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DUAL AXIS SOLAR TRACKER SYSTEM

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ABSTRACT

The objective of this paper is to foster a research a center model of a sun oriented a global positioning system, which can upgrade the exhibition of the photovoltaic modules in a sunlight based an energy system. The working standard of the gadget is to keep the photovoltaic modules continually lined up with the sunbeams, which augment the openness of the solar panel to the Sun's radiation. Subsequently, a more result power can be created by the sun based board. Crafted by the paper included the equipment plan and an execution, along with a programming for the microcontroller unit of the sun oriented the tracker. The system used an ATmega328P microcontroller to control the movement of two servo motor, which pivot solar panel in two tomahawks. How much still up in the air by the microcontroller, in light of data sources recovered from four photograph sensors situated close to solar panel. Toward the end of the work, a utilitarian sun oriented global positioning system is planned and executed. It can keep the solar panel lined up with the sun, or any light source tediously. The plan of the sun based the tracker from this work is additionally a reference and a beginning stage for the improvement of further developed systems later once and a beginning stage for the improvement of further developed systems later on.

Keywords: Dual Axis, LDR, Microcontroller, Servomotor, Solar Tracker.

I. INTRODUCTION

With the unavoidable deficiency of petroleum product sources later on, sustainable kinds of energy have become. A subject of a revenue for specialists, experts, financial backers and leaders from one side of the planet to the other. New kinds of energy that is standing out enough to be noticed to incorporate hydroelectricity, bio energy, sun based, a wind and geothermal energy, flowing the power and a wave power. On the account of their inexhaustible, they are considered as good swaps for petroleum derivative sources. Among those sorts of energy, sunlight based photovoltaic (PV) energy is quite possibly the most accessible asset. This innovation has been taken on more broadly for private use these days, on account of innovative work exercises to work on sun oriented cells' exhibition and lower the expense. As per International Energy Agency (IEA), the overall PV limit has developed at 49% each year on normal since mid 2000s. sunlight based PV energy is profoundly expected to turn into a significant wellspring of force later on.

In any case, regardless of the benefits, sun powered PV energy is still a long way from supplanting customary sources available. It is as yet a test to boost the power result of PV systems in regions that don't get a lot of sunlight based a radiation. We actually need further to develop advancements from producers to work on the ability of PV materials, yet an improvement of a system design and module development is an achievable way to deal with make sunlight based PV power more effective, subsequently being a dependable decision for clients. Focusing on that reason, this undertaking had been completed to help the advancement of such encouraging innovation.

One of the principle strategies for expanding effectiveness are to amplify the span of openness to the Sun. The goal of this paper is to build a prototype of light tracking system at smaller scale, but the design can be applied for any solar energy system in practice.

The objective of this paper is to build a prototype of light tracking system at a more limited size, yet the plan can be applied for any sun oriented energy system in practice. It is likewise anticipated from this project a quantitative estimation of how well tracking system performs compared to a system with fixed mounting the strategy.

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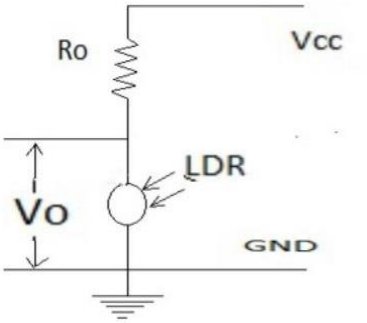
II. METHODOLOGY

