Self Sensing Solar Panel Using 555 IC

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Abstract
This project comprises of an extremely robust and cost-effective technology which can transform any ordinary solar panel into a self-sensing solar panel which would always move perpendicular to the sun thereby gathering the maximum amount of solar energy which could be converted into electricity and as a breakthrough it uses only 555 Timer IC and no microcontrollers for its operations thereby copying the movements of a Helianthus annuus which naturally moves in the direction of the sun.

Keywords: TARGET TRACKING; ENERGY HARVESTING; MIMIC; MOTION CONTROL; PHOTODIODES; SELF-ADJUSTING SYSTEMS

1. Introduction
In nature, the "Helianthus annuus" moves itself in the direction of SUN in order to gather maximum Sun light, similarly the SELF-SENSING SOLAR PANEL moves itself with the direction of the SUN to gather maximum amount of sunlight in order to produce maximum energy. The best part of this project is that the technology behind it is very cost effective and can convert an ordinary solar panel into a SELF-SENSING SOLAR PANEL. I am sure that this type of technology might exist but I am 100% confident that it is not so much cost effective.

Benefits:

EFFICIENCY of ordinary solar panels improved to a great extent. MAINTENANCE FREE DESIGN. HIGH RELIABILITY. AUTOMATIC MOVEMENT. HIGHLY COST EFFECTIVE. Can provide electricity even in cloudy days. No extra investment needed as the existing solar panel can be upgraded into SELF-SENSING SOLAR PANEL. CLEAN and GREEN energy. Reduction in energy prices, making electricity available to the poor people. Providing infinite scopes of development. Scopes for the use of solar energy in Automobiles.

2. Components Required
Three I.C. 555, Two SCR(03p2j), R1= 6.8 Kohm, R2= 100 Kohm, R3= 4.1 Kohm, R4= 4.7 Kohm, R5= 6.8 Kohm, R6= 2.2 Kohm, R7= 10 Kohm, R8= 2.2 Kohm, R9= 6.8 Kohm, R10= 100 Kohm, R11= 4.1 Kohm, R12= 6.4 Kohm(5 watt), C1= 1000 uF(25 Volt), C2= 10 uF(25 Volt), C3= 10 uF(25 Volt), C4= 10 uF(25 Volt), 12 Volt D.C. Motor, P1= P2= P3= P4=P5= Photodiodes, Two OPTO COUPLER(L 0807), S1= S2= Pushbutton Switch, Polarized Glass, Screw Gear, Teethed Gear.

3. Innovative Components in the Design
In this project named SELF-SENSING SOLAR PANEL, a few new components like SCR [4], 555-timer chip [3], OPTO COUPLER [1], photodiodes [2], etc. are used in comparison to micro controllers as is common in similar type of projects. The technology behind this design is very cost-effective and simultaneously being extremely robust, makes the design affordable to the people living in developing nations like INDIA, etc.

Fig. 1: Circuit Diagram
4. Project Outlay

In this project, as per the Fig. 1, there are three 555 Timer I.C. [3] named as I.C. 1, I.C. 2, & I.C. 3 respectively. Let us begin with the point where the +12 Volt supply is applied and let us also assume that it is the morning time and the sun is about to rise, so as per Fig. 1, I.C. 1 is triggered and suddenly the sun rises, which activates the photodiode P1, and there is no input at pin 2 of I.C. 1, hence there is positive output at pin 3 of I.C. 1, thus OPTOCOUPLER 1 is deactivated and hence there is no power to I.C. 2. As soon as the sunlight falls on photodiode P2, I.C. 3 gets power and as soon as direct sunlight falls on photodiode P5 which is placed just beside the solar plate covered by a polarized glass (which is only allowing the direct sunlight to enter into the photodiode), I.C. 3 gets de-triggered and there is output at pin 3, thus the D.C. Motor remains at rest. But as soon as the sun moves upward and suddenly a time comes when there is no direct sunlight available to the photodiode P5, then I.C. 3 gets triggered and there is no output at pin 3 which causes a potential difference across the D.C. Motor and the motor starts moving slowly and as soon as the photodiode P5 or the solar plate becomes perpendicular to the sun, then again the motor stops as the trigger of the I.C. 3 is grounded and there is output available at pin 3 which again stops the motor. Thus the phenomenon continues as long as the sunlight is available and the solar plate remains perpendicular to the sun and gathers maximum sunlight for maximum production of electricity and the viewer who watches the entire phenomenon finds it to be similar to the phenomenon that occurs naturally in the case of Helianthus annuus which moves with the sun in order to get maximum sunlight.

Then, in the evening as soon as the sun sets, the solar plate presses the pushbutton switch S1 located in the west side as shown in Fig. 2 which further provides gate pulse to SCR 1 and simultaneously as there is no natural light available, then all the photodiodes gets deactivated, hence I.C. 3 gets deactivated. But I.C. 1 gets triggered, which further activates OPTOCOUPLER 1 which further activates I.C. 2 and OPTOCOUPLER 2. And as earlier mentioned, SCR 1 gets Gate Pulse so it triggers I.C. 2 which causes a potential difference across the D.C. Motor and the motor starts moving in opposite direction and ultimately the solar plate presses the pushbutton switch S2 located at the east side as shown in the Fig. 2, which further provides gate pulse to SCR 2 and the SCR 2 gets activated which further discharges the Capacitor C1 across the SCR 1 causing forced commutation to SCR 1 and thus SCR 1 gets de-activated which further stops the trigger at I.C. 2 causing output at pin 3 and ultimately stopping the motors movement. SCR 2 automatically gets deactivated due to lack of power via line commutation. Then, again the next morning the photodiode P4 gets activated which further allows the capacitor C1 to get charged and all other phenomenon works the same as mentioned above.

Note: All the photodiodes are directly exposed to the natural light but only the photodiode P5 is covered by a polarized glass and is not exposed to normal light and is attached in parallel to the solar plate just beside it and perpendicular to the direct sunlight as per the Fig. 2.

5. Conclusions

This design provides a huge scope for further development and with slightly more modification and also increased complexity, one can push the limits by creating a 3-dimensional moving self-sensing solar panel with auto error-correction during seasonal changes and then the design would give us the freedom for its application in almost every platform including automobiles, ships, etc.

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References
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