

# International Journal of Innovative Research in Science, Engineering and Technology

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## Sun Tracking Solar Panel Using ATMEGA328 Microcontroller

Pavan Badarinath

U.G. Student, Department of Electronics and Communication Engineering, BNM Institute of Technology,  
Bangalore, India

**ABSTRACT:** Solar energy is fast becoming a very important means of renewable energy resource. With solar tracking, it will become possible to generate more energy since the solar panel can maintain a perpendicular profile to the rays of the sun. This paper will discuss the design and construction of a prototype for solar tracking system. Light Dependent Resistors (LDRs) are used for sunlight detection. The control circuit is based on an ATmega328 microcontroller. It was programmed to detect sunlight via the LDRs before actuating the servo to position the solar panel. The solar panel is positioned where it is able to receive maximum light. There are types of solar cells with relatively higher efficiencies but they tend to be very costly. One of the ways to increase the efficiency of solar panels while reducing costs is to use tracking. Through tracking, there will be increased exposure of the panel to the sun, making it have increased power output. In terms of costs and whether or not the system is supposed to be implemented by those that use solar panels, the system is viable. The increase in power is considerable and therefore worth the small increase in cost. Maintenance costs are not likely to be high.

**KEYWORDS:** Solar Tracker, Light Detecting Resistor (LDR), Arduino, Atmega 328, Servo Motor.

### I. INTRODUCTION

Solar energy is clean and available in abundance. Solar technologies use the sun for provision of heat, light and electricity. These are for industrial and domestic applications. With the alarming rate of depletion of major conventional energy sources like petroleum, coal and natural gas, coupled with environmental caused by the process of harnessing these energy sources, it has become an urgent necessity to invest in renewable energy sources that can power the future sufficiently. The energy potential of the sun is immense. Despite the unlimited resource however, harvesting it presents a challenge because of the limited efficiency of the array cells. The best efficiency of the majority of commercially available solar cells ranges between 10 and 20 percent. This shows that there is still room for improvement. This project seeks to identify a way of improving efficiency of solar panels. Solar tracking is used. The tracking mechanism moves and positions the solar array such that it is positioned for maximum power output. Other ways include identifying sources of losses and finding ways to mitigate them. When it comes to the development of any nation, energy is the main driving factor. Solar panels directly convert radiation from the sun into electrical energy. The panels are mainly manufactured from semiconductor materials, notably silicon. Their efficiency is 24.5% on the higher side. Solar tracking is a system that is mechanized to track the position of the sun to increase power output by between 30% and 60% than systems that are stationary. It is a more cost-effective solution than the purchase of solar panels. There are various types of trackers that can be used for increase in the amount of energy that can be obtained by solar panels. Dual axis trackers are among the most efficient, though this comes with increased complexity. Dual trackers track sunlight from box axes. They are the best option for places where the position of the sun keeps changing during the year at different seasons. Single axis trackers are a better option for places around the equator where there is no significant change in the apparent position of the sun. The level to which the efficiency is improved will depend on the efficiency of the tracking system and the weather. Very efficient trackers will offer more efficiency because they are able to track the sun with more precision. There will be bigger increase in efficiency in cases where the weather is sunny and thus favourable for the tracking system.

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## II. PROPOSED SYSTEM DESIGN

In this project include design and construction of an arduino based solar tracker. This solar tracker system uses the arduino board, a servomotor, 2 LDR and 2 resistors to rotate the solar panel towards the sun or a source of light. In this project LDR was selected since it has no polarity, and easy to interface with circuit, cheap, reliable and is described by high spectral sensitivity, so that difference in high intensity is represented immediately by change in its resistance value. The block diagram of proposed system as shown in figure 1.

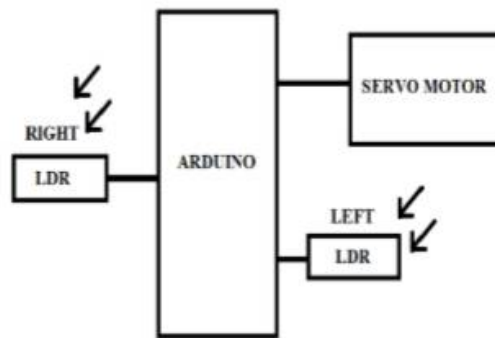


Fig 1: Block Diagram of project.

In constructing the solar tracking system, LDRs are used to determine solar light intensity. The 2 LDRs are connected to pin A0 and A1 on the board. One servo motor is used for rotation part. Usually the servo has a yellow wire that is used to control the cycle and it must be associated on pin 9 on the board. When light falls on the LDR, its resistance differs and a potential divider circuit is used to obtain corresponding voltage value from the resistance of LDR. The voltage signal is sent to the microcontroller. Constructed on the voltage signal, a corresponding PWM signal is send to the servo motor which origins it to rotate and finally attains a position where intensity of light falls on the solar panel is maximum. The schematic diagram of proposed system as shown in figure 2.

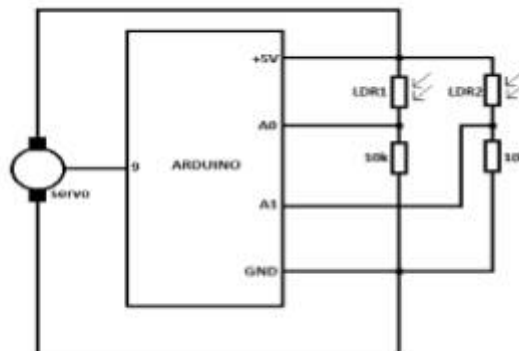


Fig 2: Schematic of Solar Tracker Circuit.

In this project the angles are designed by finding which LDR is in shadow. For example, if high source is right with respect to right LDR will receive maximum light and left LDR will be in shadow. The major components of this system are as follows, Light dependent resistor, Arduino board, Servo motor, 10 k resistor.

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## III. TECHNICAL SPECIFICATIONS

Microcontroller	Atmega328
Operating Voltage	5V
Input Voltage	7-12V Input Voltage (limits): 6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 Ma
DC Current for 3.3V Pin	50 Ma Flash Memory :32 KB of which 0.5 KB used by bootloader
SRAM	2 KB EEPROM :1 KB
Clock Speed	16 Hz

## IV. RESULTS

Result of this project is, when light falls on the LDR, its resistance varies and a potential divider circuit is used to obtain corresponding voltage value (5v) from the resistance of LDR. The voltage signal is sent to the Arduino microcontroller. Established on the voltage signal, a corresponding PWM signal is sent to the servo motor which causes it to rotate and to end with attains a position where intensity of light falls on the solar panel is maximum.

## V. CONCLUSION

Solar trackers generate more electricity than their stationary counterparts due to an increased direct exposure to solar rays. There are many different kinds of solar tracker, such as single-axis and dual-axis trackers, which can help us find the perfect fit for our unique jobsite. Installation size, local weather, degree of latitude, and electrical requirements are all important considerations that can influence the type of solar tracker that's best for us. Solar trackers generate more electricity in roughly the same amount of space needed for fixed tilt systems, making them ideal optimizing land usage. Solar trackers are slightly more expensive than their stationary counterparts, due to the more complex technology and moving parts necessary for their operation. Some ongoing maintenance is generally required, though the quality of the solar tracker can play a role in how much and how often this maintenance is needed.

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