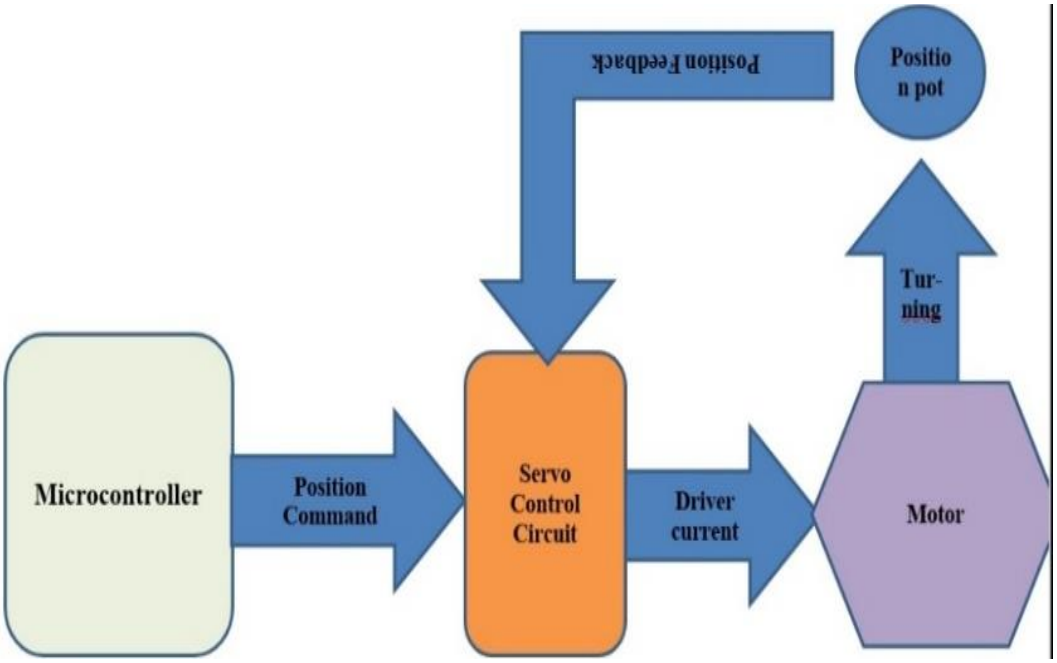
Working Principle

- The obstruction of LDR relies upon a power of the light, and it fluctuates as per it. The higher is the power of light, lower will be the LDR opposition and because of this the result voltage brings down and when the light force is low, higher will be the LDR obstruction and hence higher result voltage is gotten.
- A potential divider circuit is utilized to get the result voltage from the sensors (LDRs).The circuit is displayed here.



- The LDR faculties the simple contribution to voltages between 0 to 5 volts and gives a computerized number at the result which by and large ranges from 0 to 1023
- Presently this will give input to the microcontroller utilizing the Arduino software(IDE).
- The servo motor position can be constrained by this system which is examined later in the hardware model.
- The tracker at last changes its position detecting the greatest force of light is falling perpendicular to it and stays there till it sees any further change.
- The sensitivity of the LDR relies upon a point wellspring of light. It scarcely shows any impact on a diffuse lighting condition.

Basic Circuit Diagram



An overview of the necessary circuit for the Dual-axes sun powered tracker is displayed here. The 5V stock is taken care of from a USB 5V DC voltage source through Arduino Board.

