



Dual Axis Smart Flower Solar System

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ABSTRACT-

One of the most important problems in a developing third-world nation like India is the energy crisis. Electrical energy production and demand are vastly out of balance. The majority of the population—nearly 50%—is utterly cut off from this blessing. Only renewable energy can address this problem. One of the most potent forms of renewable energy that could significantly contribute to the resolution of this dilemma is solar energy. This study examines the effectiveness of an Arduino-based dual-axis solar tracking system. The major goal of this study is to determine whether or not a static solar panel is superior to a solar tracker. The hardware and software systems in this study are separated into two sections. Four light dependent resistors (LDRs) are employed in the hardware section to identify the sun as the strongest light source. The solar panel is moved by two servo motors working together to place it where the LDRs can detect the most light. The software component's code was created using the C programming language with the Arduino UNO controller in mind. The results of the analysis and comparison of the solar tracker system with fixed or static solar panels revealed higher performance in terms of voltage, current, and power. As a result, it is demonstrated that the solar tracker is more useful for obtaining the greatest amount of sunlight for star harvesting applications. In comparison to fixed and single axis solar tracking systems, the results showed that dual axis solar tracking systems produced an additional 10.53 watts of power. Dual axis, solar tracker is the main focus to talk about.

I. INTRODUCTION

One of the most promising forms of renewable energy is solar. By harnessing the photovoltaic effect, we can transform solar radiation into solar energy. This technology provides a lot of benefits, such as being reliable, clean, and quiet, with few maintenance requirements and minimal environmental impact. Yet, only approximately 20% of the solar energy is used in India, while the majority is lost as waste. Nonetheless, a lot of research is being done in India to find better ways to harness solar energy and boost solar panels' effectiveness. Due to the sun's constant movement in position, the amount of energy incident on solar panels changes over time. The largest amount of energy was received by the panel when the sun was perpendicular to its surface. Hence, by installing a panel that continuously tracks the position of the sun, we can get the most energy output. Due to the lack of actual maintenance requirements and the absence of noise from the technology. Compared to other technologies, this one has a lot of advantages. No matter what, tracking must be done in all weather situations, including cloudy periods. This system must be capable of tracking the sun with a specific level of precision and returning the collector to its initial position at the end of the day. The dual axis solar tracker is the main topic of discussion in this paper. Also, this paper illustrates the current state of renewable energy transactions, completely unique light sensors, some anticipated value of solar trackers, etc. We'll wrap off with some deliberate techniques that could work to increase solar energy

II. LITERATURE REVIEW

[1]Kshitij Manwatkar, Nitin Pimpalkar, Rohan Meshram, Nikhil Tagde, Tejas Ghaiwat, Prof.Chandresh Bhangre, "An Empirical Study for Solar Sunflower" The goal of this project is to make an automatic tracing system, which can trace location of the sun. In order to maximize the conversion from solar to electrical energy, the solar panels need to be placed at right angle to the sun. This system outputs 30% more energy than solar panels without tracking systems.

[2] Aman Pachori , Mohit Thakre , Vipul Pande , Prof. Umesh. W. Hore. "Smart Flower Solar Energy Generator" The Smart Flower system comprises a dual-axis tracker that tracks the direction of the sun and allows the petals to follow the direction of the sun. This paper sketches an outline of the details of solar power energy generation and about the expanding world.

[3]Prof. Sanjeet Kumar Singh, Mr. Surajkumar Mabbu , Mr. Tejinder Singh , Miss. Priya Pandey "Smart Flower" This paper aims to provide an overview of the Smart Flower system, its technical specifications, and its potential for widespread adoption in the energy sector.The Smartflower has integrated solar panels

that follow the sun's movements throughout the day, ensuring optimal energy production. One of the key advantages of the system is its ability to track the sun's movement throughout the day, which enables it to generate up to 40% more energy than traditional fixed solar panels.

[4] Souza, A. M. C., and Amazonas, J. R. A. "A Novel Smart Home Application Using an IOT Middleware" We observe that the working of the photo voltaic cell absorbs the ultra violet rays from sun and store the energy in the battery and helps in the working of the water pump which can be comparable to diesel power plant due to this we can save fuel. The comparison between the diesel using pump and solar pump is made such that the utilization of sun rays results in more economical benefit rather than the diesel one

[5] Mr. Sandip. S. Chavan, Mr. Hritik. B. Gargade, Mr. Abhijeet. L. Chate, Mr. Sarjerao. A. Kokare, Mr. Shubhamraje. P. Throat, Mr. Nikhil. P. Patil, Mr. Vivekanand. S. Anjankar "Designing of Flower Shape Solar Panel for Agriculture Purpose" In this paper The solar panels are of rectangular shape which stores energy in the battery's and further it is used to run the motor, Because of its flower like shape it can be folded and has higher efficiency than other solar panels because it tracks the sun light and moves according to it to obtain grate efficiency.

