Solar Tracking System Using Arduino

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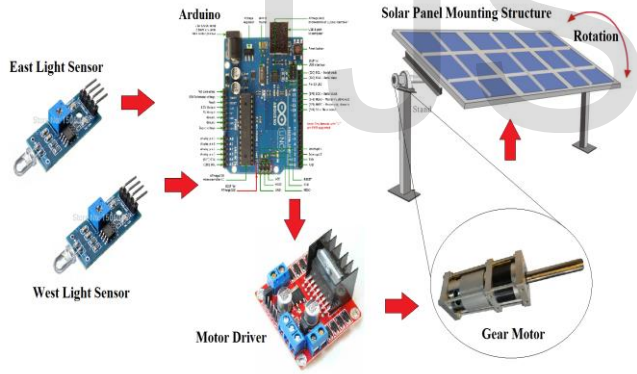
Abstract— In this paper, a solar tracking system using Arduino is designed and built. This system collects free energy from the sun and stores it in the battery and then converts this energy to the respective alternating current. Its makes the energy usable in normal homes as an independent power source. This system is designed to react to its environment in the shortest amount of time. Any errors at software and hardware will be controlled or eliminated. Our system is tested for its real-time responsiveness, reliability, stability and safety. Our system is designed to be resistant to weather, temperature and some minor mechanical stresses.

keywords— Solar Panel, Arduino, Dual Axis Motor, Power Supply, Stepper Motor, Display.

I. INTRODUCTION

Solar energy is an unlimited source of energy which if harnessed properly will get the mankind devoid of using the conventional sources of energy he has been long using. This project has been designed keeping this in view to make the harnessing of solar energy more efficient.

II. BLOCK DIAGRAM



III. SOLAR PANEL

A photovoltaic module is a packaged, connect assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions , and typically ranges from 100 to 365 Watts (W). The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230 W module will have twice the area of a 16% efficient 230 W module. There are a few commercially available solar modules that exceed efficiency of 22% and reportedly also exceeding 24%. A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photovoltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism.

The most common application of solar panels is solar water heating systems.

IV. TECHNICAL USED

Arduino is an open source computer hardware and software company, project, and user community that designs and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License or the GNU General Public License permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduino of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

V. POWER SUPPLY

A power supply is an electronic device that supplies electric energy to an electrical load. The primary function of a power supply is to convert one form of electrical energy to another. As a result, power supplies are sometimes referred to as electric power converters.

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VII. STEPPER MOTOR

A stepper motor or stepping motor is a dc brushless electric motor that divide a full rotation into a display device is an output device for presentation of information in visual or tactile form. When the input information is supplied has an electrical signal, the display is called an electronic display number of equal step. The motor's position can then be commanded to move and hold at one of these steps without any position sensor for feedback as long as the motor is carefully sized to the application in respect to torque and speed.

VIII. DISPLAY

A display device is an output device which is for presentation of information in visual or tactile form. When the input information is supplied has an electrical signal the display is called an electronic display.

IX. ADVANTAGE

- Trackers generate more electricity than their stationary counterparts due to increased direct exposure to solar rays.
- Solar trackers generate more electricity in roughly the same amount of space needed for fixed-tilt systems, making them ideal for optimizing land usage.
- Advancement in technology and reliability in electronics and mechanics have drastically reduced long ter0m maintenance concerns for tracking systems

X. DISADVANTAGE

- Solar trackers are slightly more expensive that their stationary counterparts, due to the more complex technology and moving parts necessary for their operation.
- Trackers are a more complex system than fixed racking.
- Single-axis tracker projects also require an additional focus on company stability and bankability.

XI. APPLICATION

- Solar Photovoltaic plants require continuous orientation towards sun for consistent efficiency output. This product will prove a great boon for them.
- Solar water heating applications can also implement the same technique to heat water throughout the day.
- Concentrated applications like concentrated photovoltaic panels require a high degree of accuracy to ensure the sunlight is directed precisely at the focal point of the reflector or lens.
- Non concentrating applications do not require tracking but using a tracker can improve the total power produced by the system.
- Photovoltaic systems using high efficiency panels with trackers can be very effective.

XII. WORKING

- There are two light sensing modules. One for East and the other for West.
- Both the sensors send digital information about presence and absence of light intensity to the Micro controller.
- The micro controller decides the output signals for the motor driver so as to drive the motor in CW or ACW direction.
- The motor driver module receives the signals from the micro controller and drives the motor in the specified direction with the specified speed.
- The motor in turn controls the orientation of the solar panel mounting structure. Thus maintaining constant exposure to sunlight throughout the day.

XIII. FUTURE SCOPE

As the proposed prototype is a miniature of main system, it has some limitations which can be mitigated through future developments. A small cardboard is rotated in the system and 12v solar panel is used for analysis.

As a miniature system, it works out well. Larger Solar panel must be integrated with the system to prepare better result and cost analysis. It has been proven through our research and statistical analysis that solar tracking system with single-axis freedom can increase energy output by approximately 20%.Further mechanical enhancement can be done to the prototype, to implement dual-axis tracking.

XIV. CONCLUSIONS

An Arduino solar tracker was designed and constructed in the current work. LDR light sensors were used to sense the intensity of the solar light occurrence on the photo-voltaic cells panel. Conclusions of this project is summarized as ,the existing tracking system successfully sketched the light source even it is a small torch light, in a dark room, or it is the sun light rays.

The cost and reliability of this solar tracker creates it suitable for the rural usage. The purpose of renewable energy from this paper offered new and advanced idea to help the people.

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