FABRACTION OF INTELLIGENT SOLARTRACKER

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Abstract- *The aim of the project is to keep the solar photovoltaic panel perpendicular to the sun throughout the day and year in order to make it more efficient. The dual axis solar photovoltaic panel takes astronomical data as reference and the tracking system has the capability to always point the solar array toward the sun which wiil be installed in various regions with minor modifications.*

Keywords- DC motors, LDRs , Microcontrollers, Solar Panels

I. INTRODUCTION

The world population is increasing day by day and the demand for energy is increasing accordingly. Oil and coal as the main source of energy nowadays, is expected to end up from the world during the recent century which explores a serious problem in providing the humanity with an affordable and reliable source of energy. The need of the hour is renewable energy resources with cheap running costs. Solar energy is considered as one of the main energy resources in warm countries.

In general, India has a relatively long sunny day for more than ten months and partly cloudy sky for most of the days of the rest two months. This makes our country, especially the desert sides in the west, which include Rajasthan, Gujarat, Madhya Pradesh etc. very rich is solar energy. Many projects have been done on using photovoltaic cells in collecting solar radiation and converting it into electrical energy but most of these projects did not take into account the difference of the sun angle of incidence by installing the panels in a fixed orientation which influences very highly the solar energy collected by the panel.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Sun-synchronous navigation is related to moving the solar powered system in such a way that its solar panel always points toward the sun and which results into maximum battery charging and hence the system can work for long hours. The unique feature of this solar tracking system is that instead of taking the earth as its reference, it takes the sun as a guiding source. Its active sensors constantly monitor the sunlight and rotate the panel towards the direction where the intensity of sunlight is maximum. The light dependent resistor's do the job of sensing the change in the position of the Sun. The control circuit 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. By using this system the additional energy generated is around 25% to 30% with very less consumption by the system itself. The paper gives the implementation of a fuzzy logic computer controlled sun tracking system to enhance the power output of photo voltaic solar panels. The tracking system was driven by two permanent DC motors to provide motion of the PV panels in two axis. The project describes the use of a microcontroller based design methodology of an automatic solar tracker. Light dependent resistors are used as the sensors of the solar tracker. The tracking system maximizes solar cell output by positioning a solar panel at the point of maximum light intensity. This paper describe the use of DC motors, special motors like stepper motors, servo motors, real time actuators, to operate moving parts of the solar tracker. The system was designed as the normal line of solar cell always move parallel to the rays of the sun.

The Aim of this project is to develop and implement a prototype of two-axis solar tracking system based on a microcontroller. The parabolic reflector or parabolic dish is constructed around two feed diameter to capture the sun's energy. The focus of the parabolic reflector is pointed to a small area to get extremely high temperature. The temperature at the focus of the parabolic reflector is measured with temperature probes. This autotracking system is controlled with two 12V, 5W DC gear box motors. The five light sensors (LDR) are used to track the sun and to start the operation (Day/Night operation). The paper adopts the DC motor controller. It is capable of archiving the timeliness, reliability and stability of motor speed control, which is difficult to implement in traditional analog controller. The project concentrates on the design and control of dual axis orientation system for the photovoltaic solar panels. The orientation system calculations are based on astronomical data and the system is assumed to be valid for any region with small modifications. The system is designed to control the Altitude angle in the vertical plane as well as the Azimuth angle in the horizontal plane of the photovoltaic panel workspace. And this system is expected to save more than 40% of the total energy of the panels by keeping the panel's face perpendicular to the sun. In the previous solutions, each tracking direction is controlled by using a Sun sensor made by a pair of phototransistors. The single matrix Sun sensor (MSS) controls both axes of the tracking system. The inspiration for the MSS is the antique solar clock. MSS comprises 8 photo resistors and a cylinder. The difference between a shaded photo resistor cell and a lighted cell is recognized using an electronic circuit and corresponding output voltage signals are given to the DC motors which will move the array toward sun. In order to improve the solar tracking accuracy, the author comes up with combining program control and sensor control. Program control includes calendarcheck tracking and the local longitude, latitude and time, to calculate the solar altitude and solar azimuth by SCM (singlechip microcomputer), servo motor is used to adjust the attitude of the solar panel. Sensor control is that sunray is detected by photoelectric detector and then the changed signal is transmitted to control step motor to adjust the attitude of the solar. The paper discusses the technology options, their current status and opportunities and challenges in developing solar thermal power plants in the context of India. The National Solar Mission is a major initiative of the Government of India and State Governments to promote ecologically sustainable growth while addressing India's energy security challenge. It will also constitute a major contribution by India to the global effort to meet the challenges of climate change.

