



# Multi axis solar Tracking System by Using MPPT Controller with self-cleaning Mechanism

Prof. K. S. Shirsat<sup>1</sup>, Mr. Shubham R. Khachane<sup>2</sup>, Mr. Swapnil K. Naphade<sup>3</sup>, Mr. Ayush P. Awasarmol<sup>4</sup>, Mr. Kunal R. Dawange<sup>5</sup>, Mr. Amol R. Khawale<sup>6</sup>, Mr. Prathmesh C. Deshmukh<sup>7</sup>

<sup>1</sup> Assistant Professor, Department of Electrical Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

<sup>2</sup> Student, Department of Computer Science & Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

<sup>3</sup> Student, Department of Computer Science & Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

<sup>4</sup> Student, Department of Computer Science & Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

<sup>5</sup> Student, Department of Computer Science & Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

<sup>6</sup> Student, Department of Computer Science & Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

<sup>7</sup> Student, Department of Electrical Engineering, Padm. Dr.V.B.K.C.O.E.Malkapur, Maharashtra, India

## ABSTRACT

*In this paper multi-Axis solar shadowing system has been introduced. The main purpose of this system is to track Sun position and gain the maximum energy affair of the solar panels. The proposed automatic shadowing system controls elevation and exposure angles of solar panels analogous that the panels always maintain perpendicular to the sun. We mainly observe that ultimate of the solar panels are deposited at fixed angles. In order to maximize the amount of solar radiation collected by a solar panel, we use solar shadowing device whose function is to follow the sun orthogonally throughout the. The system is a combination of attack and software corridor that work concurrently to achieve a precise angular Sun shadowing. A Base, Penal Frame, Super Jack Motors, high- effectiveness Solar Panel, Arduino Uno microcontroller, Relays, Rechargeable battery, Light Dependent Resistor (LDR) have been used for the system's attack part. These attack corridor need a high- position programming law, as a software part, to be bedded in the microcontroller to get an effective and precise solar shadowing system*

*keywords– Multi-axis solar tracking, Solar Panel, Solar Panel efficiency.*

## I. INTRODUCTION

Solar energy refers to the conversion of the sun's shafts into useful forms of energy, similar as electricity or heat. A photovoltaic cell, generally called a solar cell or PV, is the technology used to convert solar energy directly into electrical power. There are substantially two types of solar trackers on the base of their movement degrees of freedoms. These are single axis solar shamus and binary axis solar shamus. Again, these two systems are farther classified on the base of their shadowing technologies. former experimenters used single axis shadowing system which follows only the sun's diurnal stir. In active shadowing or nonstop shadowing, the position of the sun in the sky during the day is continuously determined by detectors. The detectors will spark the motor or selector to move the mounting system so that the solar panels will always face the sun throughout the day. However, also there will be a difference in light intensity on one light detector compared to another, If the sun isn't vertical to the shamus. This difference can be used to determine in which direction the shamus has to be listed in order to be vertical to the sun.

## II. Existing Work

Several workshop have been proposed to address the enterprises of solar system. Like fixed solar panel, due to dust on solar panel energy wasn't collected duly. The deficit of available coffers has forced contemporary society to look for measures to consummate the demands of the ultimate. With the nurturing civilization, the reduction of conventional energies, due to mortal practices has been an alarm to sustainable development issues. The failure of energy and its source guided us towards the auspicious approach of using the indispensable coffers bestowed to humankind – Solar, tidal etc. The Sun has been looked upon as an imperative source of energy. Solar energy is an eco-friendly resource as compared to its counterparts. The advancement of technology has out-turn foster ways to use this energy into its own good use. Be it as thermal energy, electricity, energy product and numerous further. Photovoltaic or concentrated solar power (CSP) systems are operated to transform the solar power expropriated by the earth into electricity. Solar shadowing device utilizes this expropriated solar power through the channel of photovoltaic arrays, an acquainted scaffolding of photovoltaic/ solar cells.