Servo X : Rotates of solar panel along X direction

Servo Y :Rotates of solar panel along Y direction

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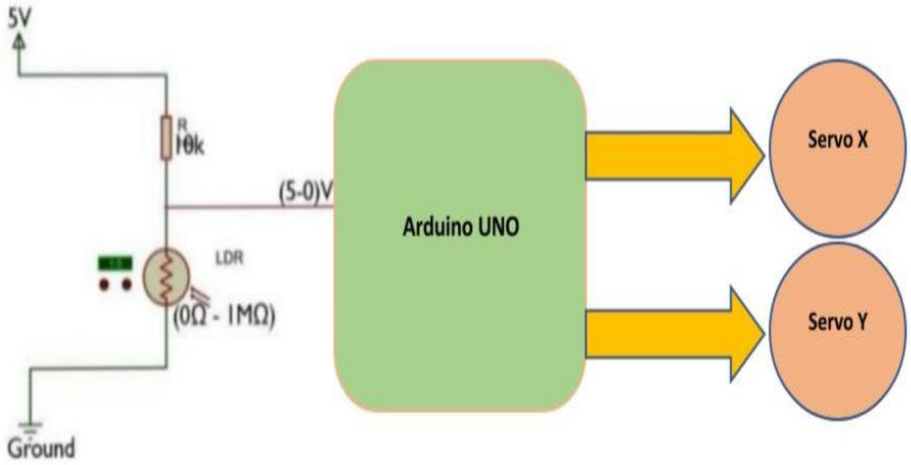
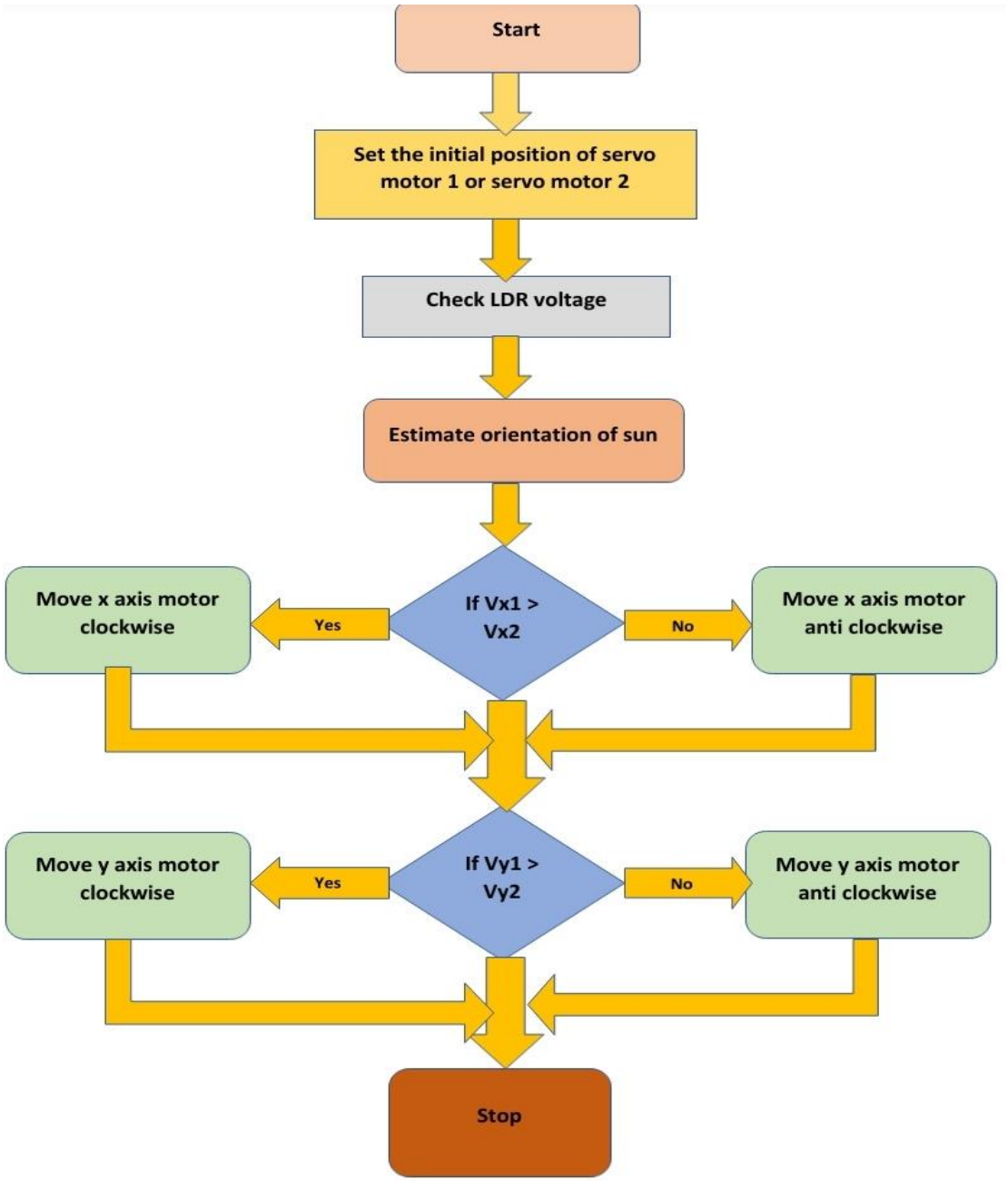


Flowchart



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III. ANALYSIS OF SOFTWARE AND HARDWARE

ADC CONCEPT IN ARDUINO UNO

Arduino UNO board has 6ADC info ports. Among this anybody or every one of them can be utilized as contributions for simple voltage. The Arduino UNO ADC is of 10-digit goal (so the number qualities from (0-(2^10) 1023)). This implies that it will plan input voltages some where in the range of 0 and 5 volts into whole number qualities between 0 and 1023. In this way, for each (5/1024=4.9mV) per unit. The UNO ADC channels have a default reference worth of 5V. This implies we can give a greatest info voltage of 5V for ADC transformation at any information channel. Since specific sensors give voltages from 0-2.5V, with a 5V reference we get lesser precision, so we have a direction that enables us to change this reference regard. Along these lines, for changing the reference esteem we have ("simple Reference"). As default, we get the greatest board ADC goal which is 10bits, this goal can be changed by utilizing guidance ("simple Read Resolution(bits);").

ABOUT SOLAR PANEL AND CONNECTED LOAD

- Solar panel is put at the top and associated with a heap straightforwardly. The load may drove a voltmeter which could be associated with get the specific voltage which relies upon the force of light falling on the board and the place of the tracker.
- Concentrated solar photovoltaics' and have optics that straightforwardly acknowledges daylight, so sun oriented trackers should be calculated accurately to gather energy. All concentrated solar panel have trackers on the grounds that the system don't deliver energy except if coordinated accurately toward tracker
- The solar panel is only a simple gadget to acknowledge the light radiation which is absolutely constrained by LDR sensors and the load associated relies on the rating of the panel utilized.

