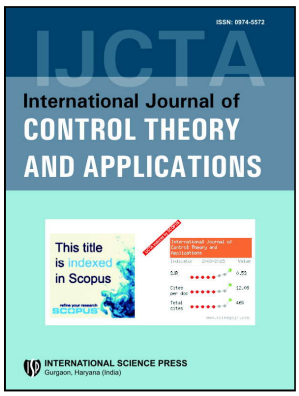

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Design and Development of Sun Tracker System

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Abstract: Today, in this world where non renewable energy sources like coal, fossil fuels ect are depleting at an exponential rate and is becoming major concern by various organizations on worldwide scale. The best way of replenishing and balncing the damage done by increasing demands of growing population is to use the natural resources like sunlight or water or wind ect. The proposed model is an up gradation of solar cell which will increase the efficiency of solar panel and will generate more electricity by following the path of sun such that sun rays are normal to PV panel which gives the maximum efficiency and voltage.

Keywords: PV panel, Sun Tracker, electricity through renewable resources.

1. INTRODUCTION

Non-renewable source of energy is on the verge of extinction. Fuels like diesel, petrol comes under non-renewable source of energy. And to replace these non-renewable sources of energy, the most accepted source of energy is solar energy. Solar energy is converted into a usable form that can be used to complete are daily needs. Sun rays from the sun are fallen upon a panel with an array of photovoltaic system which converts solar energy into electrical energy [1]. The efficiency of a solar panel is approximately 22% [2]. Many experiments and researches are carried out to increases the efficiency of the solar panels. One of the most innovative strategies discussed was the development of the solar cells which are based on the sensitization of mesoscopic oxide films by using dyes or quantum dots. This strategy gave a boost to the efficiency by 11% [3]. In this method quantum dots were assembled into mesoscopic TiO2 films [4]. Another interesting development was done using polymer solar cells which are based on the heterojunction of polymer poly(3-hexyltheophene) and methanofullerene. These increased the hole mobility and balanced charge transport which increased the efficiency of the solar panel by 4.4% by increasing external quantum efficiency [5]. TiOx used to deposit a layer in between active layer and electrode collecting aluminum electrode. This results in enhancement of 50% in a short-circuit current without using optical spacer. This resulted an increase of 5% in the efficiency of a solar panel [6]. Another research done by P. Peumans and S. R. Forrest used a layer of vacuum deposited copper phthylocyanine. This research resulted in a significant change in efficiency of the solar panels [7]. This idea is proposed to increase the efficiency of a solar panel by 40%. The main idea is t replace the fixed solar panels by rotary solar panels. These panels rotates with the movement of the sun. Basically it follows a mechanism of a sin flower which follows the movement of the sun. This rotary solar panel is named as Sun Tracker

as it tracks the movement of the sun. There are two possible types of sun trackers. First is single axis sun tracker and other is Dual axis sun tracker. The most efficient one is dual axis sun tracker system which rotates on both the axis. The base of this panel rotates from left to right or vice-versa and the main panel rotates from east to west or vice-versa. A sun tracker can be controlled by a microprocessor. There are limit switches attached to the solar panel. The status of these limit switches is read by the microprocessor and accordingly the panel movement is controlled[8]. A paper by William A. Lynch and Ziyad M. Salameh describes a sun tracker which uses two electro-optic sensors. One cell is mounted on the tracker plane and the second sensor is sunlight beam sensor which faces south. The system uses POWER MOSFETS to drive the high torque DC gearbox motors[9]. This idea is proposed to control the sun tracker by using proteus interfacing with arduino.

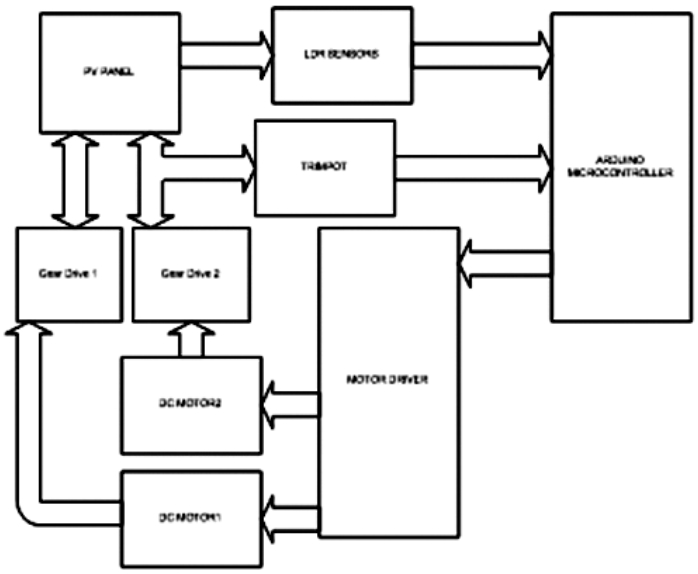
2. SYSTEM DESCRIPTION

BLOCK DIAGRAM DESCRIPTION The PV Panel is attached to LDR sensors which in turn are connected to the Microcontroller. Motor Driver is connected to DC motors which are connected to Gear drives which drives the Gear Drives attached to PV panel. Also a Trimpot is connected to gear drives(refer to figure1). Hence microcontroller takes readings from LDR and givers the command to dc motors which hence give movement to Dc drives which moves the mechanism in both azimuth as well as vertical direction

