

# Advanced Solar Tree with Sun Tracking and Cleaning

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**Abstract:** Solar panel has been used increasingly in recent years to convert solar energy to electrical energy. The solar panel can be used either as a stand-alone system or as a large solar system that is connected to the electricity grids. The earth receives 84 Terawatts of power and our world consumes about 12 Terawatts of power per day. We are trying to consume more energy from the sun using solar panel. In order to maximize the conversion from solar to electrical energy, the solar panels have to be positioned perpendicular to the sun. Thus, the tracking of the sun location and positioning of the solar panel are important. The goal in this paper is to design an automatic tracking system, which can locate position of the sun. The tracking system will move the solar panel so that it is positioned perpendicular to the sun for maximum energy conversion at all time. Photo resistors will be used as sensors in this system. The system will consist of light sensing system, microcontroller, gear motor system, and a solar panel. Our system will output up to 40% more energy than solar panels without tracking systems.

**Keywords:** Eco-Friendly, Efficient, Cheaper, Tracking

## I. INTRODUCTION

This solar tree system is separate/close mechanism solar panel mount on smart design stand, stand rotate then solar panel separated. This solar tracking system is a power generation method of solar energy. One of the most promising technologies of converting solar energy to electrical energy is Photovoltaic effect. A solar tracker is a device in which solar photovoltaic panels are mounted towards the sun by using photo sensors connected with motor. It is one of the simple and cheaper way for producing electricity. This structure of solar tracker moves with position of sun over the course of day in order to produce maximum KW. Other major problems are dust on solar panel, and everyday cleaning is challenging task or not possible, so in this system user can clean solar panel by using mobile app.

## II. OVERVIEW

In this advancing era of technology we are more concerned about the advancements made in technology rather than thinking upon the alternative sources of energy. Energy costs and decreasing supplies of fossil fuels, emphasis on protecting the environment and creating sustainable forms of power have become vital, high priority projects for modern society. Since, as solar energy which is also considered a renewable form of energy can be used to offset some of the power coming from the main grid that is generated by let us say nonrenewable sources of energy. And creating these renewable sources in such a way that these provide us with the maximum efficiency is our main goal. This paper proposes a solar tracking system designed with microcontroller and ldr's that will actively track the sun and change its position accordingly to maximize the energy output. The ldr's incorporated on solar panel helps to detect sunlight which in turn moves the panel accordingly.

Accumulation of dust (also known as soiling) on the surface of solar panels decreases the amount of sunlight reaching the solar cells underneath and thus the efficiency of the solar panel is severely impacted. To harness their designed capacity to its fullest, they need to be cleaned periodically, usually with water. Due to water scarcity in some area, cleaning becomes difficult, challenging and subsequently costly. Solar Photovoltaic conversion technique of is largely used as a pioneer and efficient conversion of solar energy. Many factors govern Solar Photovoltaic energy conversions efficiency like solar intensity, the area of the module, semiconductor, tracking mechanisms, dust, and dirt etc. Nowadays among these factors dust and dirt has become crucial for research since they have a significant effect on conversion efficiency. If proper cleaning mechanisms are used then, it may show about 25% improvement in output energy or about 15 to 20% enhancement in conversion efficiency. Hence, rigorous study of SPVC automated cleaning mechanism is vital. This paper discusses a comprehensive overview of dust problem and the recent developments made on automated



cleaning system of solar photovoltaic modules which gives a brief overview of techniques like electrical, mechanical, chemical and electrostatic. The main objective of the study is to review the literature on solar photovoltaic module automated cleaning techniques for identifying research gaps in the automated cleaning systems.

Recently with the rising population and energy demands, we should get an option of renewable energy source and that energy source should not cause pollution and other natural hazards. For this condition the Solar Energy is the best alternative for us. A Solar Power Tree is the best innovative way, which requires very less place to produce energy efficiently. We can also use the "SPIRALLING PHYLLATAXY" to improve the efficiency of the plant. It is much better than traditional solar PV system in area point of view and also more efficient. So this will be a very good option and should be implemented.

