diagram of proposed system

A. Arduino Microcontroller

Arduino Microcontroller is a open source microcontroller. It can be used in both software and hardware. It is easy to use and for uploading the memory program in the Arduino. It consist of various pins and features for better efficiency. In our project we use Arduino ATmega328 Microcontroller. This microcontroller has 28 pins. It has Electrically Erasable Programmable Read Only Memory (EEPROM). This Arduino ATmega328 feature consists of advanced architecture, good performance, and low power consumption. It operates at a range of 3.3V to 5.5V but we use 5V as a standard. The program is uploaded on AVR micro controller attached on Arduino. This Arduino is used in automatic process of solar panel tracker. The data from the LDR which are stored in the EEPROM. The figure arduino microcontroller as shown.



Fig: 2.Arduino microcontroller

B. Light Dependent Resistor

LDR is also called as photo resistors. It is used to detect the presence of light or the level of the light. They provide large change in resistance for the change in level of light. When the light falls on the LDR the resistance value is

changed. This change in the resistance is based on many measures like magnitude. They are made from semiconductor materials to enable to increase their light sensitivity. The semiconductor material used in this LDR is purely passive elements because they do not pass through the PN junction and this separates them from the photo detectors.

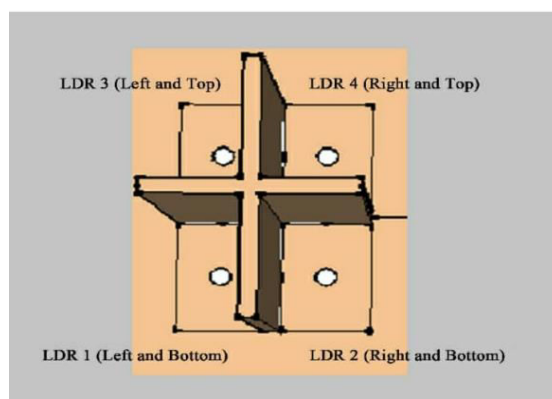


Fig: 3. Position of LDR

The LDR is divided into four quadrants by the barrier. Top and bottom LDR is used to track the sun movement South/North directions and the right and left LDR is used to track the sun in east and west directions. LDR values will be equal in flat panel in this project the values may vary and the directions are accurate.

C. Solar Panel

Solar panel is a device which consists of combination of many photovoltaic cells. These photovoltaic cells are used to convert the solar energy (or) sun light into direct current electricity. These cells use photons to have electricity. The cells in the panel are connected one another in series to the desired voltage and they also connected in parallel to increase amps. The performance of the solar panel is based on the time of day. Difference in current and voltage may affect the performance of the solar panel. Solar panels are used in wide variety such as telecommunications, remote sensing. The power in the solar panel is drawn from the battery to the inverter which converts the dc current to ac current. Solar panel gives clean renewable energy to the users. The solar panel consist of different layers such as silicon, phosphorous and boron. Phosphorous that provides the negative charge and Boron provides the positive charge. The photovoltaic effect is the main process of the solar panel to generate the electricity. Here the photons from the sun striking the surface of the solar panel which allows the electrons to pass through the panel. Solar panels produce enough electricity to supply all of its power.

D. Servo Motor

Servo motor is a type of motor which is used for rotation. This motor is rotated with the greater precision. This motor is used to rotate with an angle for the movement. The controller gives initially 5v to the motor. In this project, the motor is used to rotate the panel. The controller gives the single to motor the panel will rotate towards the desired direction either a clockwise or anticlockwise.

E. Artificial Intelligence

Artificial intelligence is a part of computer science advancement. It is a technique which can act on its own and think on its own. This is a concept of creating the machine with the capability of thinking and acting rationally and humanely. AI will behave same as human. It has many algorithms here we use Regression algorithm predicts the output value based on input features from the data fed in the system. The go-to methodology is the algorithm builds a model on the features of training data and using the model to predict the value for new data.

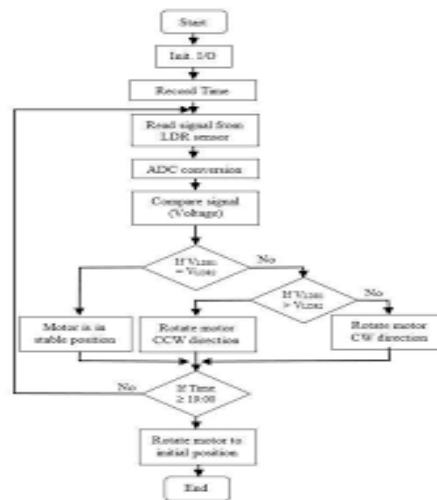


Fig :4. Flow Chart of Regression Algorithm

III.SIMULATION RESULT

After running the program, the LDRs sense the light intensity and the AI is used to differentiate the values which are collected from the LDRs. It changes the direction when the sunlight falls on the solar panel. For the identification of panel rotation use LCD to display. When the value of the LDR 1 high, the panel rotates in east direction. Then the value of the LDR2 is high the panel rotates in west direction. Similarly, when the value of the LDR 3 high, the panel rotates in north direction. Then the value of the LDR4 is high the panel rotates in south direction. The angle of the servo motor is changed during the rotation of the panel. This is shown in below diagram.

