

A Novel Method to Generate Maximum Power Using Maximum Power Point Tracker in Solar PV Systems

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Abstract

The main goal of this project is to achieve the maximum solar panel or photovoltaic cell power production. The Sun's Direction is, in general, from East to West but the location of the Sun varies from season to season. Holding this in mind, we have constructed a device that rotates in three dimensions to capture as many photons as possible from the Sun rays as possible. The photovoltaic panel turns solar energy (photons) into electricity. Through doing so the system's performance efficiency is improved relative to the fixed mounted system's efficiency. PLC (Programmable Logic Controller) controls the overall project, and linear actuator-controlled rotation of the panels.

Keywords: PLC, Linear Actuator, Solar Panel, Relay.

1. Introduction

Renewable sorts of electricity have end up a topic of situation for academics, technicians, buyers and decision-makers all around the global with the upcoming loss of fossil gas re assets with inside the future Hydroelectricity, bioenergy, sun, wind and geothermal electricity, tidal energy, and wave energy are all new sorts of electricity which are getting attention. Because in their renewability [1], fossil gas re assets are taken into consideration appropriate substitutes. Solar photovoltaic (PV) electricity is amongst those sorts of electricity which are a few of the maximum to be had resources. Thanks to research and improvement sports to enhance the performance of sun cells and decrease the cost, this era has been followed greater widely for residential use nowadays.

According to the International Energy Agency (IEA), for the reason that early2000s, worldwide photovoltaic ability has risen at a mean of forty nine in keeping with cent in keeping with year. Solar PV energy is relatively anticipated to end up a substantial energy supply with inside the future. Despite the benefits, however, sun photovoltaic energy continues to be a long way from changing traditional electricity re assets. Maximizing the energy manufacturing of PV structures in regions that do not acquire an enough quantity of sun radiation is still a problem. We do want greater superior production generation to enhance the functionality of photovoltaic materials, however enhancing tool layout and module production is a possible technique for making sun photovoltaic [2] power greater efficient, making it a dependable choice for customers.

2. Proposed System

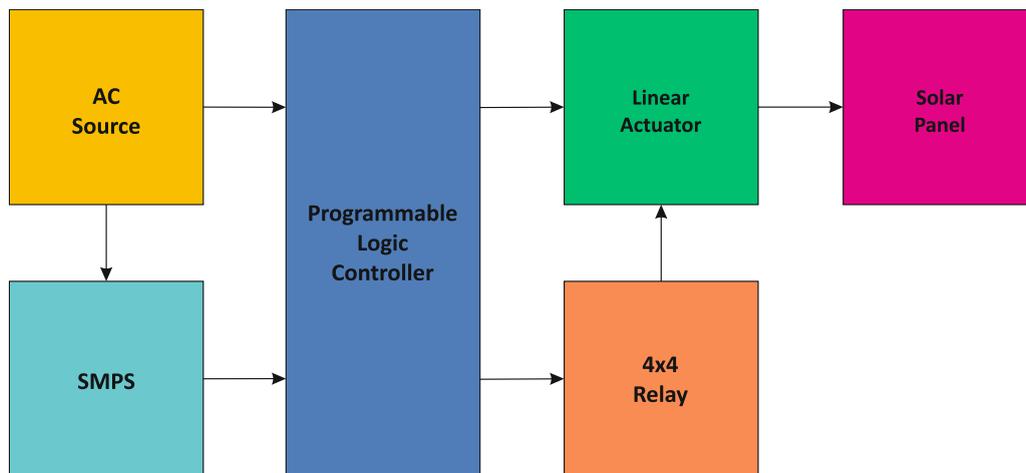


Fig.2.1 Block Diagram for MPPT

The supply of the enter ac furnished to the electricity deliver switched in mode. We obtain regulated DC output voltage from unregulated supply of ac thru the SMPS circuit. SMPS is a complicated circuit like different supplies, imparting excessive- voltage DC electricity is typically switched at a very excessive switching velocity with inside the variety from 15 KHz to 50 KHz. Connect dc output from SMPS to a programmable common sense controller that acts because the center of the system. Both re assets are given for the reason of switching and the dc supply foe relay and linear actuator switching for percentage. Linear actuator that produces movement in an immediately linear and applies to the gadgets used to convert rotational movement into the corresponding linear movement used the practice to tilt the solar panel.