### III. PROPOSED WORK

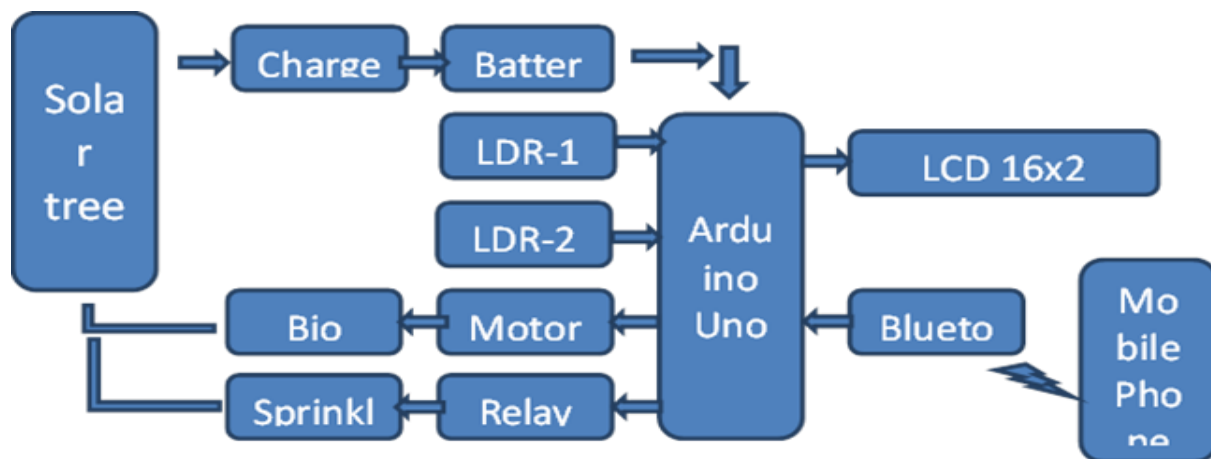


Fig1. Block Diagram of solar tracking and cleaning mechanism.

In this block diagram the Arduino Uno is Atmega based microcontroller board which is control all system. Solar tree is system or design use for solar panel separation and closing and both solar output is connected to the charge controller.

The charge controller is a device use for protect over charging and over discharging of battery and connected to the load.

The both LDR's use for detecting the sun East-west direction and data providing to Arduino.

According to the LDR data Arduino send control signal to the motor driver and motor driver operate motor to clockwise or anticlockwise.

The motor connected to an arduino will rotate the solar panel.

When user send clean signal from mobile phone via Bluetooth module Arduino make relay ON condition and then pump will On and sprinkle will start and clean dust. The all operation performed by Arduino according to the incoming signal but which operation run shown on LCD.

### IV. IMPLEMENTATION DETAILS

#### SOLAR PANEL

A 12V solar panel is used which is connected to a charge controller. The system derive power from photovoltaic cell. Hence it does not depend on electricity. The majority of modules use water-based crystalline silicon cells or thin-film cells. The structural member of a module can either be the top layer or back layer. Cells must also protect from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones are available, based on thin cells.

#### CHARGE CONTROLLER

Charge controller is a device which is used to supply the flow of input at constant rate. So that the battery should not get overcharge or over discharge. If the battery gets overcharge or over discharge it may cause damage to the battery. When a battery reaches full charge, it can no longer store incoming energy. If energy continues to be applied at the full rate, the battery voltage gets too high. Water separates into hydrogen and oxygen and bubbles out rapidly. (It looks like it's boiling so we sometimes call it that, although it's not actually hot.) There is excessive loss of water, and a chance that the gasses can ignite and cause a small explosion. The battery will also degrade rapidly and may possibly overheat. Excessive voltage can also stress your loads (lights, appliances, etc.) or cause your inverter to shut off. Preventing overcharge is

simply a matter of reducing the flow of energy to the battery when the battery reaches a specific voltage. When the voltage drops due to lower sun intensity or an increase in electrical usage, the controller again allows the maximum possible charge. This is called "voltage regulating." It is the most essential function of all charge controllers.