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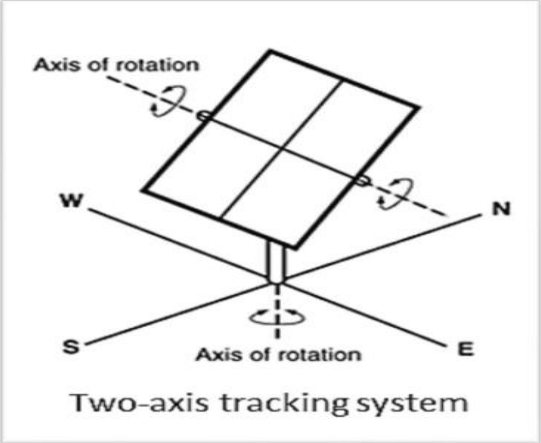
DUAL AXIS MOVEMENT OF SOLAR TRACKER

- The dual axis solar sun oriented tracker is gadget which detects the light and positions towards the most extreme power of light. It is made in such a manner to follow the light coming from any direction.
- The simulate the general scenario of the Sun's movement, the total coverage of the movement of the tracker is considered as 120˚in both the directions.
- The underlying place of both the servo motor are picked at 90˚i.e, for east-west servo motor as well concerning north-South servo motor.
- The position of the tracker ascosporic ends only when the threshold value is above the tolerance limit.



Two-axis tracking system

DESCRIPTION OF THE SOFTWARE PROGRAM STEPS:

- As a matter of first importance, both the servos are announced and object is made to control the servo motor.
- The factor posx and posy are utilized to store the reference servo positions.
- The ADC input pins for LDRs are chosen for dual direction movement and one for reference.
- The tolerance or a constant value is selected to establish the working of the motors
- The servos are connected on advanced pins to the servo article.
- The required simple pins are chosen as info utilizing pin Mode (pin, mode)
- The servos are sets to mid-point or unique situation with a 1000ms or 1sec postponement to find the client.
- Three factors are picked to peruse the simple qualities and guide it into numbers esteem among 0 and1023.
- In the event that the contrast between the two factors is not exactly the resilience esteem then it will remain to its or unique area else it shows development towards the direction of greatest force of light by augmenting or decrementing the upsides of posx and posy.
- The position is then kept in touch with servo and the circle rehashes till it experiences any progressions in the qualities of info more prominent than the base resilience.
- Assuming that the position becomes more prominent than 150˚then position will be set to 150˚only and if the place of the motor is under 30˚then it would be kept at 30˚only as the lower and maximum breaking point points are picked to be 30˚and 150˚respectively.

IV. RESULTS AND DISCUSSION

WHAT WE HAVE OBSERVED….

In this Dual Axis Solar Tracker, when source light falls on the board, the board changes its situation as indicated by greatest force of light falling opposite to it. The target of the paper is finished. This is accomplished through utilizing light sensors that can recognize the amount of sunlight that reaches the solar panel. The qualities acquired by the LDRs are thought about and assuming there is any critical distinction, there is incitation of the board utilizing a servo motor to the place where it is for all intents and purposes inverse to the light emissions sun.

- An input stage that is responsible for converting incident light to a voltage.

