

## Intelligent Solar Tracker System Implemented On 8051 Microcontroller

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**Abstract**— Solar energy offers more and more attractive offers because we are dealing with global climate change. But, while solar power is free, clean and inexhaustible, solar panels are being assigned. Like, if you have them, they can't reap all the benefits of sunlight and air, and the seasons change. The solar panel will receive more sunlight even when it is perpendicular to the sun's rays, but the sun, light, direction changes, constantly changing seasons of the year and in any weather. Currently, most solar panels are rigid, meaning the solar panels have a fixed orientation to the sky and rotate to follow the sun. In order to increase the specific area of lighting, solar, solar panels, we are developing a solar tracking system for the power generation system. The design of the solar panel mechanism also allows the panel to approximate a three-dimensional (3-D) rotating hemispheroid, control the movement of the sun throughout the day, and improve overall power generation. This system is made in order to achieve maximum illumination, both energy and concentration and reduce energy costs by reducing the number of panels and is therefore of great importance for research and development work. The main task of this work is to maximize the power of the sun. Now it's daytime, we

really need to use solar energy, in the next day or two, everything we use may be a consequence of this type of system.

**Keywords:** *Solar Tracking, Solar Panel, Microcontroller, Stepper Motor, Analog-to-Digital Converter, Liquid Crystal Display.*

### 1. INTRODUCTION

Solar energy refers to the use of radiant energy to generate solar energy. Solar energy is used interchangeably with solar power, but also more specifically refers to the conversion of sunlight into electricity using photovoltaic solar heating panels or using experimental technology like solar, chimney or solar pool. Solar panels, solar photovoltaic cells that give a DC voltage-if you put it in sunlight. This is exactly how you are changing the position of the panels, and this effect will change a lot. The method of direct sunlight exposure to solar panels, which can give a good effect, otherwise there may be a decrease in the cost of his earnings. So, we must follow the path of gaining a higher power. Solar installations of two types of stored energy and the sun. One is photovoltaic solar cells and modules that use photovoltaic cells that convert sunlight into electricity, and the other is solar collectors that

convert energy from the sun, heat, water, or other liquid like oil or antifreeze.

Types of solar panels help us in this project. The main goal of the project is to develop a system for automatic tracking of the solar system. To do this, we use the 8051 series-this is both a micro-controller and two LDRs to find the light intensity, as well as a stepper motor for rotating solar panels. We execute a program in connection with the C and cargo program using the ISP micro-controller (in-system programmer), and it goes to read data from sensors through the MCP3208 ADC, and this information is stepper motor will rotate. Stepper motors are directly connected to the microcontroller, and are connected via ULN2003. The main objective of this project is to maximize the use of solar energy. Today we really need to use solar energy, in the next day or two, everything that we use may be a consequence of this type of system.

## 2. OBJECTIVE

- Our projects are aimed at increasing the use of solar panels by solar panels. A digital based automatic sun tracking system has been proposed for this purpose.
- Light the solar panel automatically tracks the sun from east to west for maximum light intensity.

## 3. LITERATURE REVIEW

Today, several research groups reported on the development and operation of a microcontroller solar tracking system. Autotracking introduces the 8051-based solar tracker microcontroller to use a combination of LDR, optocouplers, stepper motors, relays, an analog-to-digital converter, and a manual tracking system application designed to track the sun, " as

reported in [1]. Anuraj et al. reported the application of a solar tracking system using ATMEGA 16 and increased energy efficiency by as much as 20% [2]. Tudorache et al. comments on the design and performance of sun tracker systems, solar photovoltaic (PV) power plants. The tracker's operation is based on a DC motor that is controlled by an intelligent driver circuit mini housing-photovoltaic panel feels the difference between the signals of two-efficient-light-sensors [6]. See the implementation of the solar tracker presents a prototype using a micro PIC 16F84A, the design of two degrees of freedom, art and vertical are presented in the paper [7]. Wang et al. proposed new designs for biaxial sun weight watchers photovoltaic systems using control theory with an inverse four-quadrant light-dependent resistor sensor (LDR) and a simple electronic circuit. Tracking is carried out both with the help of a unique two-axis AC motor, and in the form of an autonomous photovoltaic inverter [8].