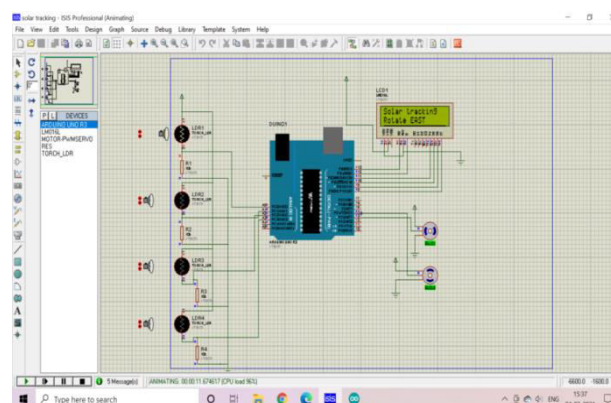


Fig :5. Simulation result

IV. HARDWARE SETUP

In this proposed work is the implementation of hardware system to maximize the power output. The range of battery used in the machine is 12v. The range of solar panel is 12v and the output of solar panel is 12 watts. Panel is used to absorb the sunlight. LDR place a major role. It senses the light intensity when then sunlight falls on the solar panel using four quadrant method. Artificial intelligence which has the many methods. In that reactive machine method is used to predict and differentiate the LDR values. After the prediction of LDR values, the data are stored in EEPROM memory. Arduino is used in automatic process of solar panel tracker. It operates at a range of 3.3V to 5.5V but we use 5V as a standard. Then, Machine learning is used for the automatic process of the solar panel. It has many

algorithms here we use Regression algorithm predicts the output value based on input features from the data fed in the system for the automatic rotation of the panel. The go-to methodology is the algorithm builds a model on the features of training data and using the model to predict the value for new data. Servo motor is a type of motor which is used for rotation. This motor is rotated with the greater precision. This motor is used to rotate with an angle for the movement. The controller gives initially 5v to the motor. In this project, the motor is used to rotate the panel. The controller gives the signal to motor the panel will rotate towards the desired direction either a clockwise or anticlockwise. Then LCD is used to display how much voltage is generated by the solar panel.

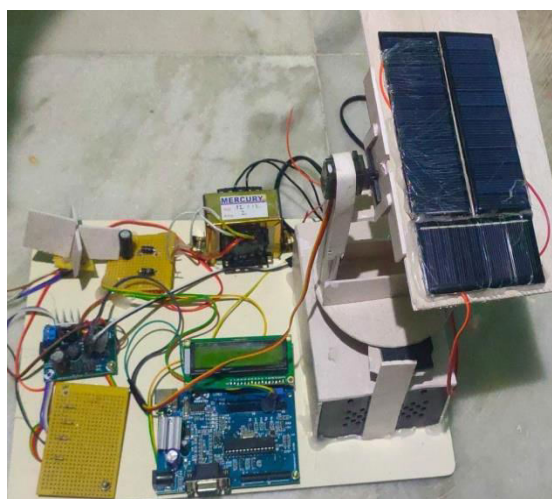


Fig :6. Hardware Setup

V. CONCLUSION

In today's world, need of an electricity is more in our day to day life. The proposed dual axis solar tracking system will be reliable and accurate and maximize the output when compared to static and single axis solar tracking system. It will be good and help us to improve the performance of the photovoltaic solar system in a simple way. In our future research, we intend to concentrate on the following challenges to develop, design and realize a dual axis solar tracking system for a large PV panel or a PV array and Make the dual axis solar tracking system as a connected object by using internet of things (IoT) technology, which can offer several benefits such as the possibility of remote control of dual axis solar tracking system and monitor the PV energy.