[6] V. Brahmeswara Rao, K. Durga Harish Kumar, N. V. Upendra Kumar, K. Deepak., "Arduino Based Two Axis Solar Tracking by Using Servo Mechanism" This paper proposes a dual axis solar tracking system using Arduino as the main processing unit to capture maximum amount of solar energy. Dual axis tracking systems can increase the power output of solar energy systems by 40% -60%. Solar energy systems are based on a solar collector to capture the sun's energy and convert it into electrical power or thermal energy.

PROPOSED SYSTEM

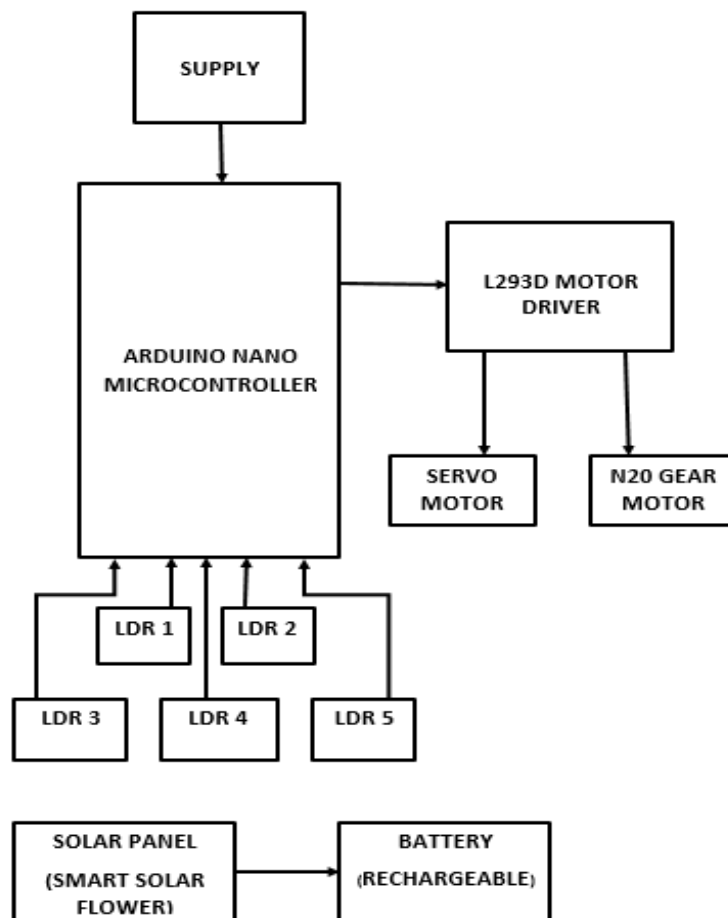


Figure : Block Diagram

This block diagram demonstrates how LDR sensors provide a signal to the microcontroller after detecting sunlight. The microcontroller is a logical gadget that begins the motor driver's track by initiating transactions on the base of installed sensors. Imagine that if the sun moves from one location to another, from east to west, the light absorption will alter on each sensor individually. Wherever the light falling on sensor pairs is the same, the controller initiates driver circuits and moves the servo motor to new positions based on the light intensity feature on the sensors. The same technique can keep it going even if the location of

the sun in relation to the sky changes. This proposed model can so capture additional sun rays, and the system's ability to convert solar energy is significantly better. Battery storage is controlled by the thought of generated voltage

III. HARDWARE DESCRIPTION

Solar Panels:



Figure: Solar panels

A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through the photovoltaic effect. Solar panels are comprised of several individual solar cells which are themselves composed of layers of silicon, phosphorous (which provides the negative charge), and boron which provides the positive charge.

Microcontroller (Arduino Nano):

