A novel PID controller based solar panel tracking system

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Keywords: Solar panel, steeper motor, PID controller

ABSTRACT - In the world, the renewable energy creates the sustainable and clean energy for the new generation in the future life. This solar energy resource of these considered utilizing the electricity production. So presently, use of solar panel energy systems needs more improvement. Sun tracking system is a key component in the controlling system obtaining maximum efficiency. The different type of controllers has been proposed in the literature to enhance the performance of the sun tracking system. In this paper performance of the solar panel, the tracking system has been improved by using a "PID controller". The proposed PID controller compare to the P controller is found to better performance.

1. INTRODUCTION

The renewable energy source is a very important resource in electric energy generation [1]. This renewable energy source is several, which use for electric energy generation, such as wind power, solar power, geothermal power etc. Solar-based power is a decent decision for electric energy, as the sun-based vitality is straightforwardly changed over in electrical, the vitality by solar power PV modules [2]. The solar panel is made upon silicon cells. Generally, Solar panel trackers (SPT) systems can use power to generate process from sunlight. This tracking system needs only maximum sunlight to generate power. Moreover, the equipment to get maximum sunlight automatically with solar panel tracking help power generation by setting [3]. This solar tracking system is taken high-intensity light. This system automatically changes the do direction to get the high intensity of light [4]. The SPT system is of two types: "single-axis and dual axis tracking system". The single axis tracking depends only on two sides and dual axis tracking system depend only four sides. Both solar panels tracking system is very necessary to produce the electricity. In this paper performance of the solar panel, the tracking system has been improved by using a "PID controller. It has stabilized the control gain. In this paper, the author proposed the "PID controller" for the single-axis tracking system to provide improved performance. The design and development of the "PID controller" are discussed in the paper. The comparison to the PID controller provides better performance rather than the P controller.

2. METHOD OF PID CONTROLLER

This is a solar panel tracking structure which executes be utilized as an energy creating technique is from day-light. This needs just maximize daylight to create power. In this work, helps the power created by array the hardware to acquire the most daylight naturally. This tracking system is following for high power of light. The several among outputs of the devices are assumed to the PID controller unit. Here in this work are utilizing the PID controller for following and producing energy from sunlight as shown in Figure 1.

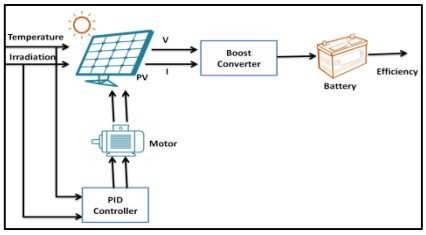

Figure 1 Architecture of PID controller based Solar panel tracking system.

The PID controllers are normally utilized to manage the time conduct of a wide range of sorts of dynamic plants and engineering problem solve. PID is a control procedure which objectives to diminish the blunders of a framework by experiencing three diverse numerical tasks and doleful outcomes up delivering a controlled output. Moreover, the PID formula described in Equation [1].

$$P + I \times \frac{1}{S} + D \times \frac{N}{1+N\times\frac{1}{S}} \quad [1]$$

Here, P proportional, I integral, D derivative, and N filter constant.The corresponding impact affects controller output as mistakes increase with a particular pick up esteem. The relative impact builds the precision of dynamic and static reaction of a framework. That is, it affects a system in the method for quick response time and a ruination of errors. In this examination, a programmed tuning code is implanted in the PID because of criticism acquired from the framework. The fundamental impact affects controller outputs relative to the total of the mistakes from the powerful activity of the framework. This investigation centres on vital impact and the indispensable coefficient is dictated by a programmed tuning framework and by the experimentation strategy. "Ziegler– Nichols "strategy is a standout amongst the best techniques that expand the utilization of "PID controllers". The initial phase in this technique is array the "I and D" gain up to zero, expanding the P avail up until a managed and static swaying is acquired on the output. At that point, the basic gain up KC and the wavering period P0 is a record and the "P, I, and D" esteems are balanced likewise in Equation [2].