REFERENCES

1. R. Anand, S. Saravanan "A Correlative Study of Perturb and Observe Technique and GA- RBF-NN Method Supplying a Brushless DC Motor," International Journal of Circuits and Systems, 2016, vol.7, pp 1653-1664.
2. C.Sowmiya, N.Mohananthini, S.Saravanan and M.Ranjitha, "Inverter Power Control Based On DC-Link Voltage Regulation for IPMSM Drives using ANN" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 11, pp.1442-1448, 2018.
3. S Prasanth, G Praveenkumar, V Sridhar, S Saranraj, Dr.S Saravanan, "Paddy Harvesting Using Vacuum Inhalation Mechanism", International Journal of Innovative Research in Technology (IJIRT), ISSN: 2349-6002, Volume 6, Issue 11, April 2020.
4. P.Manikandan, S.Karthick, S.Saravanan and T.Divya," Role of Solar Powered Automatic Traffic Light Controller for Energy Conservation" International Research Journal of Engineering and Technology (IRJET), Vol.5, Issue 12, pp.989-992, 2018.



5. R.Satheesh Kumar, D. Kanimozhi, S. Saravanan, "An Efficient Control Scheme for Wind Farm Using Back to Back Converter," International Journal of Engineering Research & Technology (IJERT), Vol. 2, No.9, pp.3282-3289, 2013.
6. K.Prakashraj, G.Vijayakumar, S.Saravanan and S.Saranraj, "IoT Based Energy Monitoring and Management System for Smart Home Using Renewable Energy Resources," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1790-1797, 2020.
7. J Mohammed siddi, A. Senthil kumar, S.Saravanan, M. Swathisriranjani, "Hybrid Renewable Energy Sources for Power Quality Improvement with Intelligent Controller," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1782-1789, 2020.
8. S. Raveendar, P.M. Manikandan, S. Saravanan, V. Dhinesh, M. Swathisriranjani, "Flyback Converter Based BLDC Motor Drives for Power Device Applications," International Research Journal of Engineering and Technology, Vol.7, Issue 2, pp.1632-1637, 2020.
9. T.R. Vignesh, M.Swathisriranjani, R.Sundar, S.Saravanan, T.Thenmozhi, "Controller for Charging Electric Vehicles Using Solar Energy", Journal of Engineering Research and Application, vol.10, Issue.01, pp.49-53, 2020.
10. G. Poovarasan, S. Susikumar, S. Naveen, N. Mohananthini, S. Saravanan, "Study of Poultry Fodder Passing Through Trolley in Feeder Box," International Journal of Engineering Technology Research & Management, vol.4, Issue.1, pp.76-83, 2020.
11. C. Sowmya, N. Mohananthini, S. Saravanan, and A. Senthil kumar, "Using artificial intelligence inverter power control which is based on DC link voltage regulation for IPMSM drives with electrolytic capacitor," AIP Conference Proceedings 2207, 050001 (2020); <https://doi.org/10.1063/5.0000390>, Published Online: 28 February 2020.
12. M.Revathi, S.Saravanan, R.Raja, P.Manikandan, "A Multiport System for A Battery Storage System Based on Modified Converter with MANFIS Algorithm," International Journal of Engineering Technology Research & Management, vol.4, issue 2, pp.217-222, 2020.
13. Dr.S.Saravanan, S.Karthick, K.Rajeshkumar, S.Sriramachandran, P.Surjeethkumar, "Fishermen Border Alert System," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.9, Issue, 03, pp.236-241, 2020.
14. A.Ananthan, A.M.Dhanesh, J.Gowtham, R.Dhinesh, G.Jeevitha, Dr.S.Saravanan, "IoT Based Clean Water Supply", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.154-162, 2020.
15. S.Karthikeyan, A.Krishnaraj, P.Magendran, T.Divya, Dr.S.Saravanan, "The Dairy Data Acquisition System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.163-169, 2020.
16. A.Arulkumar, S.Balaji, M.Balakrishnan, G.Dineshkumar, S.Saravanan, "Design and Implementation of Low Cost Automatic Wall Painting Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.170-176, 2020.
17. N.Harish, R.Jayakumar, P.Kalaiyarasan, G.Vijayakumar, S.Saravanan, "IoT Based Smart Home Energy Meter", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.177-183, 2020.
18. M.Amaran, S.Mannar Mannan, M.Madhu, Dr.R.Sagayaraj, Dr.S.Saravanan, "Design and Implementation of Low Cost Solar Based Meat Cutting Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.184-190, 2020.
19. R.Anbarsan, A.Arsathparvez, K.S.Arunachalam, M.Swathisriranjani, Dr.S.Saravanan, "Automatic Class Room Light Controlling Using Arduino", International Journal of Engineering Technology Research & Management, Vol.4, Issue.3, pp.192-201, 2020.
20. S.Monika, M.Priyadharshini, R.Rajalakshmi, T.Rajeshwari, C.Ramkumar, Dr.S.Saravanan, "Design and Implementation of Electrochemical Etching Machine", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.37-44, 2020.
21. V.Periyasamy, S.Surya, K. Vasanth, Dr.G.Vijayakumar, Dr.S.Saravanan, "Design and Implementation of IoT Based Modern Weaving Loom Monitoring System", International Journal Of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.11-18, 2020.
22. M.Yogheshwaran, D.Praveenkumar, S.Pravin, P.M.Manikandan, Dr.S.Saravanan, "IoT Based Intelligent Traffic Control System", International Journal of Engineering Technology Research & Management", Vol.4, Issue.4, Pp.59-63, 2020.
23. S.Shenbagavalli, T.Priyadharshini, S.Sowntharya, P.Manikandan, Dr.S.Saravanan, "Design and Implementation of Smart Traffic Controlling System", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.28-36, 2020.



