A Review And Implementation Of A Sun Position Tracker With A Twin -Axis Control

P Sucharitha¹, K B V S R Subrahmanyam², Ch. Vinay Kumar Reddy³ & Y.Sharvani⁴

¹Assistant Professor, Department of Electrical and Electronics Engineering, Sumathi Reddy Institute of Technology for women, Warangal, Telangana, India.
²Associate Professor, Department of Electrical and Electronics Engineering, SR Engineering College, Warangal, India.
³Assistant Professor, Department of Mechanical Engineering, SR Engineering College, Warangal, India.
⁴Assistant Professor, Department of Electronics and Communication Engineering, Sumathi Reddy Institute of Technology for women, Warangal, Telangana, India.

E-mail: sucharithathakkalapally@gmail.com

Abstract. This paper presents operation of twin axis sun position system with solar array. The photo voltaic cell is an device which is employed to convert light energy into electricity by photo voltaic effect .the facility is stored by using batteries. this is often one among mostly used renewable source of energy, it's pollution free, causes no greenhouse gases, simple accessibility, convertibility to the electricity and maintenance free. Thanks to its advantages, the system with Light Emitting Diode used for street lighting purpose. A Sun Tracker with a Dual-Axis Control is used to manoeuvre upward or downward to trace the sunshine throughout the day, the automated tracking system is made to regulate the solar array to take care of perpendicular to the sun and to soak up maximum amount of sunshine. These trackers generate 40-45% of power. The working of sun tracking system depends on the sunshine dependent resistors. These resistors are used as sensors which resistance decreases with increase in candlepower. This technique is most reliable, efficient and straightforward in construction.

Keywords: Sun position Tracker, microcontroller, solar panel, solar energy

1. Introduction:
The thermal power plant is that the main conventional source of electrical power. Coal and oil are fuels for this power plant. Why can we waste time for drilling oil and digging coal, when there’s an enormous or gigantic power plant within the sky up above us, nonstop energy for free of charge i.e., the sun, a ball of atomic power. The amount of solar power, we will absorb from sun light is minimum at sunrise and sunset and maximum at midday, when the sun directly within the middle of the sky. The energy of sun reach the world as a mix of sunshine and warmth. the sunshine makes plant grow and warmth keeps us warm enough to survive. Either the sun light or heat, we can’t use on to run electric equipment’s. That’s why we discover how to convert solar power into other sorts of energy i.e., Electricity, a photovoltaic cell is employed to try to to the work.A photovoltaic cell is employed
to catch the daylight and turns it into electricity. These cells are bundled together to form larger units called “solar modules” and paired into bigger unit referred to as “solar panels”. Solar energy is obtained from sun rays. The sun produces heat as nuclear blast when fusion of hydrogen and helium atoms. Then the produced energy collide the surface of the earth. The electrical energy is produced from radiation of solar panels [1] and stored in batteries. Solar radiation strikes the earth to produce energy need for an entire year. Solar panels are grate help us to produce energy and convert it into useful form of energy to meet modern life necessity of each day. A prototype of the automated twin-axis sun position module with a replacement sun-position mechanism and microcontroller module was proposed. The sun-position tracker operation was consists of the CONTROLLER, permanent magnet motors, sensors, gears [4]. with feedback of decoders and the CONTROLLER command motor to controls angles of solar panels to maintain perpendicular to the daylight. Each module of the system was gathered by the CONTROLLER and its prototype are going to be transmitted to wireless network through the keil program on PCs. the solar power generated by the sun position module has an increase in its reliability.

Existing system: this technique is designing the various method to power efficiency is increases to developing but all methods are developing complicated and power generation is a smaller amount developing and losses is more.

Proposed system: this technique is employed to developing the facility by using different technologies and methods wont to more power generating and technology is employed to any abnormality is happen to alert is give the actual person.

2. Solar tracker:
In photo voltaic systems, tracker used to attenuate the angle of incidence between the incoming light [2] and hence array due to energy quantity increases and it produces installation. The solar photovoltaic and solar thermal concentrated have optics that directly accepts sunlight, so solar trackers must be angled correctly to energy gather [5]. All solar concentrated systems have trackers because the systems don't gives energy unless directly towards the sun.

There are two sorts of solar trackers, single axis and twin axis solar trackers.
• Single axis solar trackers rotate on one axis moving back and forth during a single direction. Different types of single axis trackers include horizontal, vertical, tilted, and polar aligned.
• Dual axis trackers rotate on the sun face hence trackers will move in two types of Directions. The two Types are tip-tilt direction and altitude - azimuth direction

Due to advantage of dual-axis solar tracker, we utilized in our module. The sort of positing is mean wont to direct a mirror and re orient sunlight among a hard and fast axis to constant receiver. Because this sun positioners follow the sun in both directions and assist to get more solar power generation.

