

SUN TRACKING SOLAR PANEL BY COUPLED WITH A STEPPER MOTOR

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Abstract—With the impending scarcity of non-renewable resources, people are considering to use alternate sources of energy. From all other open resources sun imperativeness is the most abundant and it's likewise easy to change over it to electrical essentialness. Use of sun based board to change over sun's essentialness to electrical is to a great degree understood, anyway on account of advance of the sun from east to west the settled sun controlled board may have the ability to deliver perfect imperativeness. The proposed structure deals with the issue by an approach for the sun based board to track the sun.

Keywords—Stepper motor, Solar panel, PIC Microcontroller, LDR, PIC C compiler.

I. INTRODUCTION

Sun based vitality change is a standout amongst the most tended to points in the field of sustainable vitality. Sun based radiation is normally changed over into two types of vitality: warm and electrical vitality. The sun based power has applications in numerous frameworks, for example, provincial power, water pumping and satellite correspondences.

Sun powered Tracker is a Device which takes after the development of the sun as it pivots from the east toward the west consistently. The principle capacity of all following frameworks is to give maybe a couple degrees of flexibility in development. Trackers are utilized to keep sunlight based authorities/sun powered boards arranged specifically towards the sun as it travels through the sky each day. Utilizing sun oriented trackers builds the measure of sun oriented vitality which is gotten by the sun powered vitality authority and enhances the vitality yield of the warmth/power which is created. Sun powered trackers can build the yield of sun oriented boards by 20-30% which enhances the financial aspects of the sun oriented board venture.

II. LITERATURE SURVEY

1. K.S. Madhu et al., (2012) International Journal of Scientific and Engineering Research vol. 3, 2229– 5518, states that a solitary hub tracker tracks the sun east to west, and a two-hub tracker tracks the day by day east to west development of the sun and the regular declination development of the sun. Concentrates sun oriented power frameworks utilize focal points or mirrors what's more, following frameworks to center a substantial territory of daylight into a little bar. PV changes over light into electric current utilizing the photoelectric impact. Sun oriented power is the change of daylight into electricity. Test results show that the expansion in control productivity of following sun based plate in typical days is 26 to 38% contrasted with settled plate. Furthermore, amid shady or blustery days it's shifts at any level.

2. P. Roth et al., (2004), Renewable Energy Vol. 29, PP.393-402 portrays plan also, development of an electromechanical framework to take after the situation of the sun. It permits the programmed estimation of direct sun powered radiation with a pyrliometer. It works naturally, guided by a shut circle servo framework. A four-quadrant photograph identifier detects the situation of the sun and two little DC engines move the instrument stage keeping the sun's picture at the focal point of the four-quadrant photograph identifiers. Under overcast conditions, when the sun isn't unmistakable, a processing program ascertains the position of the sun and takes control of the development, until the point that the indicator can detect the sun once more. It is conceivable to utilize this sort of tracker with bigger and heavier frameworks, as solarpanels and concentrators. Other less expensive following sensors could be utilized. Digital control ought to be utilized to show signs of improvement reaction.

3. Tiberiu Tudorache discussed the execution of a single hub sun oriented following PV board outlined and executed by College Politehnica of Bucharest in collaboration with Technosoft International SRL. The execution of the gear was tentatively tested in correlation with a settled PV panel. This paper manages the execution estimation of a sun oriented following PV panel of single hub compose. The considered gadget naturally looks through the ideal PV panel position concerning the sun by methods for a DC engine controlled by an intelligent drive unit that gets input signals from devoted light intensity sensors. The recorded information on specific day demonstrated that the sun oriented following PV panel created more vitality than the settled one with around 57.55%. Thinking about the claim vitality utilization of

the following instrument, the versatile PV panel turns out to be less appealing than the settled one, the following instrument being oversized. On the off chance that higher power PV boards are driven by a similar following mechanism they may deliver more vitality than the settled ones e.g. around 38% more vitality if there should be an occurrence of a 100 Wp PV board, under the same trial conditions.

