International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 10 | Oct 2021 www.irjet.net p-ISSN: 2395-0072

ADVANCE SOLAR TRACKING SYSTEM

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Abstract - *The demand for stable and clear forms of electricity obtained from renewable energy sources has increased in recent decades. The goal of this project is to adjust the position of a solar panel to match the movements of the sun. As the price of fossil fuels varies, renewable energy is fast gaining relevance as a source of energy. It is consequently vital for engineering and technology students to grasp and appreciate the technologies related with renewable energy at the educational level. A solar tracker is a device that allows you to point a photo-voltaic array, solar panel, or concentrating solar reflector toward the sun. Solar-powered equipment performs best when it is directed directly at the sun, therefore a solar tracker can improve its efficiency over any fixed position. About 1% to 2% of this energy is turned to wind energy (about 50-100 times greater than the energy transferred to biomass by all plants on the planet). Vertical and horizontal air currents are induced by differential heating of the earth's surface and atmosphere, which are influenced by the earth's rotation and land contours. WIND. For example, the Land Sea Breeze Cycle. We have identified that in conventional tracking system, the panel was perpendicular profile to the sun's rays and tracker could rotate one way only. In our model we solved the problem using two way axis movement with parabolic reflector to concentrate the reflected rays, so that to increase efficiency.*

***Key Words*:** Solar panel, Energy, Tracking systems, micro-controller

1. INTRODUCTION

1.1 Need of project:

The use of the sun's radiant energy is referred to as solar energy. The sun provides 1.74 x 1017 watts of power to the earth per hour. Solar power and solar energy are interchangeable terms, however solar power refers to the conversion of sunlight into electricity using photo-voltaic, concentrating solar thermal, or experimental technologies such a solar chimney or solar pond. Solar panels are photo-voltaic cells that produce voltage when exposed to sunlight. If you move the panels around, the power output will alter. Direct sunray on solar panels can provide good output; otherwise, the value of their outputs may be reduced.

As a result, we must follow the road that will lead to the greatest amount of power. The goal of this project is to adjust the position of a solar panel to match the movements of the sun. Solar panels are used in this project, as well as a micro-controller. As the price of fossil fuels varies, renewable energy is fast gaining relevance as a source of energy. It is consequently vital for engineering and technology students to grasp and appreciate the technologies related with renewable energy at the educational level.

1.2. Basic Idea

A solar tracker is a device that allows you to align a photo-voltaic array, solar panel, or concentrating solar reflector or lens toward the sun. As the sun moves through the sky, its position in the sky changes with the seasons (elevation) and the time of day. Solar-powered equipment performs best when it is oriented at or near the sun, hence a solar tracker can improve the efficiency of such equipment over any fixed position, but at the cost of increased system complexity. Because the solar panel is constantly able to maintain a perpendicular profile to the sun's rays, solar tracking allows for more energy to be created. Solar panel tracking systems have been in development for several years. Because the sun moves across the sky during the day, it is beneficial to have the solar panels track its location so that they are constantly perpendicular to the solar energy emitted by the sun. PV systems will be able to absorb more power as a result of this. It has been projected that using a tracking system instead of a fixed system can enhance power output by 30% to 60%.

Single axis tracking systems:

Tracking solar panels having a single axis. The panels can rotate around the axis in the middle. The actuators that tilt the panels can be provided by LINAK.

Dual axis tracking systems:

Dual axis tracking is most commonly used to orient a reflector and redirect sunlight along one fixed axis toward that stationary receiver. However, the system might increase the yield of your PV cells. LINAK can supply you with high-quality dual-axis actuators for these panels.

The three-bladed turbine is the most popular design. The turbine's steadiness is the most critical factor. When calculating the dynamic parameters of a machine, a rotor with an odd number of rotor blades (and at least three blades) can be compared to a disc. A machine with a stiff frame will have stability issues with a rotor with an even number of blades. The reason for this is that the lowermost blade passes into the wind shadow in front of the tower at the exact instant when the tallest blade bends

backwards because it receives the most strength from the wind.

2. LITERATURE REVIEW

2.1 Solar Tracking System: More Efficient Use of Solar Panels

The potential system benefits of a basic tracking solar system using a stepper motor and light sensor are demonstrated in this study. By designing a system that follows the sun to keep the panel at a proper angle to its beams, this technology improves power gathering efficiency. A solar tracking system is created, installed, and tested in the field. The trial findings as well as the design details are displayed.