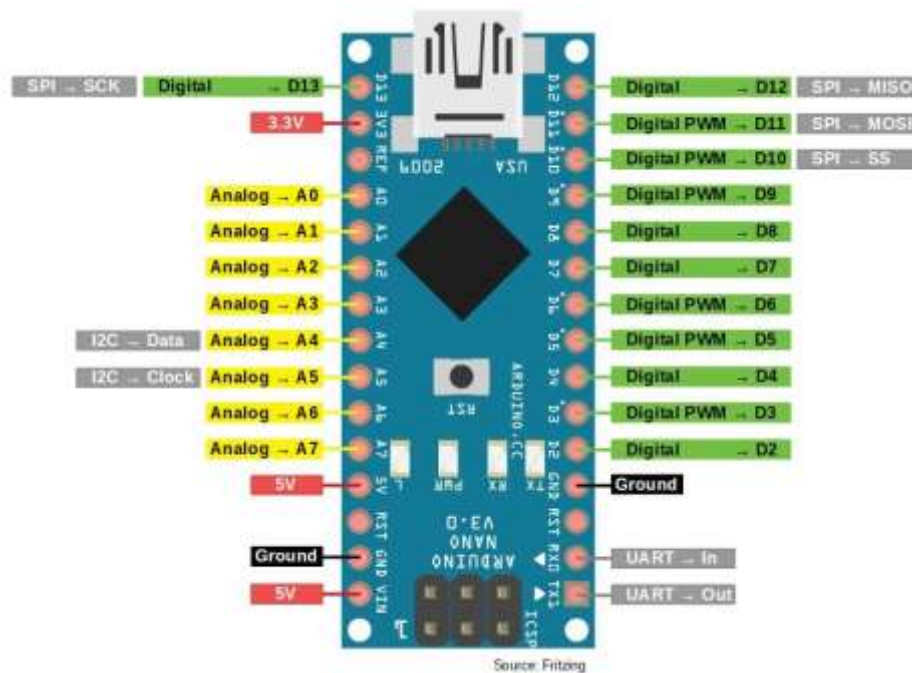


Figure: Microcontroller (Arduino Nano)

Based on the ATmega328P, the Arduino Nano is a compact, comprehensive, and breadboard friendly board. In a more compact design, it provides the same connections and specifications as the Arduino Uno board. The Arduino Nano has 30 male I/O headers that are arranged in a DIP-30-like format and can be programmed using the Arduino Software integrated development environment (IDE), which is available both online and offline and is shared by all Arduino boards. The board can be powered by a 9 V battery or a type-B mini-USB connection.

Servo Motors:

Figure: Servo Motor

MG995 Metal Gear Servo Motor is a high-speed standard servo can rotate approximately 180 degrees (60 in each direction) used for airplane, helicopter, RC-cars and many RC model. Provides 10kg/cm at 4.8V, and 12kgcm at 6V. It is a Digital Servo Motor which receives and processes PWM signal faster and better

N20 Gear Motor :

Figure : N20 Gear Motor

N20 DC gear motor is a typical example of spur gear motors. It consists a N20 DC motor and a metal gearbox. Such integrations are also commonly referred to as N20 micro gear motor, micro DC gear motor and micro metal gear motor. Gearboxes are added to miniature motor to provide the lower speed and higher torque. The materials of gearbox frame we use the higher grade of brass alloy, so the concentricity and meshing of the gears are very good. Our miniature gear motor works smoothly and efficiently. N20 metal gear motor is the heart of several electrical and electronic applications. It is the excellent choice for speed control

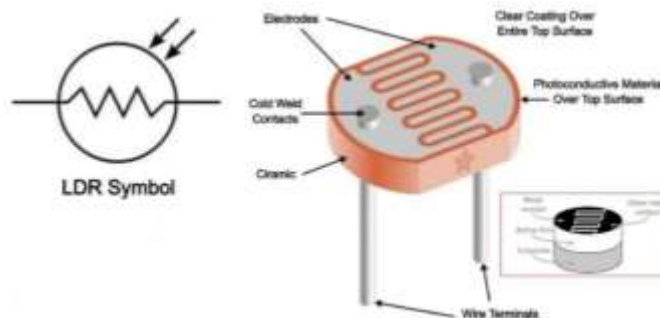
LDR'S :

Figure : LDR'S

Light dependent resistors, LDRs or photo resistors are electronic components that are often used in electronic circuit designs where it is necessary to detect the presence or the level of light. LDRs are very different to other forms of resistor like the carbon film resistor, metal oxide film resistor, metal film resistor and the like that are widely used in other electronic designs. They are specifically designed for their light sensitivity and the change in resistance this causes.

L293D Motor Driver :

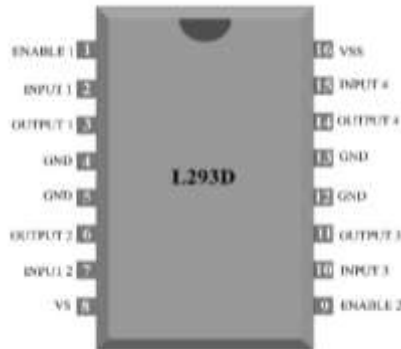


Figure : L293D Moto Driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two [DC motor](#) with a single L293D IC.