3. MECHANISM OF SUN TRACKER

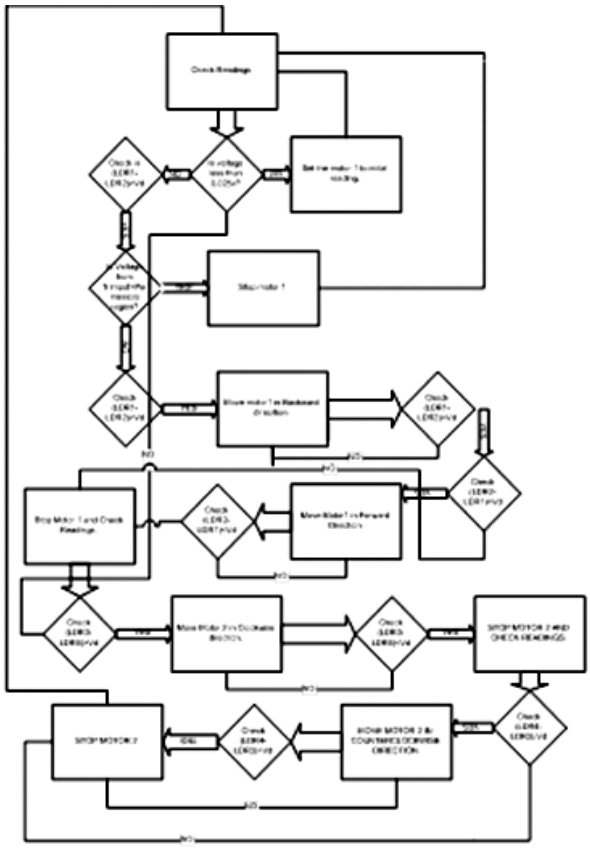
The working of the entire sun tracker system is primarily based of four Light Dependent Resistors LDR) placed at four sides of rectangular PV panel. The movement of Motors of Sun Tracker in based on the difference of readings of pair of LDRs each, one pair for vertical direction and one for azimuth direction. Also the voltage of Trimpot is also taken in account so that the voltage does not falls above the desired level which may damage the panel(refer to figure2). The sun tracker detects the night or no light on the first reading of motor 1 which the difference of readings of two LDRs(LDR1-LDR2) is less than 0.020 volts, the motors turn initially to their position and when it does detect light, as per the readings of LDRs the motor movement is done both in azimuth as well as in vertical direction. Note that the tracker will be in optimum position(normal to rays of sun) when the reading of all four LDRs in less than or equal to a threshold voltage and the motion of tracker will be continuous till the condition is not met both for azimuth as well as for vertical direction.

4. ROBOT SECTION



Block Diagram of Robot

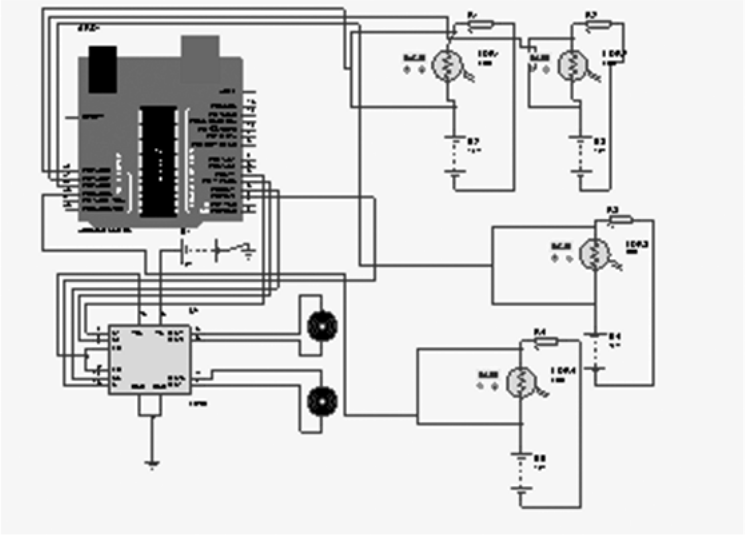
5. SERVER SECTION



Main Working of the System

6. RESULT

The designed system is tested on Proteus simulation software with the interfacing with MATLAB. Fig.6 shows the Proteus simulation model for system and Fig.7 shows MATLAB GUI control for simulation model.



7. FUTURE SCOPE AND CONCLUSION

The emerging technology can be extended to an wireless version from the cloud using IoT ESP 8266 by which user can see sun trackers power generation and monitor its condition in different weathers.

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