## BATTERY

Battery which will store the power, The project aims at finding a system that can charge a battery using economic and non-conventional way. Hence we have used a 12 V battery for the charging purpose as a normal lighting load can be connected to a 12 V battery . we can use a battery with higher rating as the output of the generator That can reach upto 50 V Battery bank with multiple units can be installed if the rating of the generator is increased.

## DC MOTOR

A DC motor is any an rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic to which periodically changes the direction of current in part of the motor.

## MOTOR DRIVER

Motor driver is a simple design, which reduces the board space and lower the system cost. It is also used in the large applications, the use of drive are very necessary for smooth running and operation of motors. The DC motor drives are mainly used or good speed regulation, frequent starting, braking and reversing. Before enlisting the practical applications of the drives used for DC motor. Motor driver can be used from a simple vibration motor inside a mobile phone to complex stepper motors in CNC machines, DC machines etc. To control a motor using a microcontroller or processors we need something called a motor driver or motor controller.

## RELAY

A hand-off is an electrically worked switch many transfers utilize an electromagnet to work an exchanging system mechanically however other working standards are likewise utilized. Transfers are utilized where it is important to control a circuit by a low control motion, or where few circuits must be controlled by one flag. Relays can allow one circuit to switch a second circuit which can be completely separate from the first. There is no electrical connection inside the relay between the two circuits, the link is magnetic and mechanical.

## LCD

LCD is liquid crystal display. It is an electronic display module. A 16x2 LCD display is very commonly used device in various devices and circuits. 16x2 LCD means it can display 16 characters in a line and there are 2 such lines. In this LCD each character is displayed in 5\*7 pixel matrix. This LCD has two registers, Command and Data. The command register stores the command instructions has given to LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.

## ARDUINO:

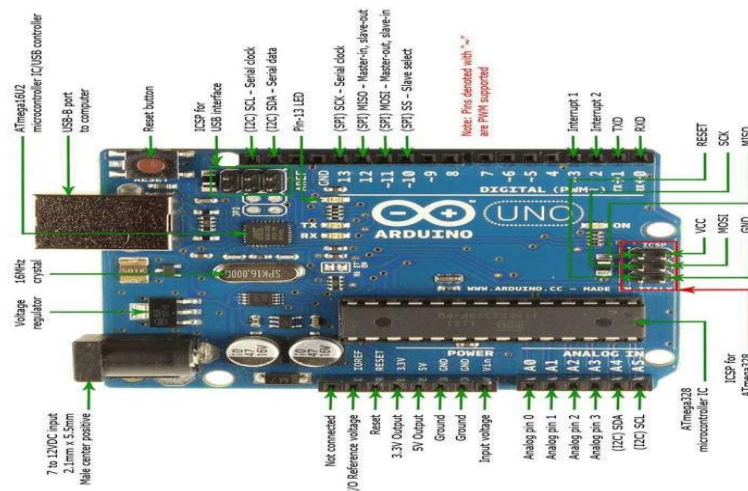


Fig 2. Pin Diagram Of ARDUINO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything

needed to support microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision 3 of the board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin. In future, shields will be compatible both with the board that use the AVR, which operate with 5V and with the Arduino Due that operate with 3.3V. The second one is a not connected pin, that is reserved for future purposes.
- Stronger RESET circuit.
- Atmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

## V. CONCLUSION

In course of the project, we have come to the conclusion that is still a lot of scope of energy production with the help of tracking solar panels. With better design and increasing the number of solar panels along with some advanced technology it is Possible to implement in this paper on a large scale. It would not only solve the Problem of energy crisis to a great extent but would also give a landscapic view to the city. We highly recommend these solar trees alongside the streets in order to save electricity required for the street load. By further increasing the height and the number of solar panels, it is possible to Light up an entire building with the help of the solar panels.

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