7806(Voltage Regulator) :

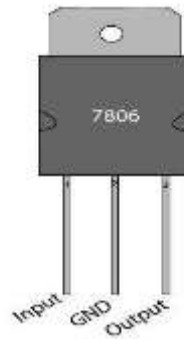


Figure : 7806 Voltage Regulator

The L7806CV is a three-terminal positive Voltage Regulator with several fixed output voltages, making it useful in a wide range of applications. This regulator can provide local on-card regulation, eliminating the distribution problems associated with single point regulation.

Li-ion Batteries



Figure : LI-ION Batteries

This rechargeable Lithium Ion Polymer Battery is a cylindrical 18650 cell that is typically used in everything from small flashlights to electric cars. The battery has a capacity of 2500mAh at 3.7V, the voltage can range from 4.2V when fully charged to 3.0V when completely discharged.

IV. IMPLEMENTATION

When the light is minimum, the micro controller Arduino read the resistance value and the the threshold value is sated in the coding section, when the light is available and the threshold level breaks, the Arduino rotate the n20 gear motor anticlockwise through the L293D Driver till the limit switch level high, when anticlockwise limit switch pressed the panel stop rotating and panel is fully opened position when the button is pressed, now the main work is going to progress, according the sun rotation other 4 LDRs sense the light and send data to the Arduino, and Arduino process the data then rotate the servo motors according the sun rotation, the rotation position of the servo is max 170 degrees,when the sun goes down the fifth LDR sense data again and this time the process is reverse condition, the LDR data goes down blow the threshold level and Arduino Rotate the N20 motor clockwise till the 2nd limit switch press and run the servo in home position, when light is available in next day the same process goes on again

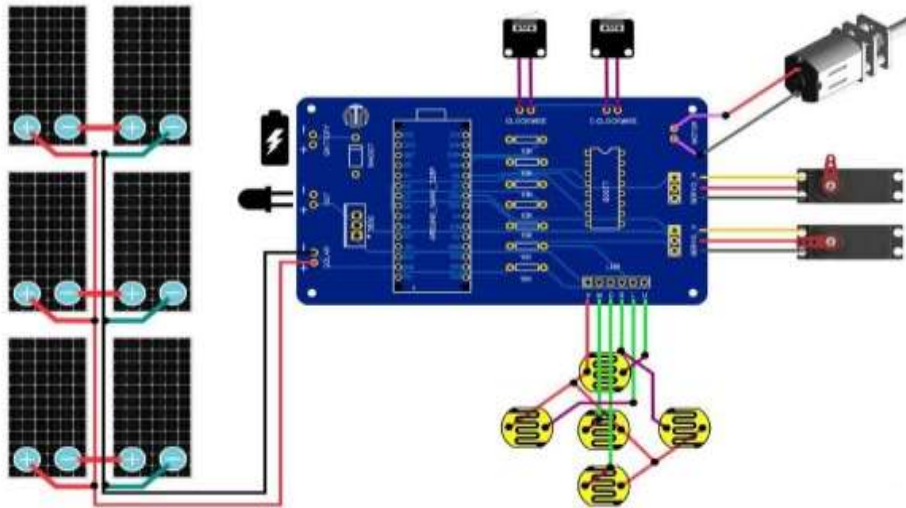


Figure : Circuit Diagram



Figure : Working Model

V. CONCLUSION AND FUTURE SCOPE

Compared to single and stationary solar systems, dual axis tracking is superior. Because a single axis tracker's stroke adjustment resulted in a substantial power boost inside the system, the suggested solution is also reasonably priced. Our investigations have revealed that compared to fixed arrays, dual axis tracking increases energy by about 40%. We have a propensity to believe that with a lot of effort and improved systems, this figure can rise even higher.

- A software that has the precise coordinates of where it was during installation.

- Through a mobile app, Smart-flower offers you information on its energy use so that you may follow the sun from its exact location.
- Sunflower is capable of changing its position in response to harsh weather conditions.
- In adverse weather, a wind sensor can be utilised to safeguard the solar panels.
- Rain sensors can be used to prevent the solar panels from being damaged by the rain

VI. ADVANTAGES

- Greater energy output: Smart flower's solar panels produce more energy than standard fixed solar panels since they can detect the sun's movement throughout the day. Smart flower's solar panels are an environmentally beneficial and sustainable energy source, lowering carbon emissions and contributing to a healthier world.
- Smart flower's solar panels have an innovative design that mimics the natural movement of sunflowers, making them an aesthetically beautiful complement to any landscape.
- Smart flower's software platform is user-friendly, allowing for remote monitoring and control of the panels and letting clients to easily track their energy production.
- Scalable and adjustable: Smart flower's solar panels may be tailored to meet the individual demands of various customers, ranging from residential to commercial and industrial.

VII. REFERENCE

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