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STUDY AND ANALYSIS OF SOLAR TRACKING GPS CONTROL SYSTEMS

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ABSTRACT

There is huge in demand for energy in this decade as compared to earlier decades. Impact of over the top reliance on regular fuel is that the world is very nearly a vitality emergency. To endure such conditions sustainable power source has risen as a beam of expectation. Sunlight based vitality is accessible in overflowing gracefully on earth. Be that as it may, it is helpful just when harne ssed appropriately. This paper focusses on different sun powered following frameworks which are comedy ing the increases of sun powered PV cells by social affair more daylight. These frameworks were discovered to be beneficial in improving performance of PV sunlight-based boards. Execution gains are accomplished by moving sunlight based board opposite to sun beams by methods for various systems/standards

Key words:, Renewable energy, Solar tracking systems, PV solar panels

1. INTRODUCTION

Energy is the vital element o f our life. Energy is the backbone of the world economies. The current scenario of excessive consumption of fossil fuel i.e. conventional energy has brought us to imminent realityof thes e sources perish soon. Each passing day the problem of energy depletion has become a challenge in front of countries around the world; our approach towards being independent fro m these non-renewable energy sources i and goes for renewable and endless sources of energy such as renewable energy sources e.g. solarr, tidal, geothermal, wind energy etc.Being a developing nation to increase the rate of devellopment we should approach towards revolution of renewable energy. We should have developed renewable energy alternative for each non- renewable energy consumable system. But these energy sources are non-concentrated,, so we also put our step towards enhancingg their performance and output. These sources can be proven serving in remote areas, hilly areas where transmission of electricity might me expensive. There are many alternatives can be served competitive to conventional one. So this paper reviews such systems which are found to be effective for improving performance of solar cells.

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1.1. Concept of solar tracking system

Solar trackers are auxiliary attachments to be provided for enhancing the gain/output of solar panel. Solar tracking systems help to gather more solar energy as per the system accuracy. Though this system improves gain of PV solar panel we must consider following factors:-

- Cost of installation
- Maintenance of system
- Power consumption
- Reliability
- Performance
- Suitability according to region.

Solar tracking systems are of following types based on working principle as follows:

- Photo-sensor actuated type
- Hydraulic actuated type
- PLC controlled type
- Mechanical pendulum clock type
- Weight and counterweight principle
- Servo controlled.

Some of the above systems require auxiliary or autonomous power supply as per their design. Some systems are bit complex in design and construction while some are simple in construction and operation too. Every system has its own merits and demerits.

2. REVIEW OF SOME RESEARCHERS:

2.1. Hossein Mousazadeh et al [1]

In this paper researchers had provided brief description of various types of solar tracking systems. Brief review is provided by considering various parameters of different systems such as structure, motors used, orientation, power required etc. Researchers had also provided detailed results of corresponding systems in the tabulated form by considering tracker type, second axis, tracking method, way of evaluation, latitude location, gain etc. In this paper it is concluded that tracking systems classified as active trackers and passive trackers as well as single axis tracking and dual axis tracking too.

2.1.1. Results

- Every system reviewed has found to be efficient
- By implementation of every system we could definitely having more output than conventional fixed one.
- Every system has been tested on several parameters thoroughly.
- Implementation of solar tracking system in PV solar plants is gainful and one step towards improved green energy gain.

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2.2. Salsabila Ahmad et al [2]

Researchers has proposed PLC assisted two axis solar tracking system according to Malaysian tropical climatic conditions. They have used a simple motor and controller drive imn order to assist the solar PV cell as per the positioning of sun. System proposed in paper is found to be efficient since it consumes too least power about 5.84% of overall generated output. Since this is an electromechanical system using PLC; the PLC is programmed and timer instructed on the basis of pre-calculated one year angle of azimuth and altitude for location of E110^{0}11', N6^{0}26'. Counter instructions are used for repeated time gap. System has shown increased gain with the help of this solar tracking mechanism up to 139.19 Wh over non-tracking 61.49 Wh on sunny and clear day.

2.2.1 Components of system

- PLC
- PLC program feeder and controller
- Stepper motors
- Electromechanical linkage with PV module.

2.2.2. Results

- Power consumed by solar tracker = 8.71Wh (Constant)
- Max. Gain = 139.19Wh(Tracking) over 61.49Wh(non-tracking)
- Min. Gain = 17.75Wh(Tracking) over 13.61Wh(non-tracking)

Since the proposed system consumes very less power up to 8.71Wh as compared to various other systems this system is found to be efficient for implementation but programming of PLC and electromechanical approach may lead to complexity.