### A. SYSTEM ARCHITECTURE

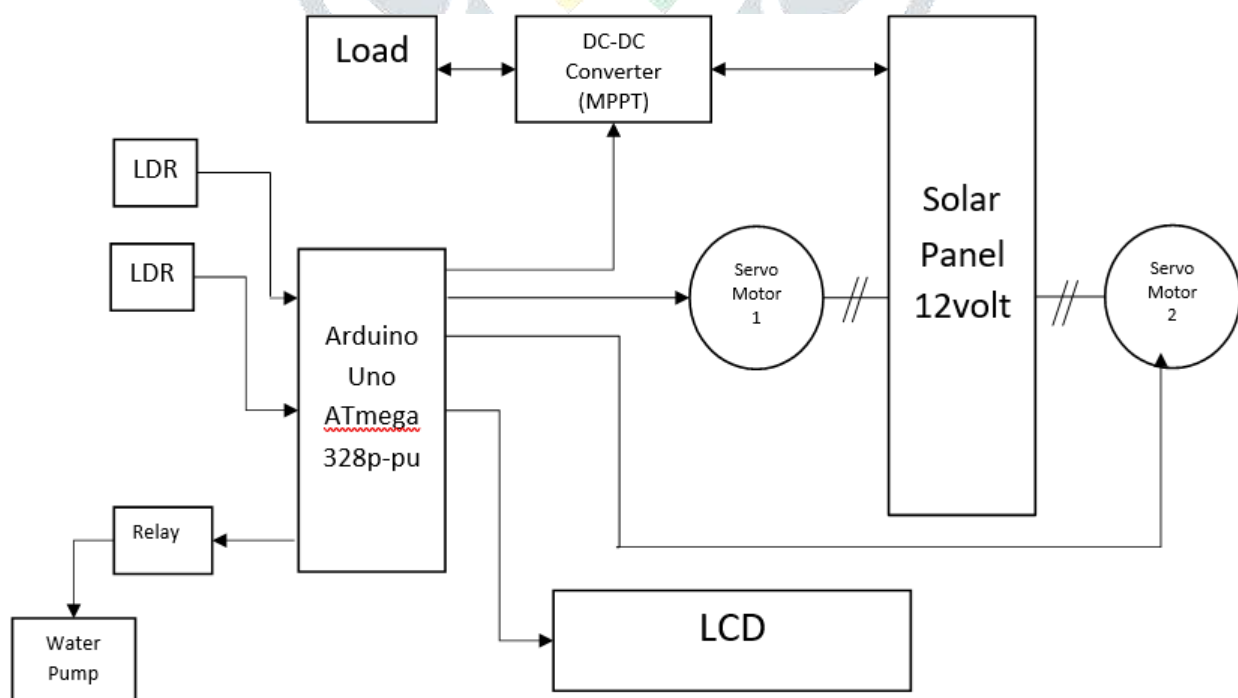


Fig.1: System Architecture

**B. Methodology**

- To understand the maximum power point tracking which helps to understand maximum solar power absorption concept.
- With mechanical technique we studied the dual axis solar tracker with electrical technique using MPPTcontroller.
- The Solar Photo Voltic system gives non-linear output because of changes occurs in weather intermittence. So, to optimize the PV system output MPPT technique is used.
- To absorb maximum solar energy with the help of PV panels cleaning PV panels are also important. So, cleaning of solar panels is done with the help of stepper motor.

This cleaning concept helps to absorb maximum amount solar energy.

