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Design of Dual Axis Solar Tracking System

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***ABSTRACT* : Sun has been the most major source of energy since the beginning of humanity, its energy fuels life in our planet. Today world is facing energy and environmental crisis due to excessive use of fossil fuels. Hence many countries like South Korea, Germany etc. have switched to renewable sources of energy mostly solar energy. Since solar energy harnessing is difficult due to its dispersed nature so in our project we have taken small initiative to enhance the output of P.V cells by keeping it continuously aligned with sun. In this work a LDR sensor is used to track the solar intensity, a stepper motor is used to move to rotate the panels towards the sun in accordance with LDR sensor a microcontroller and drivers act as relays for the smooth operation of the system with LDR sensor a microcontroller and drivers act as relays for the smooth operation of the system.**

Keywords: Solar Energy, Microcontroller, LDR sensor

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. Solar energy is considered to be most reliable sources of energy in warm countries in Africa, Asia. This work deals with research and development of solar tracking system which will provide better efficient output than conventional panels. Here in this work we have to track the sun in order to align the solar panels towards it. Active trackers use motors and gear trains to direct the tracker as commanded by a controller responding to the solar direction. As previous we have seen solar panels are either fixed at roof top or being controlled by user through p.c which is both time consuming and costly so our project come up with a idea of using a d.c motor controlled by microprocessor.

II. PROPOSED WORK:

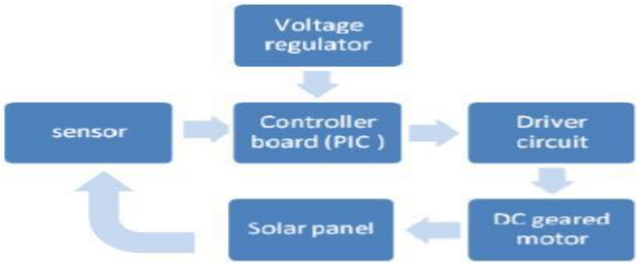

Fig 1: Block diagram of proposed work

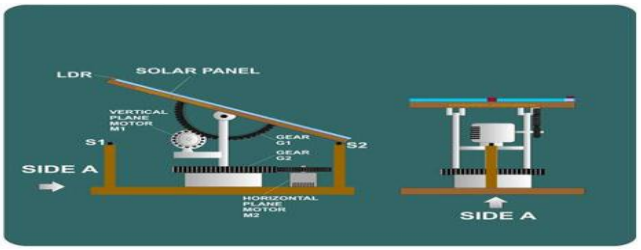

Fig 2: SOLAR TRACKING SYSTEM

The ATMEGA-168 is a modified Harvard architecture 8-bit RISC single chip microcontroller. It uses on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time. By itself the standard DC motor is not an acceptable method of controlling a sun tracking array. This is due to the fact that DC motors

are free spinning and subsequently difficult to position accurately. Even if the timing for starting and stopping the motor is correctly achieved, the armature does not stop immediately. DC motors have a very gradual acceleration and deceleration curves; therefore, stabilization is slow. Adding gearing to the motor will help to reduce this problem. The servomotor is actually an assembly of four things: a normal DC motor, a gear reduction unit, a position-sensing device (usually a potentiometer), and a control circuit.