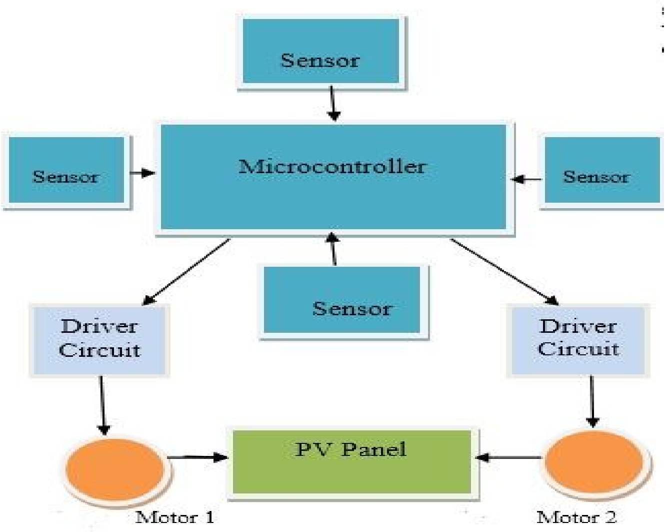
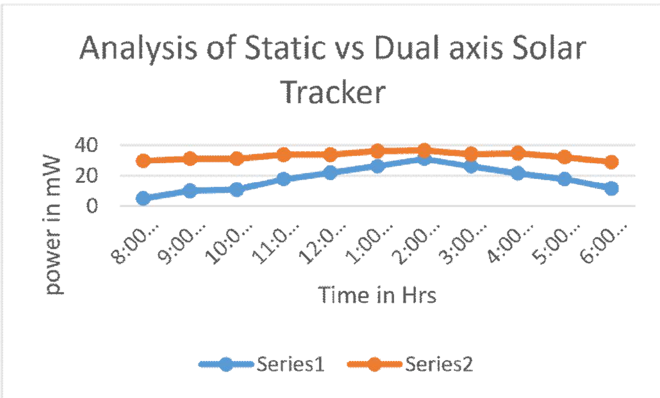


Fig 01 : Block Diagram

III. WRITE DOWN YOUR STUDIES AND FINDINGS

Efficiency of Dual-Axis Tracking System over Fixed Mounted. The readings for both the static panel and dual-axis tracker are taken for from morning 8 am to evening 6 pm for every one hour, The following readings are tabulated

Hours	Static Panel			Dual axis Solar Tracker		
	V	mA	mW	V	mA	mW
8:00 A.M	8.4	0.6	5.04	10.2	2.93	29.83
9:00 A.M	8.5	1.17	9.94	10.35	3.02	31.25
10:00 A.M	8.6	1.25	10.75	10.42	3	31.26
11:00 A.M	9.7	1.82	17.65	10.51	3.23	33.94
12:00 P.M	9.9	2.22	21.97	10.6	3.2	33.92
1:00 P.M	10.3	2.56	26.36	10.8	3.35	36.18
2:00 P.M	10.5	2.97	31.18	10.73	3.41	36.58
3:00 P.M	9.7	2.71	26.28	10.4	3.29	34.21
4:00 P.M	8.6	2.5	21.5	10.55	3.3	34.81
5:00 P.M	8.3	2.14	17.76	10.36	3.12	32.32
6:00 P.M	8.1	1.43	11.58	10.29	2.82	29.01
AVERAGE POWER			18.18			33.03



Calculations :

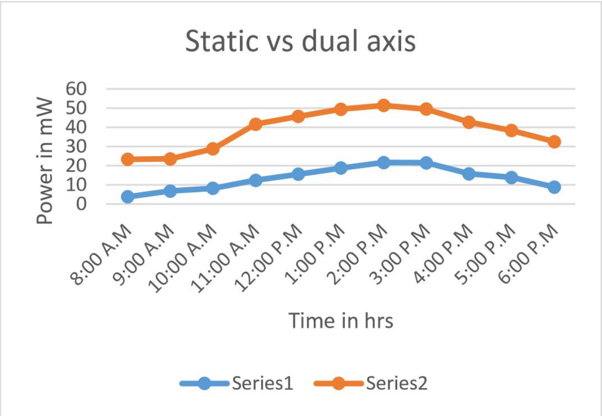
Average power by static panel : 18.18mW

Average power by Dual axis panel : 33.03 mW

Increase in power obtained : 14.85mW

Percentage increase = 44.95%

Hours	Static Panel			Dual axis Solar Tracker		
	V	mA	mW	V	mA	mW
8:00 A.M	6.4	0.6	3.84	9.3	2.1	19.53
9:00 A.M	6.96	0.98	6.82	9.38	1.79	16.79
10:00 A.M	7.24	1.12	8.22	9.8	2.1	20.58
11:00 A.M	7.93	1.56	12.44	10.1	2.9	29.29
12:00 P.M	8.38	1.86	15.58	10.2	2.96	30.19
1:00 P.M	8.97	2.1	18.83	10.3	2.98	30.69
2:00 P.M	9.31	2.32	21.66	10.32	2.89	29.82
3:00 P.M	9.42	2.29	21.57	10.4	2.69	27.97
4:00 P.M	8.69	1.82	15.81	10.12	2.66	26.91
5:00 P.M	8.25	1.68	13.86	9.89	2.48	24.52
6:00 P.M	7.95	1.12	8.9	9.69	2.44	23.64
AVERAGE POWER			16.24			25.44



Calculations :

Average power obtained by static panel : 16.24mW

Average power obtained by Dual axis panel : 25.44mW
Total increase in power : 9.2mW
Percentage increase in power = 36.16 %

IV. CONCLUSION

The project started from collecting the information about the topic chosen. The information collected source were literatures and the case studies.

After getting the prior information about the idea, the components required were Procured. The basic block diagram was made reference and work started according to it. The efficiency increase through the calculations was found out to be in the range of 35-45% .

Dual axis tracker perfectly aligns with the sun direction and tracks the sun movement in a more efficient way and has a tremendous performance improvement. The experimental results clearly show that dual axis tracking is superior to single axis tracking and fixed module systems. Power captured by dual axis solar tracker is high during the whole observation time period and it maximizes the conversion of solar irradiance into electrical energy output.The proposed system is cost effective also as a little modification in single axis tracker provided prominent power rise in the system. The Efficiency obtained from the Dual axis Solar Tracker , when compared with the static panels from the observations, shows significant rise in the total power obtained, and hence it can be concluded that the dual axis solar tracker can prove to be much more efficient and useful than any static solar tracker.

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