

## Sun Tracking Schemes for Photovoltaic Panels and Robot Controlling and Moving By Solar Energy



**Md Mashkur Ahmad Khadmi**  
M.Tech (Embedded System),  
VIF College of Engineering &  
Technology.



**Muneerkhan MD**  
Assistant Professor  
Department of ECE,  
VIF College of Engineering &  
Technology.



**Imthiazunnisa Begum, M.Tech**  
HOD,  
Department of ECE,  
VIF College of Engineering &  
Technology.

### ABSTRACT:

Solar energy systems have emerged as a viable source of renewable energy over the past two or three decades, and are now widely used for a variety of industrial and domestic applications. Such systems are based on a solar collector, designed to collect the sun's energy and to convert it into either electrical power or thermal energy. In general, the power developed in such applications depends fundamentally upon the amount of solar energy captured by the collector, and thus the problem of developing tracking schemes capable of following the trajectory of the sun throughout the course of the day on a year. This project is designed with ARM7TDMI processor. The ARM7TDMI processor 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.

### Index-Terms:

ARM processor, LDR sensor, DC motors, ADC0808 module, Relays, LCD.

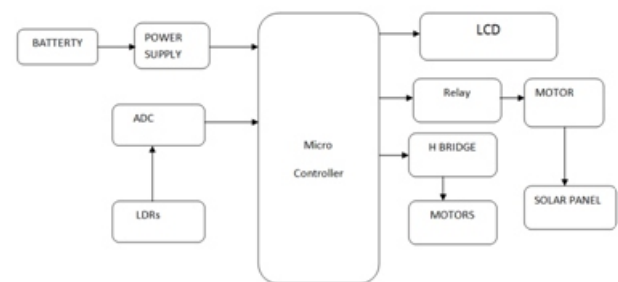
### I.INTRODUCTION:

The project uses a solar panel coupled to a dc motor to track the Sun so that maximum sun light is incident upon the panel at any given time of the day. With the impending scarcity of nonrenewable resources, people are considering to use alternate sources of energy. From all other available resources sun energy is the most abundant and it's comparatively easy to convert it to electrical energy. Use of solar panel to convert sun's energy to electrical is very popular, but due to transition of the Sun from east to west the fixed solar panel may be able to generate optimum energy.

The proposed system solves the problem by an arrangement for the solar panel to track the Sun. This tracking movement is achieved by coupling a dc motor to the solar panel such that the panel maintains its face always perpendicular to the Sun to generate maximum energy. LDR is used to measure the light intensity. The solar panel is arranged in the direction of maximum light intensity by using motor. This is achieved by programming microcontroller. The whole system is controlled by microcontroller. Here we include ROBO PLATFORM for using in urban areas which can give constant voltage or energy.

### II. PROJECT IMPLEMENTATION:

#### 2.1 BLOCK DIAGRAM:



**Figure-1: Block diagram**

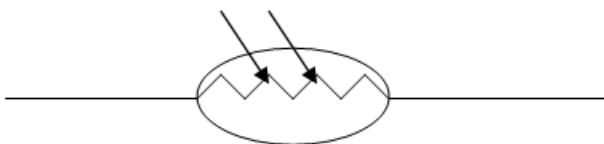
#### 2.2 ARM Microcontroller (LPC2148):

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.

Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set.

### 2.3. LIGHT DEPENDENT RESISTOR (LDR):

A photo resistor is an electronic component whose resistance decreases with increasing incident light intensity. It can also be called a light-dependent resistor (LDR), or photo conductor. Other light dependent resistors, or photo resistors have been made using materials including Cadmium Sulphide, Lead Sulphide and the more commonly used semiconductor materials including Ge, Si and GaAs. The photo resistor, or Light Dependent Resistor, finds many uses as a low cost photo sensitive element and was used for many years in photographic light meters as well as other applications such as flame, smoke, and burglar detectors, card readers and lighting controls for street lamps. Units for the light intensity are Lux or Lumence.



**Figure-2: Schematic Symbol of LDR**



**Figure-3: Light dependent resistor**

### 2.4 ADC MODULE:

ADC is short for Analog Digital Converter, Sometimes called a A-D or A to D Converter. An ADC is a device that converts a continuous analog signal to a multi-level digital signal without altering its content.

The signals that are monitored are sounds, movement, and temperature into binary code for the PC. This is 8-Bit  $\mu$ P Compatible A/D Converters with 8-Channel Multiplexer. The ADC0808 data acquisition component is a monolithic CMOS device with an 8-bit analog-to-digital converter, 8-channel multiplexer and microprocessor compatible Control logic. The 8-bit A/D converter uses successive approximation as the conversion technique. The converter features a high impedance chopper stabilized comparator, a 256R voltage divider with analog switch tree and a successive approximation register. The 8-channel multiplexer can directly access any of 8-single-ended analog signals.

