

# AUTOMATIC SOLAR TRACKER

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**Abstract:** Energy crisis is the most important issue in today's world. Conventional energy resources are not only limited but also the prime culprit for environmental pollution. Renewable energy resources are getting priorities in the whole world to lessen the dependency on conventional resources. Solar energy is rapidly gaining the focus as an important means of expanding renewable energy uses. Solar cells those convert sun's energy into electrical energy are costly and inefficient. Different mechanisms are applied to increase the efficiency of the solar cell to reduce the cost. Solar tracking system is the most appropriate technology to enhance the efficiency of the solar cells by tracking the sun. A microcontroller based design methodology of an automatic solar tracker is presented in this paper. Light dependent resistors are used as the sensors of the solar tracker. The light dependent resistor's do the job of sensing the change in the position of the sun which is dealt by the respective change in the solar panel's position by switching on and off the geared motor the control circuit does the job of fetching the input from the sensor and gives command to the motor to run in order to tackle the change in the position of the sun. With the implementation the proposed system the additional energy generated is around 25% to 30% with very less consumption by the system itself. The designed tracker has precise control mechanism which will provide three ways of controlling system. A small prototype of solar tracking system is also constructed to implement the design methodology presented here.

**Keywords:** Light Dependent Resistor (LDR), Positional sensor, Motor.

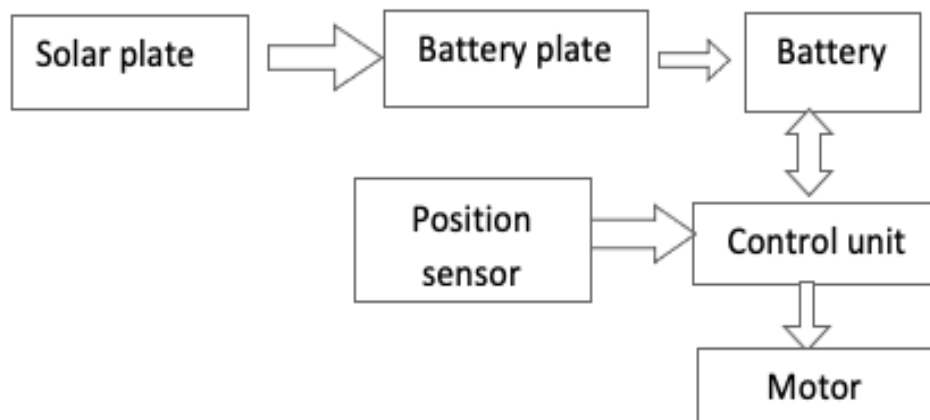
**1. Introduction:** Energy is the prime factor for the development of a nation. An enormous amount of energy is extracted, distributed, converted and consumed in the global society daily. 85% of energy production is dependent on fossil fuels [1]. This method of power generation is simple and is taken from natural resource. This needs only maximum sunlight to generate power. This project helps for power generation by setting the equipment to get maximum sunlight automatically. This system is tracking for maximum intensity of light. When there is decrease in intensity of light, this system automatically changes its direction to get maximum intensity of light.

We are using two sensors in two directions to sense the direction of maximum intensity of light. The difference between the outputs of the sensors is given to the micro-controller unit. Here we are using the micro-controller for tracking and generating power from sunlight. It will process the input voltage from the oscillator circuit and control the direction in which the motor has to be rotated so that it will receive maximum intensity of light from the sun. Solar energy refers primarily to the use of solar radiation for practical ends. However, all renewable energies, other than geothermal and tidal, derive their energy from the sun.

Solar technologies are broadly characterized as either passive or active depending on the way they capture, convert and distribute sunlight. Active solar techniques use photovoltaic panels, pumps, and fans to convert sunlight into useful outputs. Passive solar techniques include selecting materials with favorable thermal properties, designing spaces that naturally circulate air, and referencing the position of a building to the Sun. Active solar technologies increase the supply of energy and are considered supply side technologies, while passive solar technologies reduce the need for alternate resources and are generally considered

demand side technologies. Solar tracking system will help us utilize every bit of solar energy in most efficient way.