This phase of the paper will pay attention on the subject matter's practical and engineering aspects, which includes the configuration of a PV system, its subsystems and components, mechanical setup and different factors affecting overall performance and performance of PV structures. Because of its extensive use of electrical and digital information, energetic sun tracker is amongst the applied sun monitoring structures the selected subject matter of studies for this project. It is likewise the method this is regularly implemented to soak up the sun light

Improving the operation of energetic sun trackers alongside with advanced production technology of photovoltaic substances is the most powerful manner to similarly utilize the sizeable quantity of energy. Based on sun module rotation, energetic sun trackers may be categorized into the unmarried-axis and dual- axis of fundamental forms. Solar PV panels are circled in single axis trackers (SAT) round an unmarried axis, that's typically aligned with the North meridian. SATs may be adjusted in step with the axis vicinity with appreciate to the floor in a lot of ways. SATs permit the sun modules to rotate in step with the Sun's positions among east-west directions. SATs combine versatility, simplicity and performed pretty well.

3. Hardware Description

3.1 Programmable Logic Controller

A unique programming interface utilized in business manage structures is the Programmable Logic Controller (PLC). Because of its sturdy design, incredible useful capabilities which include sequential manage, counters and timers, ease of programming, green manage functionality and simplicity of hardware use – this PLC is used as extra than a unique-reason virtual pc in industries in addition to different manage-gadget areas. Most industries abbreviate those gadgets as "PC," however it's also used for private computers; numerous producers have known as those gadgets as PLCs due to this. programmable common sense controller is used for business functions in addition to for civil programs which include washing machine, working elevators and traffic alerts manage. There are numerous kinds of PLCs to be had available in the marketplace today from a massive variety of manufacturer.

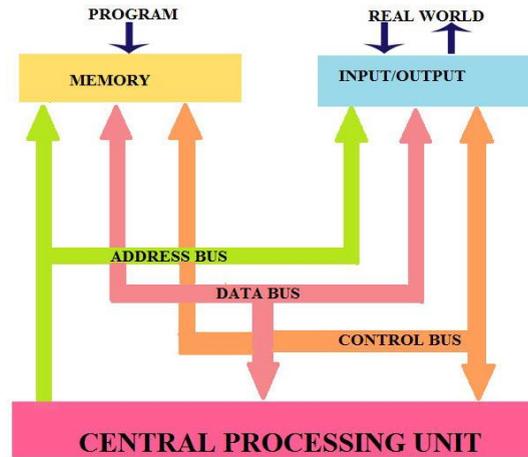


Fig.3.1 PLC Architecture – Various Units

3.2 Switched Mode Power Supply

Switch mode power supplies (SMPSs) used as an efficient and reliable power source for a variety of applications. This is due in large part to their efficacy. This is where the SMPS offers scale, weight, cost, productivity and overall performance advantages. These have become a part of approved electronic gadgets. It is basically a system in which power semiconductors provide energy conversion and control that continuously turn "on" and "off" at high frequency.

3.3 Linear Actuator

Linear actuators generate movement in an instantly line, in preference to a conventional electric powered motor's round movement. In gadget equipment and business machinery, in computer peripherals consisting of disc drives and printers, in valves and dampers and in many different locations in which linear movement is needed, linear actuators are used. Inherently, hydraulic cylinders or pneumatic cylinders produce linear movement numerous different strategies are hired to offer linear movement from a spinning motor. Linear actuators consult with the units used to convert rotational movement into the linear movement that corresponds. A linear actuator's display load enter is used to manipulate the quantity of pressure the linear actuator places on. These units have large application in each the manufacturing and home environments.