### 2.5 DC MOTOR:

A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa. The input of a DC motor is current/voltage and its output is torque (speed).



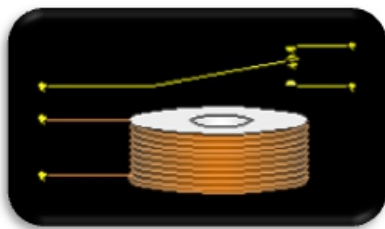
**Figure-4: DC Motor**

The DC motor has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator. Figure shows a picture of a typical DC motor, Figure shows a picture of a DC armature, and Fig shows a picture of a typical stator. From the picture you can see the armature is made of coils of wire wrapped around the core, and the core has an extended shaft that rotates on bearings.

You should also notice that the ends of each coil of wire on the armature are terminated at one end of the armature. The termination points are called the commutator, and this is where the brushes make electrical contact to bring electrical current from the stationary part to the rotating part of the machine.

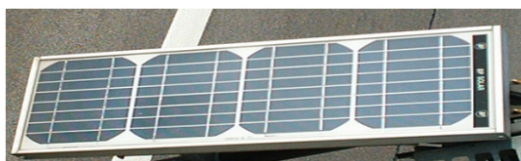
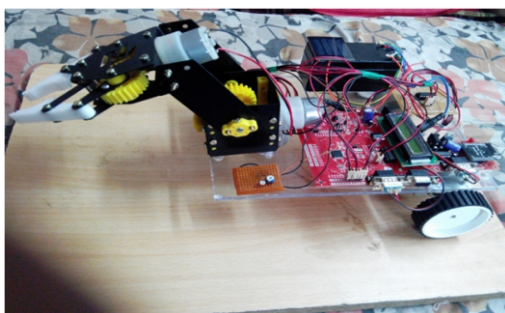
## 2.6 RELAY:

A relay is used to isolate one electrical circuit from another. It allows a low current control circuit to make or break an electrically isolated high current circuit path. The basic relay consists of a coil and a set of contacts. The most common relay coil is a length of magnet wire wrapped around a metal core. When voltage is applied to the coil, current passes through the wire and creates a magnetic field. This magnetic field pulls the contacts together and holds them there until the current flow in the coil has stopped. The diagram below shows the parts of a simple relay. SPDT Relay stands for Single Pole Double Throw relay. Current will flow between the movable contact and one fixed contact when the coil is De-energized and between the movable contact and the alternate fixed contact when the relay coil is energized. The most commonly used relay in car audio, the Bosch relay, is a SPDT relay.



**Figure-5: Relay**

## III. RESULTS:



**Figure-6: Hardware implementation**

## IV. CONCLUSION:

The project “SUN TRACKING SCHEMES FOR PHOTOVOLTAIC PANELS AND ROBOT CONTROLLING AND MOVING BY SOLAR ENERGY” has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC’s and with the help of growing technology the project has been successfully implemented.

## V. REFERENCES:

- [1] A. Zahedi, “Energy, People, Environment, Development of an integrated renewable energy and energy storage system, an uninterruptible power supply for people and for better environment,” The International Conference on Systems, Man, and Cybernetics, 1994. ‘Humans, Information and Technology’, Vol. 3 pp. 2692-2695, 1994.
- [2] R. Singh, and Y.R. Sood, “Transmission tariff for restructured Indian power sector with special consideration to promotion of renewable energy sources”, The IEEE Conference TENCON-2009, pp. 1-7, 2009.
- [3] J. Arai, K. Iba, T. Funabashi Y. Nakanishi, K. Koyanagi, and R. Yokoyama, “Power electronics and its applications to renewable energy in Japan,” The IEEE Circuits and Systems Magazine, Vol. 8, No. 3, pp. 52-66, 2008.
- [4] S. Takemaro and Shibata Yukio, “Theoretical Concentration of Solar Radiation by Central Receiver Systems,” The International Journal of Solar Energy, 261-270, 1983.
- [5] S. Armstrong and W.G Hurley “Investigating the Effectiveness of Maximum Power Point Tracking for a Solar System”, The IEEE Conference on Power Electronics Specialists, pp.204-209, 2005.
- [6] O. Aliman, and I Daut, “Rotation-Elevation of Sun Tracking Mode to Gain High Concentration Solar Energy”, The IEEE International Conference on Power Engineering, Energy and Electrical Drives, pp.551-555, 2007.
- [7] A.K. Saxena and V. Dutta, “A versatile microprocessor- based controller for solar tracking”, IEEE Proc., 1990, pp. 1105 – 1109.
- [8] E. Karatepe, T. Boztepe, and M. Colak, “Power Controller Design for Photovoltaic Generation System under Partially Shaded Insolation Conditions”, The International Conference on Intelligent Systems Applications to Power Systems, pp. 1-6, 2007.