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# Street Lighting based on Solar Power and Solar Tracker

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**Abstract:** *This project is based on the idea of maintaining maximum utilization and minimum loss of available energy. The plenty of solar energy available during the day time is stored in a solar cell and the stored energy is used to glow the street lights during the whole night. Also the System provides a power saving mode of operation by adapting the method of automation. A dark sensor and a light sensor provides the automatic "ON"/"OFF" facility to the street lights, so that it will glow automatically when it is required(i.e. when the surrounding will be dark) and it will be turned "OFF" automatically if sufficient light is available in the surrounding. Again the auto intensity control mechanism has been applied by the help of a microcontroller to control the light intensity of the luminaries as per the requirement. Hence the loss of energy due to unnecessary glow of the street lights can be avoided.*

**Keywords:** energy

## I. INTRODUCTION

We need to save or conserve energy because most of the energy sources we depend on, like coal and natural gas can't be replaced. Once we use them up, they're gone forever. Saving power is very important, instead of using the power in unnecessary times it should be switched off. In any city "STREET LIGHT" is one of the major power consuming factors. Most of the time we see street lights are ON even after sunrise thus wasting lot of energy. Over here we are avoiding the problem by having an automatic system which turns ON & OFF the street lights at given time or when the ambient light falls below a specific intensity. Each controller has an LDR which is used to detect the ambient light. If the ambient light is below a specific value the lights are turned ON.

A light dependent sensors is interfaced to the pic 18f452 microcontroller it is used to track the sun light and when the sensors goes dark the led will be made on and when the sensor founds light the led will be made OFF.

It clearly demonstrates the working of transistor in saturation region and cut-off region. The working of relay is also known Microcontroller and the code is written in c language in Micro ide, the resulted value can be seen with the help of UART or LCD display Automatic Street Light Control System is a simple yet powerful concept, which uses transistor as a switch. By using this system manual works are 100% removed. It automatically switches ON lights when the sunlight goes below the visible region of our eyes. This is done by a sensor called Light Dependent Resistor (LDR) which senses the light actually like our eyes. It automatically switches OFF lights whenever the sunlight comes, visible to our eyes.

Aim of this project is to control the street light using LDR. When the light falling occur means resistance value will be change. There is no light then the resistance value is change. From this resistance change the voltage variation can be obtained this value is given to ADC of PIC, PIC is stand for peripheral interface controller

### OBJECTIVE

To design and install solar street light based on solar tracker that provide reliable, efficient, and sustainable lighting while reducing energy costs and carbon emissions.



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## INFORMATION

**Solar Street Light Based on Solar Tracker Overview:-**

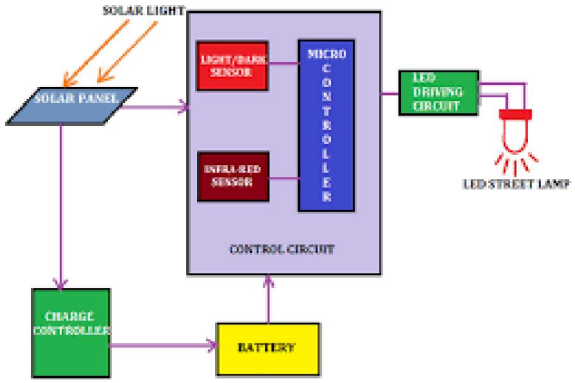
Solar street light based on solar tracker are lighting system that use solar panels to generate electricity, with a solar tracker system to optimize energy production..