## 4. SYSTEM ANALYSIS

### A. Circuit Operation:

The main goal of the project is to develop a system for automatic tracking of the solar system. To do this, we use the 8051 series-this is both a micro-controller and two LDRs to find the light intensity, as well as a stepper motor for rotating solar panels. We run programs related to the C language and its microcontroller interface via the ISP. In the following diagram, where the sun's rays fall on the LDR, that depending on the light intensity, it will create an alternative analog output. The AT89S52 microcontroller to read LDR information through the MCP3208 presents a serial ADC used to change the analog signal into digital information. The generator

provides the clock speed of the micros needed to run the program. In the microcontroller program AT89S52 comparison, the output signal is LDR that has already been loaded. The program creates a control signal fed to the stepper motor driver. The stepper motor will be rotated through the ULN2003 stepper motor driver

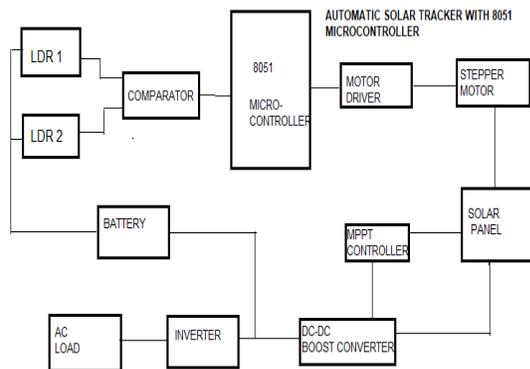


Fig. 1 Schematic representation of Solar Tracking System

## 5. WORKING PRINCIPLE

For maximum application of this project in the installation of hardware, the LDR should be placed on the surface of the large curve. And immediately the two LDRs must have a mechanism that is active at the same time. And the stepper follows the bit sample of the motor and the sun panel attached to the shaft of the stepper constantly faces the sun generally. LDR combination plays an important role. In fact combinations of these signals are given to the microcontroller 8051 and specify the motor connected to it.

The solar panel is connected to the stepper motor with its rotating mechanism. Solar tracking works this way. And it helps to increase the efficiency of the solar panel.

The solar panel generates energy and shops it inside the battery. It is used to operate the AC load with the help of MPPT, Inverter and Boost Converter.

## 6. COMPONENTS

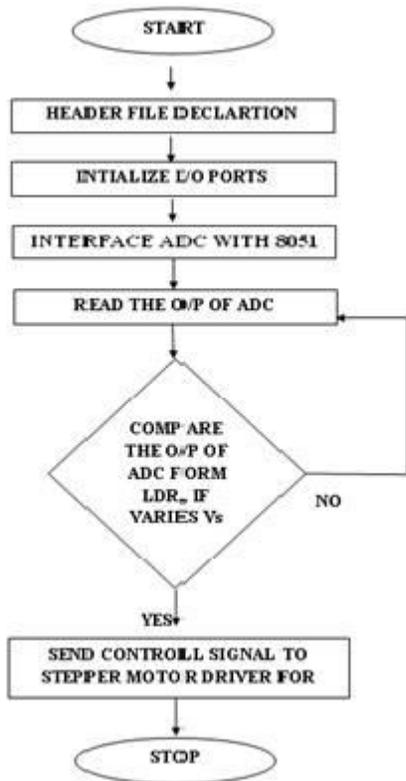
The main operating components of this system are:

- Photovoltaic Solar Panel
- Microcontroller 8051
- Comparator LM324
- Gears Mechanism
- LDRs
- Motor driver IC L293D
- Stepper motor
- MPPT
- Boost converter
- Inverter
- Battery
- AC Load

### C. Software:

- Embedded C programming
- Keil C compiler

## 7. FLOW CHART



### 8. ADVANTAGES

- 1) Increases the average voltage output of the solar panel compared to the fixed panel.
- 2) Helps protect the solar panel from dust.
- 3) High power generation throughout the day.

### 9. CONCLUSION

This solar tracker system is designed to track the movement of the sun through a micro and stepper motor. This system is able to function normally depending on weather conditions, regardless of location. We can change the way the tension is observed on the eve of the meeting and in accordance with the needs. It can also be set to its original position when the sun rises. In addition, at night, the solar panels face into the ground, which, in turn, will protect it from dust particles and extend its service life. But the prepared prototype of

the solar tracker is a miniature version of the main system and therefore has a number of limitations. In this case, the amount of LDR should be on the ground. In addition, we looked at the one-dimensional rotation tracker. So our goal is to increase the degree of freedom for this tracker in the future.

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