

## SOLAR TRACKING SYSTEM

Ramya Bandari<sup>1</sup>, Manideep Arroju<sup>1</sup>, Srividhya Bandari<sup>1</sup>, Saiteja Bollana<sup>1</sup>,  
Susmitha Katikreddy<sup>1</sup>, Venkata Reddy Adama<sup>2</sup>

<sup>1</sup>UG Student, Department of ECE, Vaageswari College of Engineering, Karimnagar, Telangana, India

<sup>2</sup>Associate Professor & Head, Department of ECE, Vaageswari College of Engineering, Karimnagar, Telangana, India

**ABSTRACT:** Solar energy is a clean, easily accessible and abundantly available alternative energy source in nature. Getting solar energy from nature is very beneficial for power generation. Using a fixed Photovoltaic panels extract maximum energy only during 12 noon to 2 PM in Nigeria which results in less energy efficiency. Therefore, the need to improve the energy efficiency of PV solar panel through building a solar tracking system cannot be over emphasized. Photovoltaic panels must be perpendicular with the sun in order to get maximum energy. The methodology employed in this work includes the implementation of an Arduino based solar tracking system. Light Dependent Resistors (LDRs) are used to sense the intensity of sunlight and hence the PV solar panel is adjusted accordingly to track maximum energy. The mechanism uses servo motor to control the movement of the solar panel. The microcontroller is used to control the servo motor based on signals received from the LDRs. The result of this work has clearly shown that the tracking solar panel produces more energy compared to a fixed panel.

**KEYWORDS:** Solar Panal , LDR , Motor , Arduino Uno.

### 1. INTRODUCTION

Over the years, various control systems have been designed to prevent access to unauthorized user. The main reason for providing locks for our buildings (home, office, church, school, etc) is for security of our lives and property. It is therefore important to have a stress free and convenient means of achieving this purpose. In order to save the belongings most of the people employed watch dogs and security personals. They both did well for some time. But both of them can be easily deceived. If properly planned, the burglars could easily deceive a watch man and could even kill him. A single watch man can't fight against 4 or 5 burglars. Even the watch dogs could be made unconscious with the help of chloroform. These failures paved way for the home security systems, which promised a perfect protection of the assets and life.

So many security systems are employed to protect ourselves from burglary and robberies. Now-a-days most of the supermarkets, banks and industries make use of the security facilities to protect them against the burglars. Industry and banks are the places targeted by most of the burglars. To safeguard these places, surveillance cameras associated with burglar alarms are employed. Using the camera, we can watch each and every person who enters and leaves the place by just monitoring on a television from another room. It helps the cops to identify the burglar and apprehend him soon. The burglar alarms are useful in catching the burglars red handed at the moment of burglary. The moment the burglar breaks into the place, the alarm sounds and everyone will be alerted.

## 2. SOLAR PANEL

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones are available, based on thin-film cells. The cells must be connected electrically in series, one to another. Externally, most of photovoltaic modules use MC4 connectors type to facilitate easy weatherproof connections to the rest of the system. Modules electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals. Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated



Figure 1: Solar Panel

## 3. LDRs:

A Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices. They are also called as photo conductors, photo conductive cells or simply photocells. They are made up of semiconductor materials having high resistance. A photo resistor is made of a high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several me ohms ( $M\Omega$ ), while in the light, a photo resistor can have a resistance as low as a few hundred ohms. If incident light on a photo resistor exceeds a certain frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electrons (and their hole partners) conduct electricity, thereby lowering resistance. The resistance range and sensitivity of a photo resistor can substantially differ among dissimilar devices. Moreover, unique photo resistors may react substantially differently to photons within certain wavelength bands.