2.2 Design and construction of an automatic solar tracking system

In today's world, the most pressing issue is the energy dilemma. Conventional energy resources are not only limited, but also a major source of pollution in the environment. Renewable energy resources are becoming more important around the world as a way to reduce reliance on conventional energy sources. Solar energy is quickly gaining traction as a viable option for boosting renewable energy use. Solar cells, which turn sunlight into electricity, are both expensive and inefficient. To minimize the cost of the solar cell, many approaches are used to boost its efficiency. The most suited technology for increasing the efficiency of solar cells by tracking the sun is a solar tracking system. This study presents a micro-controller-based design methodology for an autonomous solar tracker. The solar tracker uses light-dependent resistors as one of its sensors. The tracker is developed with a precise control mechanism that allows for three different ways to manage the system. A modest solar tracking system prototype is also built to demonstrate the design methods given here.

2.3 High–Precision Solar Tracking System

We provide a novel methodology for tracking the sun based on the usage of a commercial web cam as the sensor element in this paper. An experimental electro-mechanism was created and tested to see how accurate and effective it was at tracking the sun in various weather situations. Intermittent cloud cover and temperature variations had an impact on system performance, which was investigated. The system had a 0.1^{o} precision and was very resistant to temperature changes. It was shown to be capable of relocating the sun as well as extrapolating its position when it was not seen for an extended length of time.

3. BLOCK DIAGRAM:

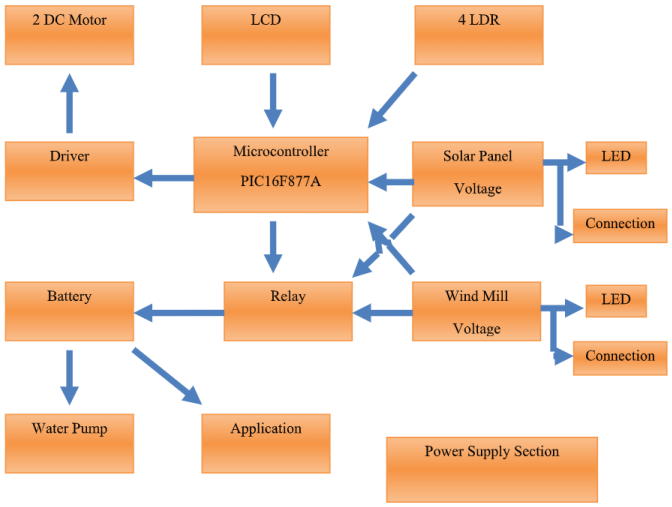

Fig -1: Block Diagram of Solar Tracking System

3.1 Hardware Implementation

The project's main goal is to create a single automated solar tracking system. For this, we're utilizing a PIC16 micro-controller with four LDRs to measure light intensity and a DC motor to rotate the solar panel. We're using embedded C to create one application programme and loading it into a micro-controller. When the sun rays hit the LDR in the block diagram above, it generates varying analogue output based on the strength of the light. The PIC16F877A micro-controller will read data from the LDR and convert the analogue signal to a digital signal using the inbuilt serial ADC. The PIC16F877A micro-controller compares the output of the LDR that has previously been fetched in the programme. Program generates control signals which are given to DC motor driver. DC motor is rotating via clockwise or counterclockwise motor driver L298N.

After sun is track and solar radiation start fall on parabolic reflector it reflect solar radiation towards solar panel or PV cell. PV cell are generate electrical signal and store that energy in battery by using relay. One more part is used in this project that is Windmill is windmill voltage is stored at battery through relay. Relay is used to pass maximum voltage come from solar panel or windmill towards battery. When energy is store at battery than many application are run from battery voltage.

There are two types of automatic tracking control for existing solar energy: The first is to use a photosensitive sensor and a Schmitt trigger, or one-shot, to control the motor stops, turn; the second is to use two light sensors and two comparators, respectively, to control the motor reversing control. Because the strength of the sun at noon changes in ambient light and the range is huge throughout the year, it is difficult to make large solar energy receivers track the sun-weather season with the

above two controllers. Two voltage comparators were used in the control circuit described here, but the input side of the light sensors was bridged by two photosensitive resistors in series. Each group has two photosensitive resistors, one for the comparator's bias resistor and the other for the next bias resistor; one is a test solar light and the other is ambient light detection, both of which are delivered to the comparator's input side. When comparing light levels, there is always a difference. As a result, the controller can track the solar receiver's seasonal weather sun, and debugging is quick and inexpensive.

From stored energy many applications are to be performing is possible e.g.: water pumping, home appliances, industrial application, etc.