III. SOLAR TRACKER

Sun based Tracker is a Device which takes after the development of the sun as it pivots from the east toward the west consistently. The fundamental capacity of all following frameworks is to give a couple of degrees of flexibility in development. Trackers are utilized to keep sun based gatherers/sun oriented boards situated straightforwardly towards the sun as it travels through the sky each day.

Auto Tracking:

The auto tracking is performed in view of sensor LDR. In this framework the LDR get the light power information, this simple information is changed over into the computerized shape by going through ADC, now microcontroller of unit 1 get the eight bits information of light, The microcontroller 8051 of unit 1 gets the separate al readings of ADC, it's subroutines look at these qualities, If any of the qualities are equivalent, the unit 1 microcontroller 8051 not take any choice for unit 3, it sits tight for couple of minutes and check again later. On the off chance that it gets the more noteworthy estimation of the distinction, which is characterized in it, it sends a bit, to move, for unit 3. If light intensity underneath the low light edge level, the tracker will keep assessing at whatever position it is at until the point when the moment that the breaking point is come to. The edge for this part has been doled out an enduring in microcontroller. This level compares to what was estimated with the sun based board amid daytime. The last bit of the routine in microcontroller enables the framework to reset itself toward the finish of multi day. After every motor advancement, a select is increased or decremented with the objective that the net position of the tracker can be known at some random time. Once the track-er moved 180 degrees, light power is checked; the system will return to its starting stage and enters in rest mode.

Manual Tracking:

In manual following we utilized programming named "Sun Track-ing Software"; this product is made on VB.NET, with the assistance of this product can move the sun based board in our de-sired bearing on one hub, this product utilizes the parallel port to speak with the circuit.

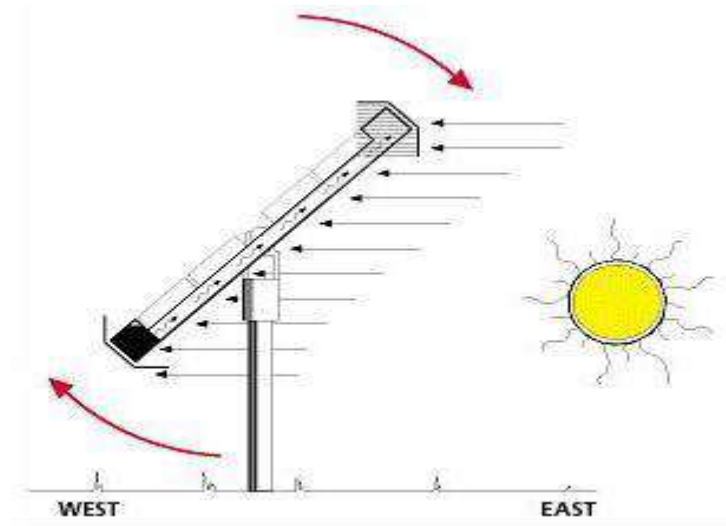


Fig. 1 SOLAR TRACKING

IV. SOLAR PANEL COUPLED TO STEPPER MOTOR UNIT

The circuit utilizes standard power supply involving a step down transformer from 230V to 12V and 4 diodes framing a bridge rectifier that conveys throbbing dc which is then sifted by an electrolytic capacitor of around 470 μ F to 1000 μ F. The sifted dc being unregulated, IC LM7805 is utilized to get 5V DC steady at its stick no 3 regardless of info DC fluctuating from 7V to 15V. The directed 5V DC is additionally separated by a little electrolytic capacitor of 10 μ F for any clamor so produced by the circuit. One LED is associated of this 5V point in arrangement with a present restricting resistor of 330 ω to the ground i.e., negative voltage to demonstrate 5V control supply accessibility. The unregulated 12V point is utilized for different applications as and when required.