Key Components of a Street Lighting Based on Solar Power and Solar Tracker:

**10 watt solar panel:-**

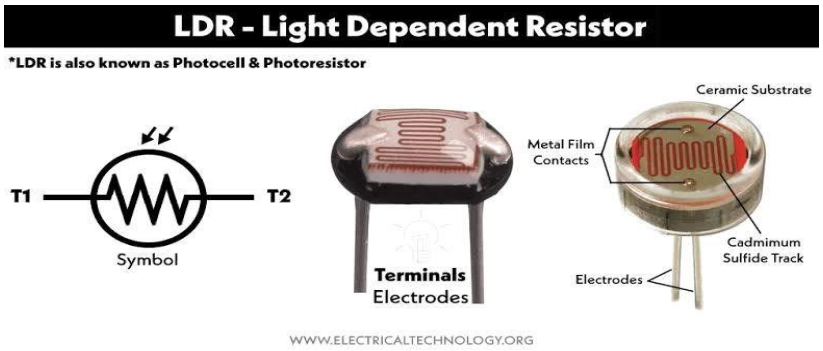
It (also known as a photovoltaic cell or PV cell) is defined as an electrical device that converts light energy into electrical energy through the photovoltaic effect. A solar cell is basically a p-n junction diode. Solar cells are a form of photoelectric cell, defined as a device whose electrical characteristics such as current voltage or resistance vary when exposed to light.

Block Diagram




**LDR sensors:-**

In an automatic street light and solar control system, the Light Dependent Resistor (LDR) serves as a crucial sensor for detecting ambient light levels.




Light Sensing: The primary function of the LDR is to detect changes in light intensity. LDRs are passive components whose electrical resistance varies based on the amount of light falling on them. When exposed to light, the resistance of the LDR decreases, and when in darkness, the resistance increases.

**LED**

A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p-n junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons

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**Resistance**

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. Resistors act to reduce current flow, and, at the same time, act to lower voltage levels within circuits. In electronic circuits, resistors are used to limit current flow, to adjust signal levels, bias active elements. And terminate transmission lines among other uses.

**Battery**

A battery voltage of 3.3volts indicates the electrical potential or pressure available from the battery to drive electric current through a circuit. This voltage level suggests that the battery is likely a single-cell lithium-ion or lithium-polymer battery commonly used in various electronic devices such as smartphones, tablets, or small portable gadgets. However, in the context of a solar-powered street light system, a 3.2-volt battery might be part of a larger battery bank.

**DC BO Wheel Motor**

A DC Motor is a precise type of motor designed to rotate with high accuracy. It typically includes a contro circuit that provides feedback on the motor shaft's current position, allowing it to rotate precisely. DC Motors are used when you need to rotate an object to a specific angle or distance. These motors consist of a simple motor driven by a servo mechanism. When powered by a DC supply, the motor is called a DC Motor, while an AC-powered motor is called an AC DC Motor. In this tutorial, we will focus on the working of the DC Motor. In addition to these basic classifications, DC Motors come in various types based on gear arrangements and operating characteristics. DC Motors often include a gear system that helps achieve high torque in compact and lightweight packages. These features make them suitable for applications such as toy cars, RC helicopters, planes, and robotics.

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**Specifications**

- Voltage Rating: The rated voltage of the motor, typically measured in volts (V).
- Current Rating: The maximum current the motor can handle, typically measured in amperes (A).
- Power Rating: The maximum power output of the motor, typically measured in watts (W).
- Torque: The rotational force produced by the motor, typically measured in newton-meters (N·m) or ounce-inches (oz·in).
- Speed: The rotational speed of the motor, typically measured in revolutions per minute (RPM).

**Applications**

- Robotics: DC wheel motors are used in robotic platforms, such as autonomous vehicles and robotic carts.
- Wheelchairs: DC motors are used in electric wheelchairs and mobility scooters.
- Electric Vehicles: DC motors are used in electric bicycles, scooters, and other small electric vehicle

**Microcontroller**

A microcontroller is a computer control system on a single chip. It has many electronic circuits built into it, which can decode written instructions and convert them to electrical signals. The microcontroller will then step through these instructions and execute them one by one. As an example of this a microcontroller we can use it to controller the lighting of a street by using the exact procedures

**Environmental Benefits:- Reduced Green House Emission:-**

- Zero Emissions: Solar-powered street lights produce no emissions or pollutants, reducing greenhouse gas emissions and contributing to a cleaner environment.
- Lower Carbon Footprint: By harnessing renewable energy from the sun, solar- powered street lights reduce reliance on fossil fuels and lower carbon emissions.