**III. CIRCUIT DIAGRAM**

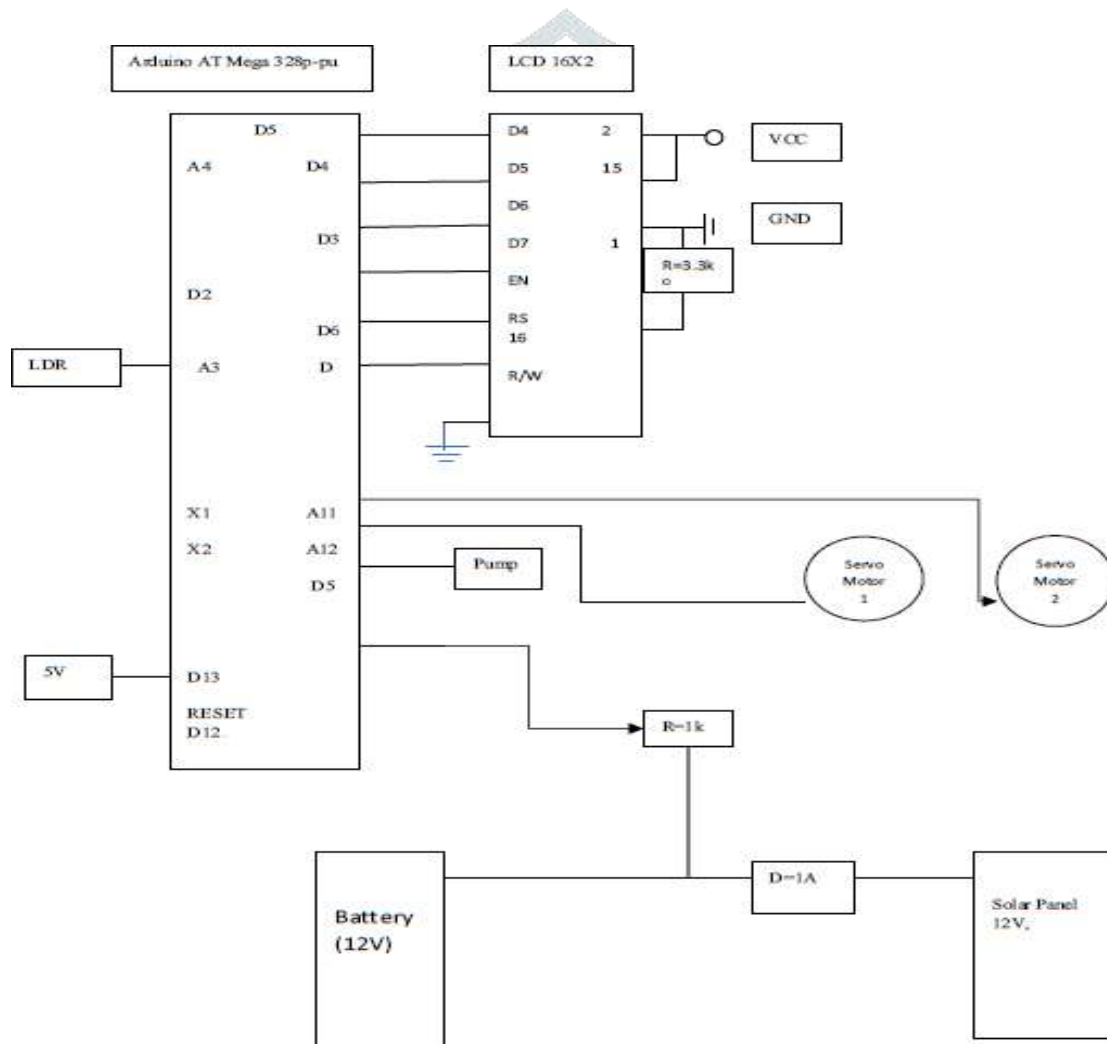


Fig2: Circuit Diagram

**IV. MPPT IMPLEMENTATION**

```

function d = MPPT(Vnew, Vold, Pnew, Pold, d1)
%V=Input Voltage; v1=New Voltage; I=Input current; a=New current; d=Calculated duty cycle
d1 = 0.5;
dV=Vnew-Vold;
%dI=Inew-Iold;
%Pnew=Vnew*Inew;
%Pold=Vold*Iold;
dP=Pnew-Pold;
    
```

```

dX=dP*dV;
if (dX==0)
d = d1;
else
if (dX>0)&(dP > 0)&&(dV>0)
d=d1-0.001;
% else if (dP > 0)&&(dV<0)
% d=d1+0.001;
% else if (dP < 0)&&(dV<0)
% d=d1-0.001;
else
d=d1+0.001;
% end
% end
end
end.
c