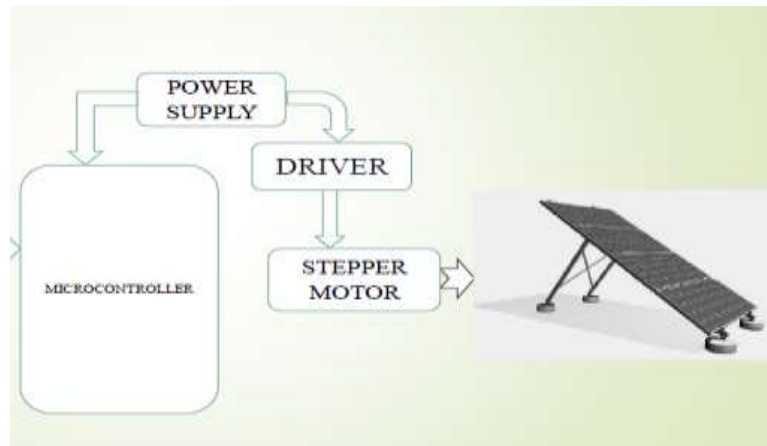


Fig. 2 Block diagram of Solar panel coupled to stepper motor

ATMEL arrangement of 8051 group of micro controllers require certain standard associations. The real number of the Microcontroller could be "89C51" , "89C52", "89S51", "89S52", and as respects to 20 pin arrangement various "89C2051". The 4 set of I/O ports are utilized in view of the venture prerequisite. Each microcontroller requires a planning reference for its inward program execution subsequently an oscillator should be useful with a coveted recurrence to acquire the planning reference as $t=1/f$. Regularly 11.0592 MHz precious stone is utilized when all is said in done for the greater part of the circuits utilizing 8051 arrangement Microcontroller. The yield of intensity supply which is associated with the 40th stick of microcontroller and ground is associated with its twentieth stick. Pins 2.0 to 2.3 of port3 of microcontroller are associated with pins1, 2, 3, 4 of ULN2003. Pins 13, 14, 15, 16 of ULN2003 are given to stepper motor and sun powered board is associated with stepper engine

V. EXPERIMENTAL SETUP



Fig. 3 Experimental setup of solar panel coupled to stepper motor

Every one of the parts of the Sun following sun powered board combined with a stepper engine, for example, sun oriented board, stepper engine, control supply unit, smaller scale controller and hand-off driver are put deliberately on the board as appeared in fig. 3 experimental setup. The current model introduces an Integrating highlight of all the equipment segments which has been utilized and created in it. The Presence of every last module has been contemplated out and put deliberately.

VI. WORKING PROCEDURE

Above block diagram and experimental setup speaks to the Solar board combined with a stepper engine unit. For doing test or to check the capacity of the undertaking, a trial setup is made with the sun powered board with stepper engine and all the required segments are precisely associated. The stepper engine is interfaced to the MC through driver IC ULN2003. Out of 6 associations from the stepper engine four (1,2,3,4) are encouraged from the yield of ULN2003 while the other two (5&6) are sustained straightforwardly to positive supply. The stepper engine shaft turns in steps while each curl is stimulated in arrangement of 1,2,3,4 by the rationale low given by the ULN 2003 while the basic point (5&6) of the four loops are associated with the positive supply Sun brings up toward the beginning of the day at 6 AM and dusk at 6PM. so in this 12 hours day and age sun pivots 1800. In the wake of finishing 1800 the sun based board comes to beginning position specifically substantially quicker with the end goal that it is prepared for rehashing the cycle from following day morning.. A low power sunlight based board is mounted on to the pole of the stepper engine with the end goal that the period of the sun oriented board faces the sun in 900 occurrences for the duration of the day.

