Design and Development of Day and Night Battery Charging using Solar Panel and IR Sensor for Power Generation

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Abstract

Increasing power demand provokes the young minds to found alternative solution using various modes. Among the various method of conventional power generation, solar is a prominent energy source for generating power. But the availability of the same is possible only during the day time and is also affected by monsoon variations. An alternative effort to solve this problem is proposed in this paper using IR sensors. The IR sensor is a grid arrangement could be used for energizing the solar panel during the night time and even during the days of monsoon variations. This work analyze the efficiency and driving capacity of the IR grid used for power generation.

Keyword- Power Generation, IR Grid, Solar Cells, LDR

I. INTRODUCTION

Solar energy is the light and radiant heat from the Sun that influences Earth's climate and weather and sustains life. Solar power is sometimes used as a synonym for solar energy or more specifically refers to electricity generated from solar radiation. Since ancient times, solar energy has been harnessed for human use through a range of technologies. Solar radiation along with secondary solar resources such as wind and wave power, hydroelectricity and biomass account for most of the available flow of renewable energy on Earth. Solar energy technologies can provide electrical generation by heat engine or photovoltaic means, space heating and cooling in active and passive solar buildings; potable water via distillation and disinfection, day lighting, hot water, thermal energy for cooking, and high temperature process heat for industrial purposes. Sunlight can be converted into electricity using photovoltaic (PV), concentrating solar power (CSP), and various experimental technologies. PV has been mainly used to power small and medium-sized applications, from the calculator powered by a single solar cell to off-grid homes powered by a Photovoltaic array. The term "PhotoVoltaic" comes from the Greek (phos) meaning "light", and "Voltaic", meaning electrical from the name of the Italian physicist Volta, after whom a unit of electrical potential (volt) is named. A solar cell, or photovoltaic cell (PV), is a device that converts light into direct current using the photoelectric effect. The first solar cell was constructed by Charles Fritts in the 1880s. Although the prototype selenium cells converted less than 1% of incident light into electricity. The necessity of solar generation is to cause less electricity loss and to improve grid security. Depending upon the solar cell efficiency, solar panel size and the amount of sunlight directly hitting the panel the energy will be produced. The objective of this project is to control solar panel cover OPEN/CLOSE depending upon the sun light. Nowadays power demand has increased due to this power failure happens many time. This project is designed to provide the solution for this power loss day and night. This project is designed with LDR, amplifier, ADC, Infrared, microcontroller, driver circuit along with motor and limit switches. Solar panel consists of number of silicon cells, when sun light falls on this panel it generates the voltage signals then these voltage signals are given to changing circuit. Depending on the panel board size the generated voltage amount is increased. Naturally suns direction varies per hour. Infrared circuit is used to produce energy when night mode activated.

II. CHALLENGES

In conventional system, there is still a lot of wire to deal with. In some dual source human cannot go near the process since it may be harmful. In proposed system, the manual operation is done to note the meter readings, Space requirement is less, free from pollution, high efficiency, less power loss, energy is generated in all the four seasons. The implementation of the day/night battery charging is used with the technology of EMBEDDED C. So, the main objective of this paper is to provide a solar power generation even night time using IR sensor.

III. SYSTEM OVERVIEW

In the proposed methodology, the input is given to the micro controller board through LM7805 and LM7812 voltage regulator. The output from the micro controller is given as an input to the square gear DC motor and IR transmitter through relay. In this project LDR is nothing but Light Dependant Resistor which varies the resistance depending on the light fall. During day time intensity of light fall is increased with decreased resistance value. The varied resistance value is converted into voltage signal.