24. R.Pradhap, R.Radhakrishnan, P.Vijayakumar, R.Raja, Dr.S.Saravanan," Solar Powered Hybrid Charging Station For Electrical Vehicle", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.19-27, 2020.
25. M.Pavithra, S.Pavithra, R.Rama Priya, M.Vaishnav, M.Ranjitha, Dr.S.Saravanan" Fingerprint Based Medical Information System Using IoT", International Journal of Engineering Technology Research & Management, Vol.4, Issue.4, Pp.45-51, 2020.
26. S.Umamaheswari, M.Thilagavathi, S.Sivaranjani, N.Mohananthini, M.Selvakumari, S.Saravanan," A Study Of Renewable Energy In Smart Grid Technology", International Journal of Engineering Technology Research & Management, Vol.05, Issue.09, Pp.94-101, 2021.
27. D.Ajithkumar, J.S.Akilan, K.Dileep, R.Lokesh, E.Viswanathan S.Tamilselvan S.Saravanan," Design and Development of Electric Two Wheeler With Fast Charging", International Journal of Engineering Technology Research & Management, Vol.05, Issue.09, Pp.94-101, 2021.
28. V.Annamalai P.S.Isaiyalagan T.Manikandan T.Premkumar N.Sathya R.Prakash S.Saravanan," Design and Implementation of Automatic Rope Robot for Supplying Poultry Feeds", International Journal of Engineering Technology Research & Management, Vol.05, Issue.09, Pp.94-101, 2021.
29. S.Arvinthraj, M.Arun, S.Inbhakumar, R.Sagayaraj, S.Saravanan," Multipurpose Hybrid Electric Vehicle for Agricultural Applications", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7366-7371, 2021.
30. G.Boopathi raja, K.Dhinesh, S.Gobi, G.Nandakumar, G.Nagarajan, G.Vijayakumar, S.Saravanan," Cotton Harvesting Machine", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7372-7377, 2021
31. S.Anbarasu, K.Hariharan, S.Hariharan, R.Vinoth, T.Divya, N.Mohananthini, S.Saravanan," Battery Monitoring for E-Scooter Using Internet of Things", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7384-7389, 2021
32. S.Mangalraj, L.Manimaran, C.Kumaresan, R.Manikandan, G.Srinivasan, A.Gokulraj, S.Saravanan," IoT Based Smart Energy Meter", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7390-7395, 2021
33. M.Dhanarasan, T.Jothimurali, S.U.Manishkumar,, G.Dineshkumar,P.Sakthilakkia, A.Senthilkumar, S.Saravanan," Gas Booking Using IoT", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7396-7400, 2021
34. D.Manoj kumar, C.Kavinkumar, S.Kesavan, S.Saranraj, M.Selvakumari, P.Dhivyabharathi, S.Saravanan," Intelligent Water Level Management for Domestic Application Using GSM", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7401-7404, 2021
35. Jaladi Kishan Kanna, S.Muniyappan, A.Ajay, M.Swathisriranjani, N.Balaji , K.Prakasam , S.Saravanan ," IOT Based Multi Functional Robot", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7405-7413, 2021
36. G.Naveen, S.Guna, P.Praveen Kumar, P.Manikandan, S.Sandhiya, M.Dineshkumar, S.Saravanan ," Smart Agriculture Using IoT", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7414-7419, 2021
37. K.Karan, M.Nirmal Kumar, S. Pugalenth, R.Suresh V.Deepika, Dr.S.Saravanan ," Design and Development of E-Vehicle Based on Roller", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7420-7426, 2021
38. S.Ashok, R.Mohanraj, K.Nandhini, P.Prakash, S.Saranraj, M.Swathisriranjani, N.Mohananthini, S.Saravanan," Solar Powered Highway Dust Cleaner", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol.10, Issue.10, Pp.7427-7426, 2031



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