3. Block Diagram Description:
Power Supply: power supply is used for giving Power to all or any module. It consists of a step down Transformer that step down the voltage to 18 V ac given by diodes. The diodes are not to convert the alternating current to direct current. Rectifiers convert alternating current in to direct current after that rectified and rippled dc is given to filter and it is filtered by a capacitive Filter.
Figure 1 Functional Diagram

**Microcontroller:** This part forms the main unit of the entire paper. This part consists of a Microcontroller with other circuit’s oscillator, Reset circuits, Pull up resistors, program which written by devices is controlled by the micro controller and it is communicate and interface with the devices.

**LCD:** This part is mainly gives point out status of the paper. This paper uses liquid Display to gives the display/prompt for necessary data [2].

**LDR:** The LDR is employed to live the sunshine radiation.

**Driver circuit:** L293D may be a two driver H-bridge motor microcircuit. L293D perform like current amplifiers as they catch a lower current signal and gives a high-current signal. This higher current signal is employed to drive the motors.

**Permanent magnet Motor:** this motor is gives rated speed And the motor is given to the AT89S52 controller. And Permanent magnet motor is controlled by the controller with the following inputs given by us. Its rated speed is going to be changes consistent with the speed given by switching operation.

4. **Methodology:**

The Microcontroller AT89S52 as needed the operating voltage is 5V. This regulated voltage 5V is obtained by transformer. Rectifier rectifies the step downed a.c. voltage and is rectified by C’type filter rectifies the voltage. Now that voltage is given to the Regulator. The regulator gives us a controlled Voltage and given to AT89S52. 5V is generated using 7805 and The rectified, filtered and controlled voltage is filtered using capacitor 120μF. For ripples. The 40 th pin of AT89S52 controller gives operating voltage. The controller AT89S52 with resistors at Port0 and oscillator of 12 MHz crystal in with a couple of capacitors of is placed at 18 th & 19 th pins of AT89S52 to make it work sufficiently. Port 0 : the data pins PO is connected of the LCD. The solar panel as twin types of LDRS these are not position the sun’s exact position along horizontal axis and vertical axis. LDR is a resistor whose resistance falls with more intensity[3]. In that one of LDR gets more intensity radiation its resistance changes. resistance This message is shipped to sunshine unit that gives data to the microcontroller. The AT89S52 controller is major unit of the entire prototype, which is used find the rotation of the motors in twin axis direction. The different candle power received by the sensing device solar array is not perpendicular to sun arrays. The output from the AT89S52 controller is give to permanent magnet motor which gives speed to move solar panel for radiation.
5. Performance Analysis And Results:
The results done on prototype give within the results between the constant panel and one axis array. the above figures gives results of data taken on prototype. The variation in output as shown in Fig.3 gives entire the day output hence other Fig.4 gives the difference of data performance between the varied sun positioning system.

Figure 2  Circuit Diagram

Figure 3 Comparison with static and single axis
Figure 4 Day based output obtained

From above figures, it gives that sun positioning system shows the day based output increases with respect to single axis positioning system and increase of 40% with respect to static array. Hence this gives twin axis solar positioning system is reliable and efficient.

6. Conclusion:
The paper “A review And Implementation Of A Sun position Tracker With A twin Axis Control” has been modeled. New technology of all components of hardware used and modeled. Sun position Tracker contributing to the working model of the each unit and of each module is tested hence carefully placed. Another is using advanced IC’s and the paper is implemented with the help of new technology.

7. References
[1] W. Yue, S. Changhong, Z. Xianghong, and Y. Wei, Oct 16-18,2009, vol 1 pp. 90–93. “Design of solar LED streetlight automatic negative feedback circuit,” in Proc. Int. Conf. Energy Environment Technol.

[2] R. Caponetto, G. Dongola, L. Fortuna, N. Riscica, and D. Zufacchi Jun. 9–11, 2010, pp. 1423–1427. Design of latest intelligent street light system, in Proc. 8th IEEE Int. Conf. Control Autom.

[3] Divya Gnanarathinam, Sundaramurthy, Amitabh Wahi January 2012. “Solar energy in India: Strategies, policies, perspectives and future potential”, Vol. 16, Issue 1, Pg. 933-941

[4] Rajasri I., Gupta A.V.S.S.K.S., Rao Y.V.D.2012, Volume110, issue 116, pp. 2619-2622, Structural aspect of symmetry and its effect on generation of Planetary Gear Trains, Applied Mechanics and Materials.

[5] Subrahmanyam K B V S R, Deshmukh R, 2020, Implementation of cuckoo search optimization algorithm in partial shading of strings based network of photo voltaic system, Journal of Green Engineering.