3.2 Software and Algorithm

1. ARES 7 Professional

2. EXPRESS PCB

3. MPLAB

Algorithm:

STEP 1: START.

STEP2: Enable input/output pins for detection of peripheral devices respectively. Make 1 port as input port for checking status of LDR.

STEP3: Check whether light intensity of any LDR is increases. If any LDR intensity is high, Go to next step.

STEP4: If any LDR intensity is high than micro-controller send high signal to respective port, and rotate towards light intensity.

STEP5: When light fall on solar panel then generated energy will be stored at battery by using particular port. go to step 3.

STEP6: STOP.

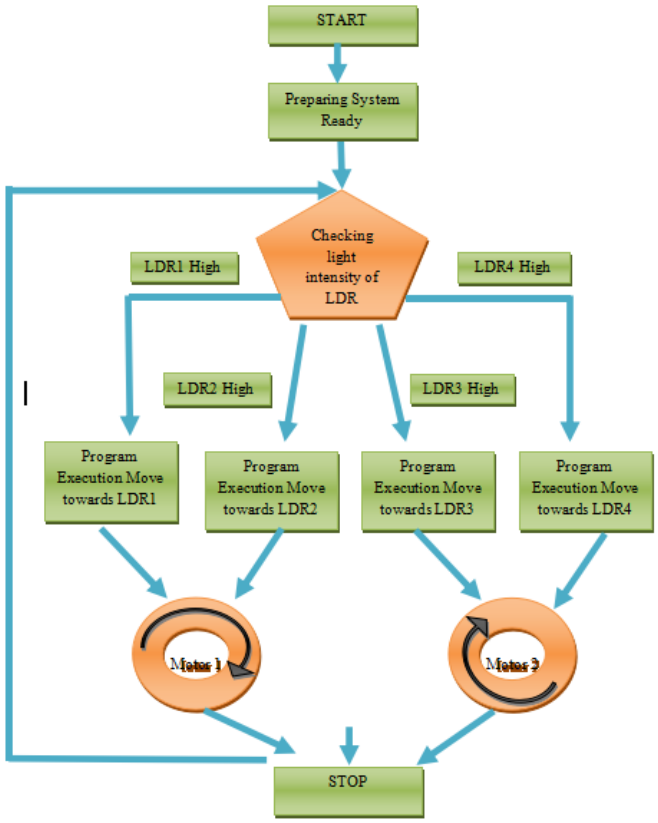

Fig -2: Flow Chart of Solar Tracking System

4. Advantages :

- No need of fuel
- Non-polluting & quick responding
- Full automate and easy maintenance
- Can be integrated with other renewable energy sources
- Simple & efficient
- Reduces man power.
- It provides major security.
- Useful in the modern days.
- The advantage of this unit is that to run the system it does not need computer.
- Solar cells directly convert the solar radiation into electricity using photo-voltaic effect without going through a thermal process.
- During the winter the sun has a low position, tracking angle from sunrise to sunset is shortened.

5. Limitations :

- Insufficient power is collected from the light source to operate the control system.
- Cost of high-efficiency solar panels is too high.
- Weather condition can affect the system.

6. Applications:

- Light applications without using normal power supplies.
- In Remote areas implementing small power systems units at each home.
- Wireless electronic device charging.
- Wireless power transfer.
- Solar automation.
- Wide area coverage appliances.
- Using this system to getting hot water.
- In Remote areas implementing a small power systems unit at each home.

7. Future Scope :

1. Fix the photo sensor leads that are causing the motor to bind. A slip ring mechanism, thinner gauge wire, a larger motor with more torque, or a combination of any or all of these ideas could be used to accomplish this.

2. Using a new light sensor improves tracking sensitivity and accuracy.

3. A photo-transistor with an amplification circuit would provide superior tracking accuracy/precision and resolution.

4. To reduce the number of discrete components utilized, use a UCN5804 Darlington transistor array.

5. To improve tracking accuracy, use a dual-axis design rather than a single-axis one.

6. In the future, conventional energy will be insufficient, necessitating the usage of non-traditional energy sources.

7. It can be controlled using a computer.

8. CONCLUSION :

It has been estimated that the use of a tracking system, over a fixed system, can increase the power output by 30% - 60%. This project presents a method of searching for and tracking the sun and resetting itself for a new day, this provides an opportunity for expansion of the current project in future years.

By using solar energy, we are conserving electrical energy which further leads to energy generation as we know **"ENERGY CONSERVATED IS ENERGY GENERATED".**

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