## 2. System overview:

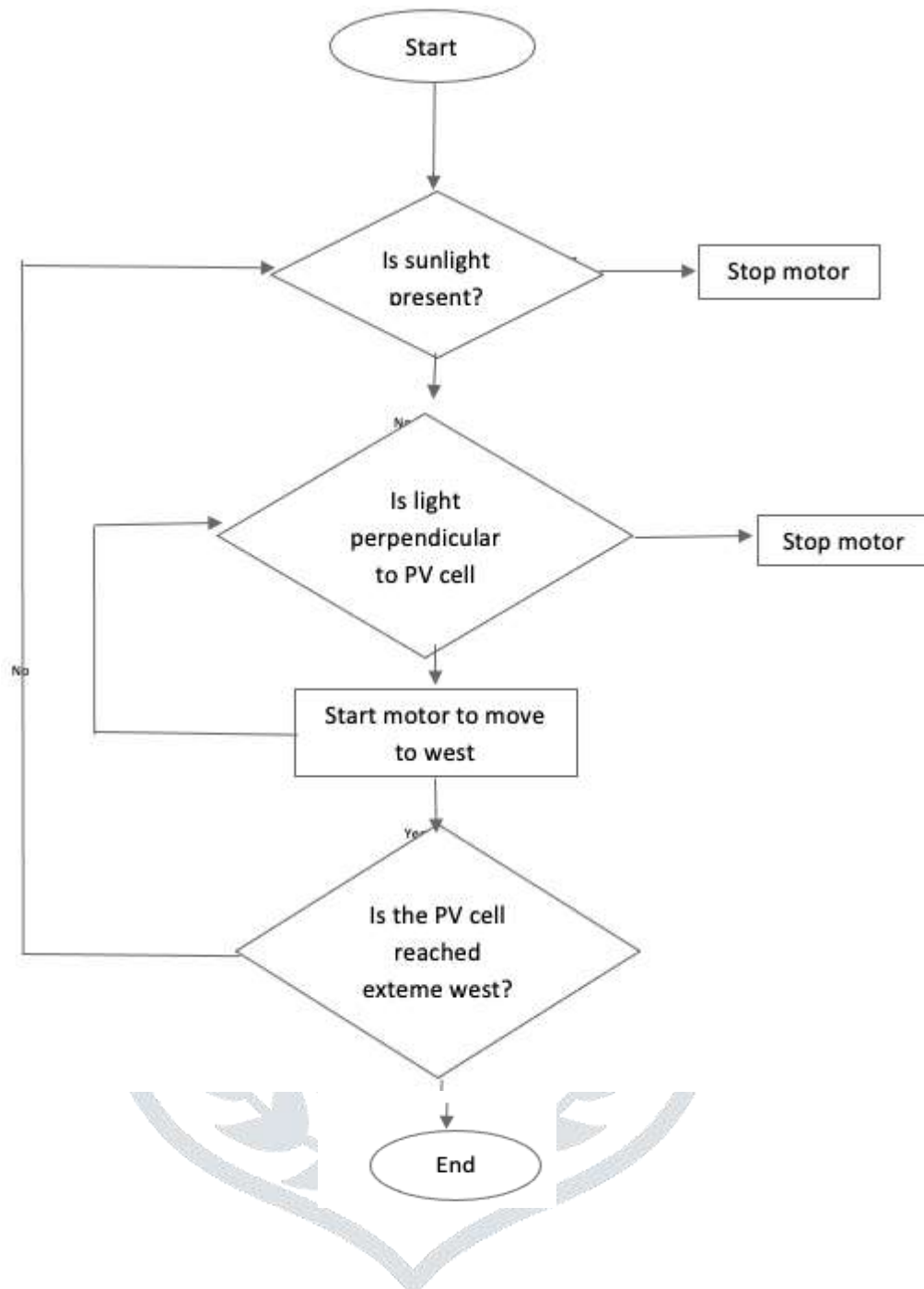


**2.1. Light Dependent Resistor (LDR):** A LDR (Light needy resistor), offers safety because of the encompassing light. The resistance decreases as the intensity of light increases, and vice versa. It acts as a sensor. It is comprised of cadmium sulfide (CdS). An LDR has a zigzag cadmium sulfide track. It conducts in both directions in same fashion, as is also called a bilateral device.