```

## V. ARDUINO PROGRAM SOFTWARE

The programming of Arduino uno is completed using the Arduino IDE software. This software is easy to use and user friendly. The programming of Arduino is completed and we are preparing the Simulation of Dual Axis solar Tracker. For Simulation we are using Proteus 8 Professional software. In simulation we are facing some issues to run the simulation but will complete it before the deadline of the project. The programmed Arduino is controlling the Servo motor, Water pump and LCD display and the communication between the battery and solar panel. The Arduino Uno receives the input from LDR sensors and as per the light intensity the servo motor runs in angle provided by programme with some delay. After the solar panel rotation, we have added cycle time for water pump to start and clean the solar panel.

## A. WORKING

The fig. 2 showing the circuit illustration of Dual axis solar tracking system using MPPT controller with self-cleaning mechanism. The components used are a photovoltaic solar panel, a motor driver, an Arduino, a DC servomotor, a  $16 \times 2$  display, Photovoltaic cells have two layers of semiconductor material with differing charges. When sunlight enters the cell, its energy hits electrons that exit through the two layers due to the reverse charge of the layers, electron should move from N shell to P shell, but the PN intersection makes an electric field.

Any way an outside circuit associated with PV cell permits electrons to head out N to P. This electron streaming in the circuit give direct current. A normal sunlight-based board changes simply 30 over to 40 level of occurrence sun powered radiation into electrical energy. Greatest force point following strategy is utilized to work on the proficiency of sun-oriented board. As per MPPT innovation the yield force of circuit is greatest When the impedance of the source is coordinated with the impedance of the heap. On the supply side, boost converter relates to a sun powered board to work on the yield voltage. By suitably adjusting the obligation pattern of converter with a solitary PWM the impedance of source is received to stack impedance there are a few procedures of MPPT, however bother and notice calculations are utilized in this task.

In this technique, regulator changes the voltage marginally by requesting that the organization measure the forces and if the force increments, further changes are endeavored the beating until the force quits expanding. This P&O technique. The cell's voltage expands first, a breakdown power is created, and the voltage continues to expand until the breakdown power decreases. When the produce power starts to diminish voltage across a unit is decreased till it arrives at greatest force. This interaction proceed until MPPT is gotten. If the force has expanded, it is expected that it has purchased the working place of MPP closer. In this way another voltage unsetting influence a similar way should move the working point to MPP. At the point of decreasing force, the working point moves away from the MPP, and the heading bit must rotate to return to the MPP. Keeping your solar panels clean is important to get the maximum amount

of solar energy. Then clean the solar panel.

## VI. RESULT TABLE

Lumens (lux)	Voltage (V)	Current (A)	Power (W)
342	9.78	0.11	1.08
476	10.22	0.15	1.53
543	11.11	0.21	2.33
643	11.54	0.27	3.12

## VII. CONCLUSION

Binary axis solar shadowing system is fresh effective than the single axis solar shadowing system. Mechanical system along with electrical system that's MPPT regulator is handed in the design of DC- DC boost motor. It's furnishing with tone-drawing fashion which is ensured drawing on solar panel at harmonious intervals. It's also maximizing the energy generation, so it improves the overall effectiveness of system Problems facing for the tackle the DC motor we're using for pump is producing a back EMF and it stop working of all the factors in design.

## VIII. FUTURE ENHANCEMENT

The opportunity to this project was basically to generate employed of prototype of a MPPT system. This system effectively usages the simple P & O procedure to influence the MPP. The supplementary resources wanted to implement additionally compound incremental conductanceis fairly uncertain to attainment stable, correct MPP at stable state, so this improves system efficiencyand increase reliability.

**Solution** we got that we added a Diode before the motor circuit so it does not allow the reversecurrent to the whole circuit.

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