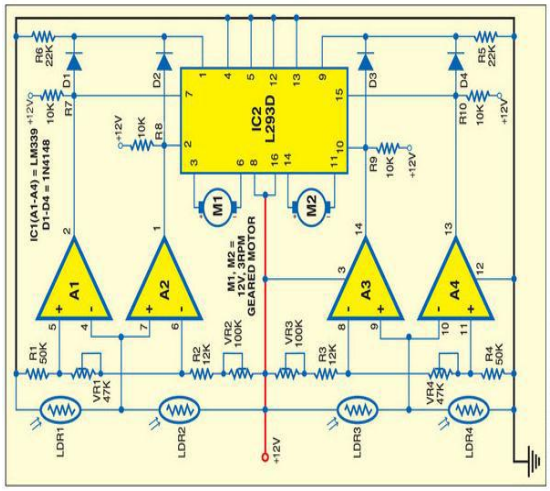

Fig :3 Circuit Diagram of proposed system

The function of the servo is to receive a control signal that represents a desired output position of the servo shaft, and apply power to its DC motor until its shaft turns to that position. It uses the position-sensing device to determine the rotational position of the shaft, so it knows which way the motor must turn to move the shaft to the command position. The solar panel that attached to the motor will be reacted according to the direction of the motor shown in fig 1,2&3.Now after assembly of the system is completed the project was tested under normal daylight conditions and readings were gathered which is shown below in the table. The above table consists of readings based on normal sunny day under perfect exposed conditions. From 6.00am to 12.00pm. Based on the reading the below graph has been drawn.

III. EXPERIMENTAL RESULT:

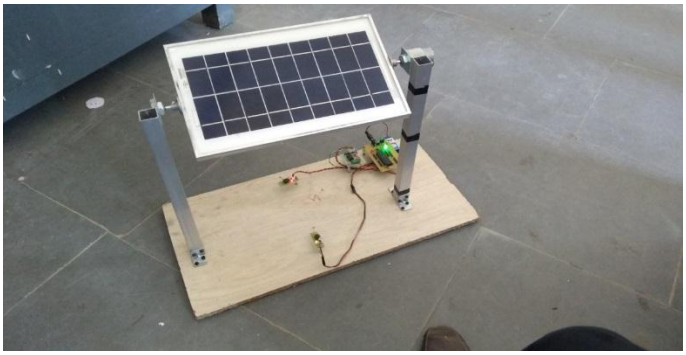

Fig 4: output of SOLAR TRACKING SYSTEM

Light dependent resistors are used in this work, the unit is using these sensors to get higher density area of sunlight, this data is in the analog form, on the basis of this data, system track the sun. Each LDR is connected to power supply forming a potential divider. Thus any change in light density is proportional to the change in voltage across the LDR's. Analog to Digital Converter(input): Arduino has an inbuilt 10-bit Analog to Digital converter(ADC), hence it can provide Digital values from 0-1023(since 2^10=1024). LDR's has two pins, and to get voltage value from it we use potential divider circuit. In potential divider we get Vout corresponding to resistance of LDR which in turn is a function of Light falling on LDR shown in fig 4. The higher the intensity of light, lower theLDR resistance and hence lower the Output voltage (Vout) And lower the light intensity, higher the LDR resistance and hence higher the Vout. Pulse Width Modulator(output):Arduino has 8t PWM generator, so we can get up to 256 distinct PWM signal. To drive a servo, we need to, this is usually accomplished using timer function of the microcontroller but Arduino makes it very easy. Arduino provides a servo library in which we have to only assign servo angle (0-1800) and the servo rotates by that angle, all the PWM calculations are handled by the servo library and we get a neat PWM signal according to the desired angle shown in fig 5.

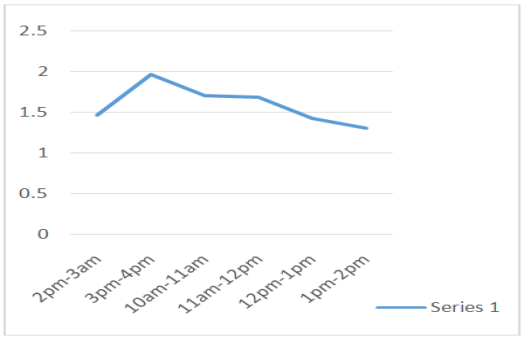

Fig 5:PWM Signal

IV. CONCLUSION

The dual axis solar tracking system is first of its kind giving higher efficiency at a cost effective value. Although it's initial cost is little high but its subsequent running cost is low. In this work a LDR sensor is used to track the solar intensity, a stepper motor is used to move to rotate the panels towards the sun in accordance with LDR sensor a microcontroller and drivers act as relays for the smooth operation of the system with LDR sensor a microcontroller and drivers act as relays for the smooth operation of the system.

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