$$K_P = 0.6\,K_c,\ K_1 = \frac{2K_p}{P_0}, K_D = \frac{K_P P_0}{8} \quad [2]$$

The transfer function of PID control is given by Equation [3]:

$$G_{PID}(S) = K_P + \frac{K_1}{s} + K_D(S) \quad [3]$$

3. PID CONTROLLER ALGORITHM

The solar panel tracker is the very intelligent way to produce the solar energy. In this solar panel tracking, for the most part, utilizes two sensors for detecting the sun way. The LDR sensors estimating light power are put on sun based following framework by showing in "east and west". The fundamental thought is to peruse the incentive to LDR1 and contrast it and the estimation of light thickness to LDR2. The resilience esteem is resolved by the affect ability of the sensor. Because of this, it gives that sunlight based beams reflect sun powered boards oppositely. The control calculation of the sun based following framework appears as shown in Figure 2.

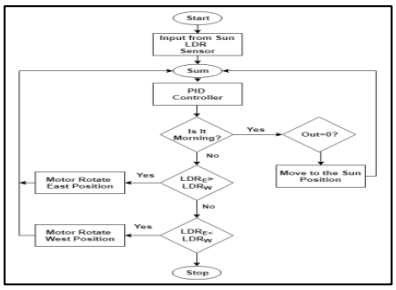

Figure 2 Algorithm of PID controller based solar panel tracking system.

4. SIMULATION RESULT

In this model, solar panel tracking for potential results is utilized in the mat lab simulation. The models represented in Figure 3 the same actuator, a stepper motor, controlled by a PID controller and a P controller. The parameters set as to: "Phase winding resistance = 0.55 Ohm, Phase winding inductance = 0.0015 H, motor" torques constant Nm/A, Detent torque = 0 Nm, "Full step size = 1.80". The block receives input signals from the "Stepper Motor driver" block. This block generates PWM pulses based on an analogue control voltage titled "Vref". The Vref signal is computed from the signal generated by the controller (PID or P) which processed with the "Abs" block, which extracts the absolute value of the control signal, The "Data type conversion" block converts the logical value generated by comparison block to real values, which then is amplified. In this system, as can be seen, by the change irradiation and temperature for consistently the new obligation cycle will generate the controller for the solar panel tracking based accuracy. Finally, in this project based on the sun angle condition, temperature and irradiance detect more develop output by the PID controller tracking system as shown in Figure 4. In summary, the proposed PID controller provides better performance rather than p controller.

5. CONCLUSION

Smart solar systems as track the change in the sun's rotation through the day gather a vast quantity of solar energy and so produce higher output energy. In this paper design and develop presented a mean of PID controlling a solar panel tracking with an embedded system. Especially, in our design system exhibit working result for maximum solar cell output by the location of a solar panel at the direction of highest intensity. This solar panel tracking system accuracy requirement is too much reliant on design and developing the PID controller. Finally, the proposed PID controller provides better performance rather than p controller.

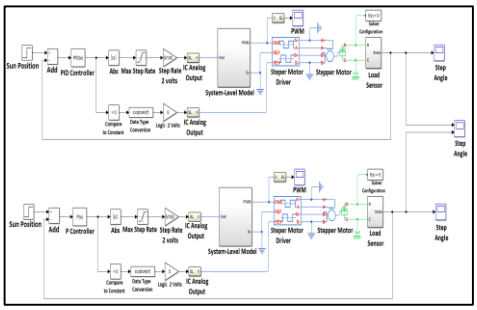

Figure 3 Design of the PID controller system.

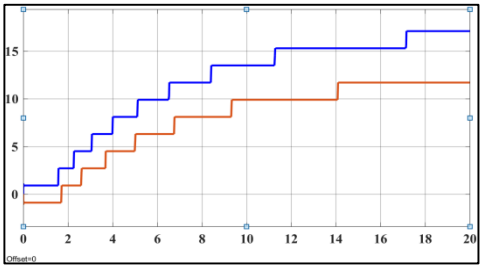

Figure 4 PID controller and P controller simulation result.

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