With the help of the automatic solar tracking system, the solar panels can rotate along its axis with accordance to the movement of sun. By this process the maximum amount of solar energy can be achieved, as there are no losses due to the change in position of the sun. Thus this will help in maximizing the power generated by the solar panels, and can be used on industrial basis. So that there is less use of other resources for generating electricity and it is also eco-friendly.

**2.2. Solar panel:** As solar energy is one of the cleanest form of energy, it doesn't affect the environment by releasing toxic gases or any kind of leftovers. Thus with the help of this tracking device we can create an eco-friendly environment and it can be used in large scale industries for power generation as this will generate enough power. With the help of solar panels there will be cut in recruiting manpower, which will be beneficial for the companies. As most of the work is done on its own, unless there is any default in the solar panels. And solar energy also helps in saving energy, as it uses lower powered items such as LED/CFL lamps. And it is easily available and easy to install.

### 3. Methodology:



A solar cell, is a gadget that changes over light energy into electrical energy. A single solar cell makes a little measure of energy (around .6 volts DC) so they are normally assembled together in a coordinated electrical board called a sun based board. Daylight is comprised of bundles of sub atomic particles called photons. At the point when the photons strike the semi-conductor layer (typically silicon) of a solar cell, a part of the photons is retained by the material instead of reflecting it. At the point when a photon is consumed, the vitality of that photon is exchanged to an electron in a small amount to the cell bringing on the electron to escape from its typical position. This makes a gap in the molecule. This opening pulls in an alternate electron from a close-by particle now making it an alternate, which is filled again by an electron from an alternate molecule. The problem with solar energy is that the output of the solar panel is variable. These solar systems are designed to extract the maximum amount of power available from the solar panels and store it in the battery. These controllers protect panels from discharging after the sun goes down. The solar panels used to convert energy from the sun into electrons are offered in various volts gradations; a solar panel battery charger is available from 2watt to 30watt range.

L293D, consider a motor connected on left side output pins (pin 3, 6). To rotate the motor in clockwise direction the input pins have to be provided with Logic 1 and Logic 0.

Pin 2 = Logic 1 and Pin 7 = Logic 0 Clockwise Direction

Pin 2 = Logic 0 and Pin 7 = Logic 1 Anticlockwise Direction

Pin 2 = Logic 0 and Pin 7 = Logic 0 Idle [No rotation] [Hi- Impedance state]

Pin 2 = Logic 1 and Pin 7 = Logic 1 Idle [No rotation]

In the same way the motor can also operate across input pin 15, 10 for the motor on the right hand side.

The most important reason behind this study is to meet the electricity supply crisis our country is facing. There are many rural areas where no electricity is supplied. Thus, if this project is held on a national basis then this scarcity of electricity will be met. Another reason is, if this gets approved then the pollution and the greenhouse gas emission will degrade. Thus the environment will have a better sustainability for lives on it.

The most promising future power generation energy resource is solar power. However, there are many issues related with its use; the main problem is that it is a weaker source of energy. Even in the hottest regions on the earth, the solar radiations flux rarely exceeds 1 KW/m, which is a less value for technological utilization. Another problem associated with solar energy is that its availability varies with change in time. The variation in availability occurs due to the day night cycle. It also changes seasonally as of the earth's orbit around the sun and due to irradiance in temperature due to the change in atmospheric conditions. In future, the small solar modular unit and small hybrid solar & wind or solar & hydro power plants cost will be economically affordable for large scale production and use of solar energy.

The experimental facility is equipped with sensors for the monitoring of meteorological variables, operating variables, and the temperature of the PV modules. Table shows the sensed parameters and the characteristics of the measuring devices used for the collection of experimental data. A meteorological station was placed in the vicinity of the experimental system to consider the direct effects of the environmental variables, i.e., environment temperature, wind direction, wind speed, and relative humidity. In addition, a pyrometer was mounted on the tracking structure to sense the overall global radiation that acts directly on the PV surface. To measure the PV temperature, infrared temperature sensors are placed in contact with the PV panels' backside, where the mean of the PV array is used as the dependent variable. Finally, PV power data are indirectly calculated by the measured PV voltage and PV current.