**Extended Benefits**

- Improved Public Health: Reduced air pollution from solar-powered street lights can improve public health and quality of life.
- Enhanced Biodiversity: Reduced light pollution from solar-powered street lights can preserve natural habitats and promote biodiversity.

**Energy Efficiency**

- Renewable Energy Source: Solar power is a renewable energy source, reducing dependence on finite fossil fuels and promoting energy sustainability.
- Energy Independence: Solar-powered street lights can operate independently of the grid, reducing energy consumption and peak demand.

**Conservation of Natural Resources:-**

- Reduced Land Use*: Solar-powered street lights can be installed on existing infrastructure, reducing land use and preserving natural habitats.
- Conservation of Fossil Fuels*: By harnessing solar energy, we can conserve fossil fuels for future generations.

**Key Considerations for Implementation:-**

- Initial Investment*: Higher upfront costs for solar-powered street lights.
- Intermittent Energy Source*: Solar power is an intermittent energy source, requiring energy storage solutions.
- Maintenance and Repair*: Regular maintenance and repair are necessary to ensure optimal performance.

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**Urban Mobility:-**

- E-bikes provide a solution to traffic congestion and are a fast, convenient, and cost-effective mode of transport for short to medium-distance commutes. They can complement existing public transportation systems, offering a last-mile solution.

**Public Health Benefits:-**

**Reduced Accidents and Injuries**

- *Improved Visibility*: Solar street lights provide reliable and consistent lighting, reducing the risk of accidents and injuries.
- *Enhanced Safety*: Well-lit streets deter crime and improve safety, reducing the risk of physical harm.

**Installation and Maintenance**

- *Installation*: Professional installation of the solar street light system, including the solar tracker, battery bank, charge controller, inverter, and street light fixture.
- *Maintenance*: Regular maintenance to ensure optimal performance, including cleaning of solar panels, inspection of electrical connections, and replacement of worn or damaged components.

**Regulation and Safety:-**

- Different countries and regions have varying regulations concerning e-bike usage, including speed limits, motor power restrictions, and helmet laws. Standardizing regulations could help foster broader adoption.

**Public Perception:-**

- Public perception of solar street lights based on solar trackers is generally positive, with many people appreciating their environmental benefits and cost-effectiveness. However, there are some concerns regarding their performance, particularly in areas with limited sunlight [1].

**Advantages:**

- Solar street lights require much less maintenance compared to conventional street Lights.
- Solar street lights are independent of the utility grid. Hence, the operation costs are minimized.
- Since external wires are eliminated, risk of accidents is minimized.

**Disadvantages**

- Snow or dust, combined with moisture can accumulate on horizontal pv- panels
- Initial investment is higher compared to conventional streetlights.
- Rechargeable batteries will need to be replaced several times over the lifetime of the
- Fixtures adding to the total lifetime cost of the light.

**Applications :**

This system is designed for outdoor application in un-electrified remote rural areas. This System is an ideal application for campus and village street lighting. Solar Street Lighting System is an ideal lighting system for Roads, Yards, Residential Colonies, Townships, Corporate Offices,
Hospitals, Educational Institutions and Rural Electrification.

**Future Scope :**

The Solar Powered LED Streetlight with Auto Intensity Control can control the electric charge and intensity of lights. This project can be enhanced by using with timer-based products and photo sensor based products. We can use solar tracking system for fast charging. In monsoon season, solar light is more difficult so that we use extra batteries in series to save more power to improve lighting we use

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## II. CONCLUSION

Solar street lights with solar trackers offer a reliable, efficient, and cost-effective solution for street lighting. With the ability to increase energy efficiency, improve lighting performance, and reduce energy costs, solar street lights with solar trackers are an attractive option for municipalities, governments, and private companies. As technology continues to advance and adoption increases, solar street lights with solar trackers are poised to play a significant role in promoting renewable energy, reducing greenhouse gas emissions, and improving safety.

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