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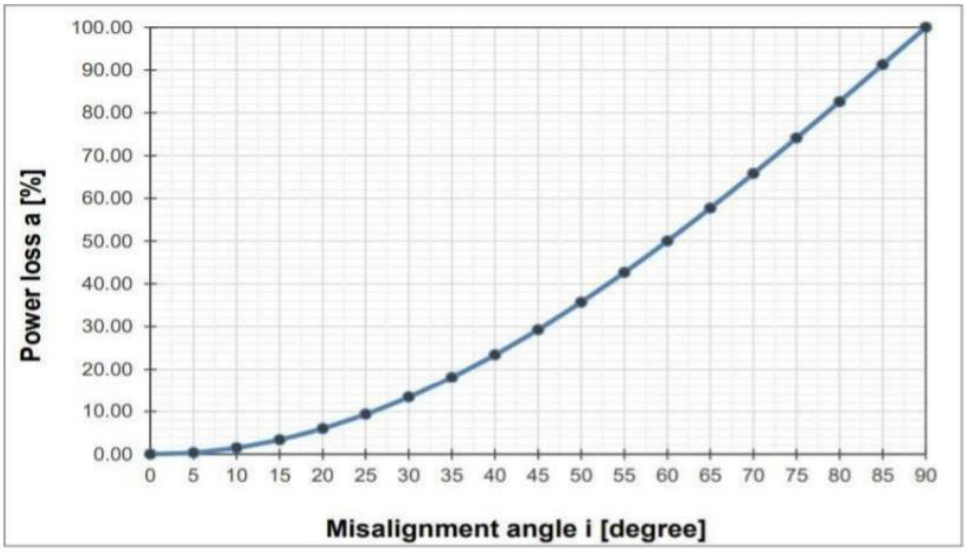
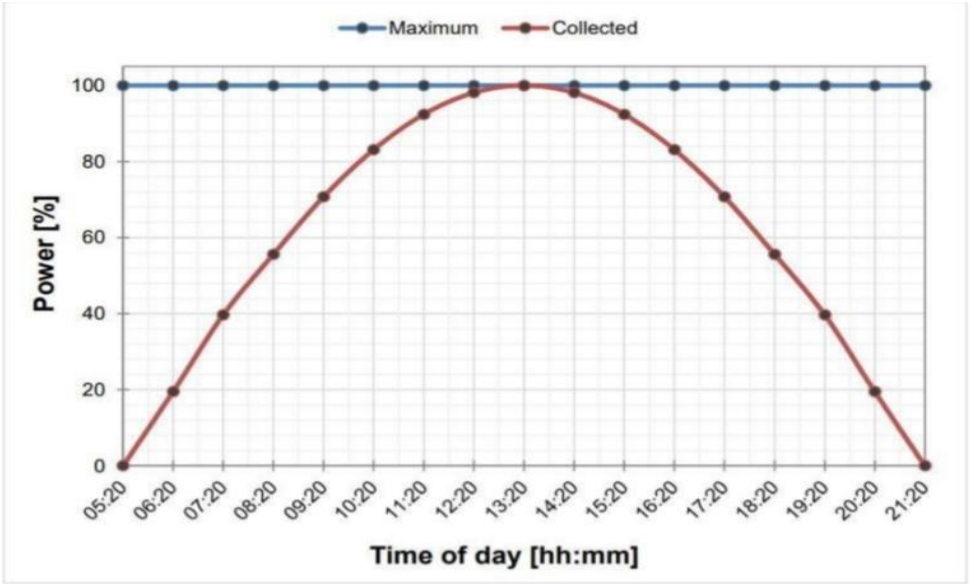
- A control stage that is responsible for controlling actuation and decision making.
- A driver stage with the servo motor. It is responsible for actual movement of the panel.

The information stage is planned with a voltage divider circuit so it gives wanted scope of light for brilliant enlightenment conditions or when there is faint lighting. The potentiometer is acclimated to provide food for such changes. The LDRs were viewed as generally appropriate for this project on the grounds that their opposition differs with light. They are promptly accessible and are cost effective. Temperature sensors for example would be exorbitant. The control stage has a microcontroller that gets voltages from the LDRs and chooses the action to be performed. The microcontroller is modified to guarantee it conveys a message to the servo motor that moves in agreement with the produced blunder. The last stage is the driving hardware that comprised for the most part of the servo motor. The servo motor had sufficient torque to drive the panel. Servo motors are noise free and are reasonable, making them the most ideal choice for the project.

Relation between solar panel misalignment and direct power loss:



Approximation of power output (red line) compared to maximum output (blue line) for a fix mounted solar module:



V. CONCLUSION

In this 21st century, as we develop our innovation, populace and development, the energy utilization per capita increments dramatically, as well as our energy assets (for example fossils energizes) decline quickly. Along these lines, for manageable turn of events, we need to think elective strategies (usage of sustainable power

sources) to satisfy our energy interest. This paper, Dual Axis Solar Tracker, we have expand a demo model of solar tracker to track the maximum intensity point of sunlight source so that the voltage gives at that point by the solar panel is greatest.

After a great deal of preliminary and mistakes we have effectively finished our venture and we are glad to contribute some work for our society. Presently, similar to each and every other test, this undertaking has a few imperfections.

- Our panel detects the light in a sensing zone, beyond which it fails to respond.
- If various sources of light (that is diffused light source) appear on panel, it calculates the vector sum of light sources & moves the panel in that point.

This paper is executed with negligible assets. The circuitry is kept simple, justifiable and easy to use.

AVENUES FOR FURTHER WORK

With the accessible time and resources,, the target of the paper is met. The task can be carried out on a lot bigger scope. For future tasks, one might consider the utilization of more productive sensors, which ought to likewise be financially savvy and consume less power. This would additionally improve proficiency while decreasing expenses. Assuming there is the chance of additional lessening the expense of this undertaking, it would help an incredible arrangement. This is on the grounds that whether or not such ventures are embraced is reliant upon how modest they can be. Shading of a one cell will have an effect on the entire panel because the cells are usually connected in series. With shading therefore the tracking system will not be able to enhance efficiency as is required.

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