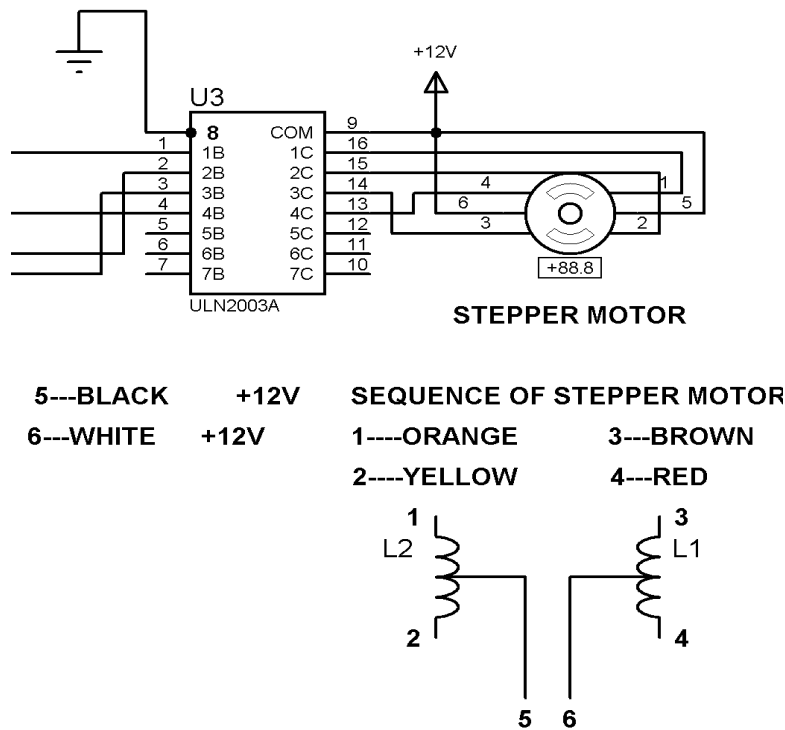


Fig.4 working of stepper motor

VI. EXPERIMENTAL VALUES

Readings for the automatic solar tracking system are taken on different days in different climatic conditions such as clear and sunny and cloudy days. The observations and readings taken are as under

1. ON A TYPICAL CLEAR AND SUNNY DAY

Table I: Experimental Results Of Sun Tracking solar panel coupled with a stepper motor System On A Clear And Sunny Day

Time	Temperature (°C)	Flat panel (o/p)	Tracking panel (o/p)
8 am	24	3.67	7.84
10am	29	7.35	8.34
12pm	30	8.84	9.37
2pm	32	8.9	9.77
5pm	25	4.55	8.21

2. ON A CLOUDY DAY

Table 2: Experimental Results of Sun Tracking Solar panel coupled with a stepper motor System on A Cloudy day

Time	Temperature (°C)	Flat panel (o/p)	Tracking panel (o/p)
8 am	22	1.197	2.898
10am	21	2.193	3.073
12pm	23	2.564	3.2
2pm	24	2.826	3.298
5pm	21	1.897	3.052

3.GRAPHICAL REPRESENTATION

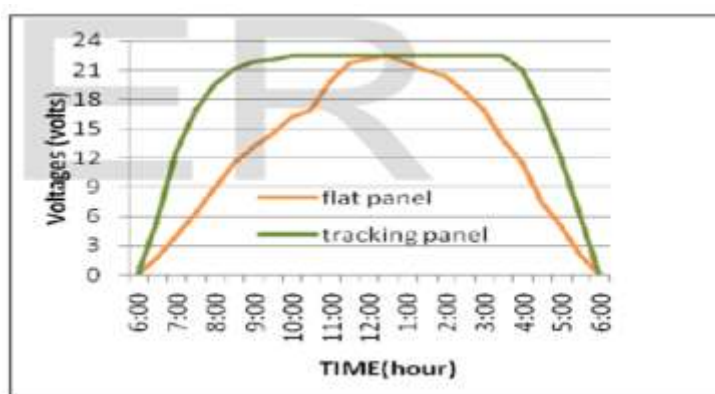


Fig 5.Time Vs Voltage

Above figure no.5 represents the difference between the output by normal fixed solar panel and tracking solar panel with respect to time.

VIII. CONCLUSION:

A solar panel that tracks the sun is designed and executed. The required program is composed that predefined the different activities required for the undertaking to work. Subsequently, tracking was accomplished. Solar tracking components enhance the vitality gain of sunlight based power plants. A tracking system is the one that achieves the most noteworthy vitality gain in every region. It is thusly the most flexible framework, since it tends to be introduced anyplace, ensuring a high vitality gain. Sun powered trackers are suggested wherever from a lively perspective, since they generally increment the measure of gathered vitality.

X. REFERENCES

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