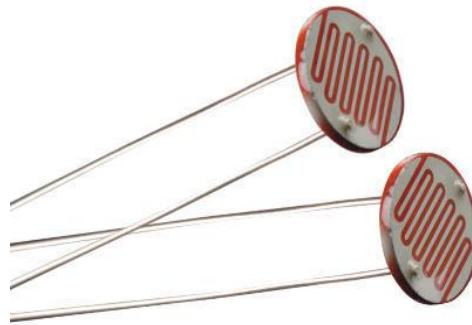


Figure 2: Light Dependent Resistor

#### 4. MOTOR

The relationship between torque vs speed and current is linear as shown left ; as the load on a motor increases, speed will decrease. The graph pictured here represents the characteristics of a typical motor. As long as the motor is used in the area of high efficiency (as represented by the shaded area) long life and good performance can be expected. However, using the motor outside this range will result in high temperature rises and deterioration of motor parts. If voltage in continuous applied to a motor in a locked rotor condition, the motor will heat up and fail in a relatively short time.

Therefore it is important that there is some form of protection against high temperature rises. A motor's basic rating point is slightly lower than its maximum efficiency point. Load torque can be determined by measuring the current drawn when the motor is attached to a machine whose actual load value is known. We will select the most suitable motor for your application after receiving your information. As shown left, if the applied voltage is changed, no load speed and starting torque also change in proportion to the voltage. Speed characteristics at a given voltage are parallel to those at other voltages. Thus, a DC motor can be used at a voltage lower than the rated voltage. But, below 1000 rpm, the speed becomes unstable, and the motor will not run smoothly Speed reduction by means of a gear box results in increased torque.

#### 5. ARDUINO

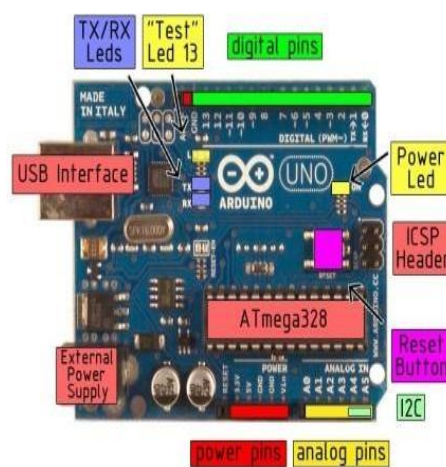


Figure 3: Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the 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

Atmega8U2 programmed as a USB-to-serial converter. "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.

## 6. WORKING

The two LDR'S are placed at the two sides of the solar panel and the motor is used to rotate the solar panel with the help of motor driver L293D. the motor will move the solar panel towards the LDR whose resistance will be low ,mean towards the LDR on which light is falling, that way it will keep following the light and if there is same amount of light falling on the both the LDR, then motor will not rotate the motor will try to move the solar panel in the position where both LDR'S will have the same resistance means where same amount of light will fall on the both the resistors and if resistance of one of the LDR will change then it rotates towards lower resistance LDR .

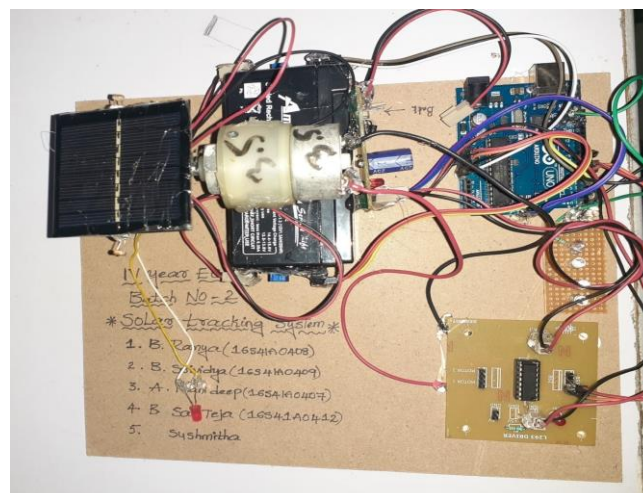


Figure 4: Arduino Uno

## 7. CONCLUSION

This chapter intends to summarize the work which has been carried out throughout this thesis, emphasizing those elements, which contribute to Maximum Power Point Tracking under partially shadowed and non uniform shadowed conditions. The thesis addresses an important technical challenge that has to be surmounted for better and increased use of solar power. In the context of Indian scenario large scale exploration of solar energy is a necessity.

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