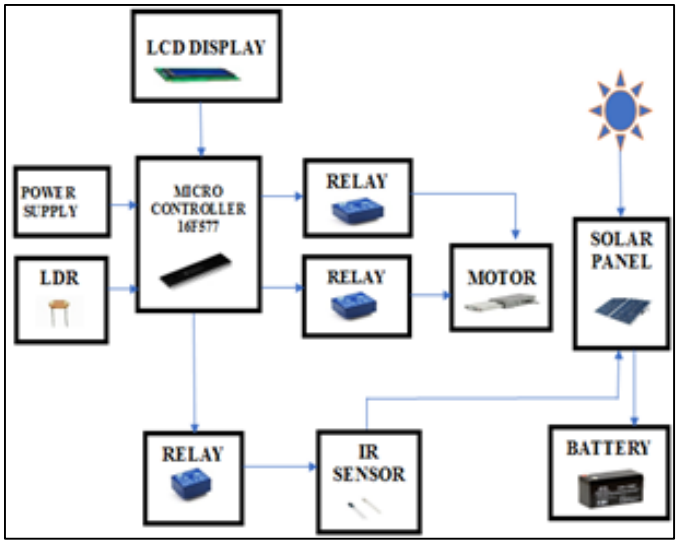
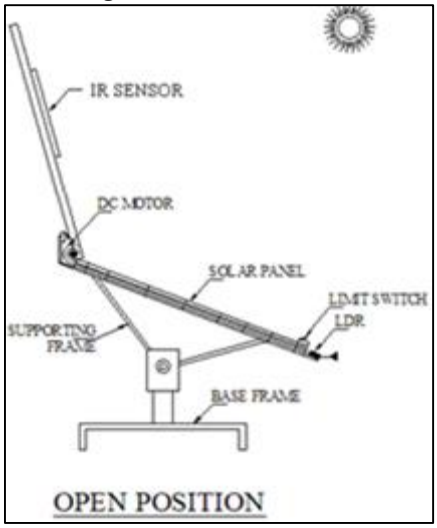


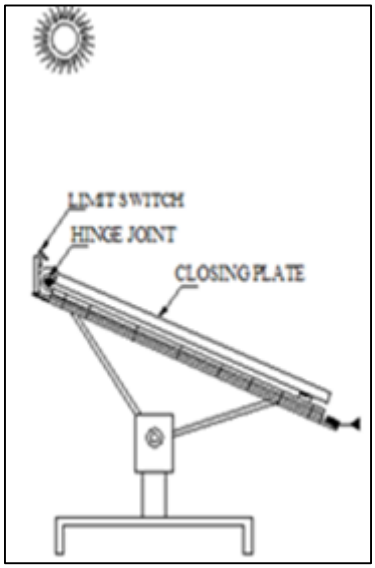
Fig. 1: Block Diagram

Then the voltage signal is given to ADC. It is nothing but analog to digital converter which receives the LDR voltage signal and converts the input analog signal to corresponding digital signal. The converted digital signal is given to microcontroller 16F877. Here, the microcontroller is the flash type reprogrammable microcontroller received digital signals from the ADC and compares that signal. This signal is varied as per the sun light.



The microcontroller displays the corresponding information on the LCD. The output of microcontroller is given to the relay 1. The relay 1 is in closed position and other two relays are in open position. The circuit activates the motor circuitry. The motor is attached with the cover plate for open and close. The motor tends to rotate in forward direction. So, the cover plate gets open and the sun light falls on the solar panel. The generated dc power stored in battery. During night time the resistance value increased with decreasing of light intensity. The value is read by microcontroller which displays the corresponding information on the LCD.

The output of microcontroller is given to the relay 2 and relay 3. The relay 2&3 is in closed position and relay 1 is in open position. The circuit get activates the motor circuitry which tends to rotate in reversed direction. So, the cover plate gets closed and the IR transmitter will produce the IR radiation. This radiation falls on the solar panel and generated power, stores in battery.



IV. RESULT ANALYSIS

The analysis and the performance characteristics of solar panel and IR grid explained below. The following are the experimental results.

Type of charging	*Before charging*	*After charging*
Solar panel	*8v*	*10v*
IR grid	*8v*	*14v*

The battery is connected to the solar panel and IR grid. The output of LDR is given to the microcontroller. The microcontroller displays the information on the LCD and activates the driver circuit for motor rotation. The motor is attached with the cover plate for open and close.

A. TRAIL 1

A 12v battery is drained to 8v and connected to the solar panel and charged for two hours. Voltage level after two hours increased to 2v. The charge of the battery is measured using analog multimeter.

B. TRAIL 2

A 12v battery is drained to 8v and connected to the IR grid and charged for two hours. Voltage level after two hours increased to 6v. The charge of the battery is measured using analog multimeter.

V. CONCLUSION

It is inferred and concluded that solar panel can conserve power effectively during both day and night time. The night time power conservation is effective because the IR grid size, IR sensor with high intensity also by using different types of sensors like moon light sensors, pyro electric sensors. This paper also focuses on the alternatives to the IR sensor which is under the study for further development.

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