2.3. Prof. Kusekar S. K et al [3]

In this paper researchers had proposed purely mechanical solar tracking system which is using hydraulic actuation for its operation unlike other solar tracking systems which are operated by electrical actuation. Basically this system is better as this does not consume any electricity for tracking and hence we could have 100% improved output gain. This system works on inertia weight assisted with hydraulic circuit i.e. movement of panel is done by weight which tries to come down due to gravitation and its movement is controlled by hydraulic mechanism but to bring panel to its original position we need to apply torque on side opposite to weight attached.

2.3.1. Components of system

- Hydraulic system (filter, FCV, DA cylinder, check valve, reservoir, T-connectors, connecting hose etc.)
- Weight
- Weight holder
- Panel seat
- Column base
- topper etc.

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2.3.2. Results

- Increased output of solar panel by using this system is around 87 kW-hr/year.
- This system is electrical loss free.
- This system has very less scope of automation.
- Since no electrical circuit the construction is simple and robust.
- System is easy to maintain and operate.

2.4. Ankit Anura et al [4]

In this paper the author has built a solar tracking system using microcontrollers, photo resistors, stepper motor. The photo resistor used is a Cadmium Sulphide CDS. It is used because of its property of being inversely proportional to the amount of light incident, that is more the light on the material less the resistance offered. ATMEGA16 microcontroller is used by the author. It was employed as it has many features such as analog comparator(AC), Stepper motor and Analog to digital convertor. They also summarized results of operation in three weather conditions.

- Normal Day light condition.
- Bad Weather condition.
- Bidirectional rotation.

The authors have used two resistors which maximize the efficiency of the tracking system which helps in cost reductions and power consumption. They have also found a solution for a problem generally found in solar tracking systems. As the solar panels are exposed to open air they collect dust on its surface reducing their efficiency. The solution employed was roller brushes. These brushes automatically clean the surface of the panel as the solar panel moves in vertical position. This also contributes towards output maximization.

2.4.1. Results:-

- A solar tracking system with single axis freedom increases the efficiency by 20%.
- There were some limitations as it is a miniature solar tracking system. Larger solar panels should be used for better results and analysis.

2.5. Nikesh Watane et al [5]

In this paper the author has built an automatic solar tracking. Their proposed tracking system has software and hardware parts. The hardware includes six functional sensors, solar cells and stepper motor. A system control unit consisting of LCD, error detectors and keypads is also employed. A complete PCB consisting of two microcontrollers is used; Master processor is 89C52 and the slave controller being RS232. Software part includes Visual Basics 6.0 based Graphic user interface, Microsoft Access database and embedded software written in C for microcontroller.

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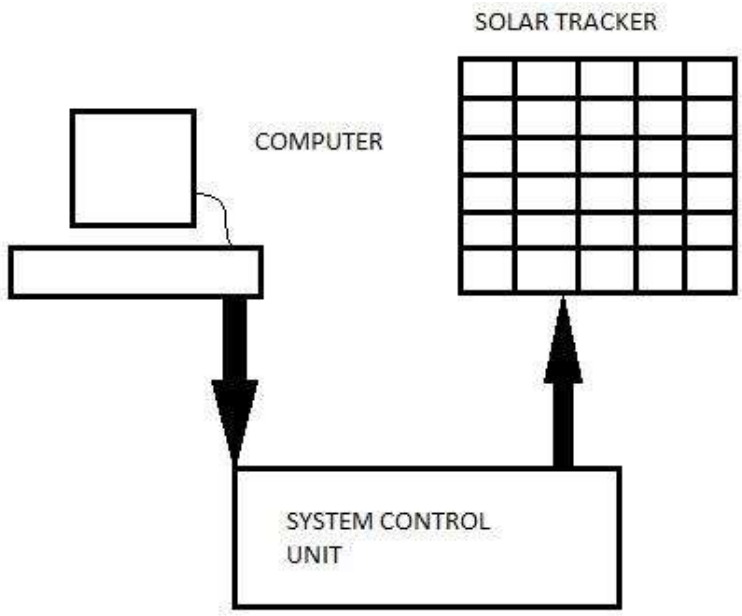

Figure 2.1. Block Diagram of proposed system

The proposed system has four sensors and their functionality depends upon the intensity of sunrays falling on it. The entiresensor sends their outputs to micro sensor. An automatic controller is provided with an algorithm to control following functions.

- Sense all sensor
- Drive stepper motor
- Drive LED

They have also provided a manual control as no human made system can be perfect in its operation and decisions.

2.5.1. Results

- The given system improves efficiency of solar tracker by 25% to 30%.
- Though the system proposed is a prototype an actual model can be made based on it.
- Its initial cost is high but is simple in construction.

3. CONCLUSION

As from above systems reviewed we can conclude that these systems are helpful for enhancing the performance of solar tracking systems. Also the construction and implementation of above system is simple and cheap and are found to be efficient as auxiliaries for PV panels.

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