Piezoelectric, mechanical, hydraulic, pneumatic, and electric are the unique kinds of strength used to power electric powered linear actuators. However, the general use of DC or AC electricity to function such units. Electrical linear actuators offer the patron with many advantages. Types mechanical actuators typically, linear mechanical actuators function through changing rotary movement into linear movement. A few fundamental kinds of gadgets are broadly used for conversion: screw: lead screw, screw jack, ball screw and curler screw actuators all paintings at the precept of the fundamental screw machine. The screw shaft travels in a line through spinning the actuator's nut. Wheel and axle hoist, winch, rack and pinion, chain power, belt power, inflexible chain and stable belt actuators paintings on wheel and axle precept. To generate linear movement a spinning wheel actions a cable, rack, chain or belt.

3.4 Solar Panel

Solar panels are the ones units used to soak up and rework the sun's rays into power or heat. A sun panel is absolutely a set of sun (or photovoltaic) cells which may be used by photovoltaic impact to generate power. These cells are organized on the floor of sun panels in a grid-like pattern. Thus, it could additionally be represented as a set of photovoltaic modules hooked up on a supporting structure. These days, sun panels are utilized in large- scale digital device's including calculators, which perform so long as there may be daylight. The most effective big disadvantage sun panels have, however, is that they're very expensive. Solar panels are frequently constructed outdoors, as they require daylight to be charged. A small-scale and practical tip-tilt Single Axis Solar Tracker shown in has been fully developed and implemented at the end of the project. The end product is

capable of generating more than 30 per cent of power than the solar panel [3-4]. Rotating a photovoltaic panel in two different directions, the reaction between the photovoltaic panel and the light. The power loss can be calculated by the following equation.

$$\text{Power loss} = (P_{\text{max}} - P_{\text{max}} \cdot \cos(i)) / P_{\text{max}} \quad (1)$$

$$\text{Power loss} = 1 - \cos(i) \quad (2)$$

4. Result and Discussion

This project is a small scaled practical tip tilt single axis solar tracker shown in has been fully developed and implemented at the end of the project. The end product is capable of generating more than 30 per cent of power than the solar panel. Rotating a photovoltaic panel in two separate directions [5], the reaction between the photovoltaic panel and the light. Below graph shows result based on real time operation.

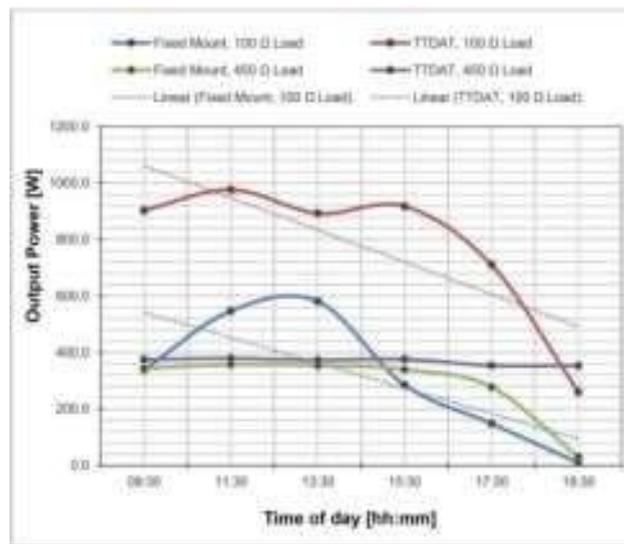


Fig.4.1 PLC Working Principle



Fig.4.2 PLC Working Principle

This ended in imperfect aligning feature of the tracker, where misalignment might be as much as eleven degrees. The wrong alignment additionally activated degree common realignments, which drew greater energy [6]. In real commercial projects, it's far encouraged to the usage of excessive great cars for higher precision.

5. Conclusion

The aim of the project was to design and implement a small- scale product of tip tilting single - axis solar tracker with basic tracking functions [7]. Designing and implementing processes have been completed as per the design requirement. Solar tracking system has been done with the help of programmable logic controller the controller has been designed to operate the panel -11 degree to+11 degree [8] with respect to sun direction. The step by step movement of solar panel been described by the time program.

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