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Solar Tracker using LDR

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Abstract: ***The impending scarcity of nonrenewable resources, people are considering to use the alternate source of energy. From all other available resources solar energy is the most abundant in nature. It is also easily converted into electrical energy. Use of solar panel to convert sun's energy to electrical is very popular. Since the transition of sun from east to west, the fixed solar panels may not be able to generate optimum energy. The proposed system is able to solve the problem by tracking the sun. The project uses a dummy solar panel coupled with two servo motors to track the sun with the help of four LDRs. The movement is achieved by using a programmed microcontroller. The microcontroller deliver the pulses in periodic form to the motor. The microcontroller used in this project is from Atmel family. The servo is driven by an interfacing IC. Further this project can be enhanced by using RTC(Real Time Clock) to follow the sun. This will help in maintaining the required position of the panel even if the power is interrupted for some time.***

Index Terms: Resources, Solar Panel, Servo Motor, LDRs, Atmel Family, RTC, Microcontroller, IC.

I. INTRODUCTION

As we all know, there are limited amount of nonrenewable energy resources present in nature. So the use renewable energy resources are increasing day by day. Solar energy is one of that renewable energy resources which has been in great demand. When it comes to the development of any nation, energy is the main driving factor. Solar tracking is a system that is mechanized to track the positon of the sun to increase power output by between 30% to 40% than the system that are stationary.

The best efficiency of the majority of commercially available solar cells ranges between 10 and 20 percent. This shows that there is still room for improvement.

This project seeks to identify a way of improving efficiency of solar panels. Solar tracking is used. The tracking mechanism moves and positions the solar array such that it is positioned for maximum absorb of sunlight.The project was designed to address the challenge of low power, accurate and economical microcontroller based tracking system which is implemented within the allocated time and with the available resources.

There is the design of an input stage that facilitates conversion of light into a voltage by the light dependent resistors. A program in embedded software in the microcontroller and lastly the driving circuit that has the servo motor allow us to track the movement.

II. OBJECTIVE

The trackers are more likely used for tracking the things. The main objective of this project is to track the movement of sun at its maximum extent. The LDRs sends the analog data of sun intensity,based on this data the microcontroller send the signal to motor to drive the panel in the movement of sun.

III. EXISTING SYSTEM

Now a days we are using a fixed tracking system for absorbing sunlight. The existing tacking system is not able to absorb the optimum amount of sunlight. The system require a manual approach to change the direction. It also required to set according to the season.

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IV. PROPOSED SYSTEM

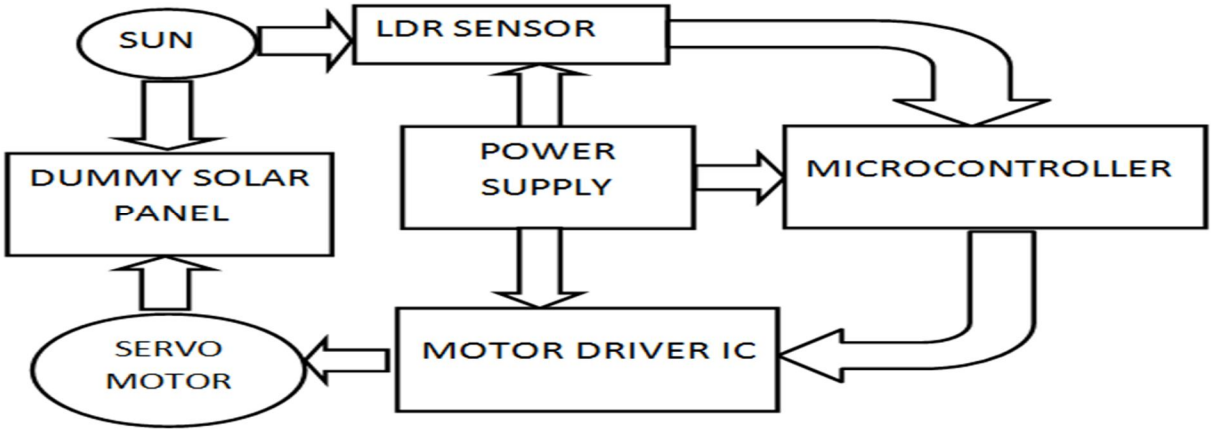

Fig.1 Proposed System Block Diagram

V. COMPONENT DESCRIPTION

A. Dummy Solar Panel

We are using a dummy solar panel as per our demonstration purpose. Since we are making a tracker only, so solar panel is only required for the movement.

B. Ldr Sensor

The simplest optical sensor is a photon resistor or photocell which is a light sensitive resistor these are made of two types, cadmium sulfide (CdS) and gallium arsenide (GaAs).The sun tracker system designed here uses two cadmium sulfide (CdS) photocells for sensing the light. The photocell is a passive component whose resistance is inversely proportional to the amount of light intensity directed towards it. It is connected in series with capacitor[2].

The photocell to be used for the tracker is based on its dark resistance and light saturation resistance. The term light saturation means that further increasing the light intensity to the CdS cells will not decrease its resistance any further. Light intensity is measured in Lux. The illumination of sunlight is approximately 30,000 lux.

C. Microcontroller

Microcontroller is also called an embedded controller because the microcontroller and its support circuits are often built into, or embedded in, the devices they control. A microcontroller is available in different word lengths like microprocessors (4bit, 8bit, 16bit, 32bit, 64bit and 128 bit microcontrollers are available today)[4]. In this project we are using ATmega328p microcontroller. The ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328P achieves throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed. It has 28 pins. There are 14 digital I/O pins from which 6 can be used as PWM outputs and 6 analog input pins. The I/O pins account for 20 of the pins. The 20 pins can act as input to the circuit or as output. Whether they are input or output is set in the software[3].

D. Motor Driver Ic

A Motor driver IC is used to operate the motor on either direction simultaneously. It might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and protecting against overloads and faults. The driver IC which is used in this project is L293D. It is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction[1]. It is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that we can control two DC motor with a single L293D IC.

E. Servo Motor

Servo motors are used for various applications. They are normally small in size and have good energy efficiency. The servo circuitry is built inside the motor unit and comes with a position-able shaft that is fitted with a gear. The motor is controlled with an

electric signal that determines the amount of shaft movement. When the shaft of the motor is at the desired position, power supply to the motor is stopped. If the shaft is not at the right position, the motor is turned in the right direction[5]. The desired position is sent through electrical pulses via the signal wire. The speed of the motor is proportional to the difference between the actual position and the position that is desired. Therefore, if the motor is close to the desired position, it turns slowly. Otherwise, it turns fast.

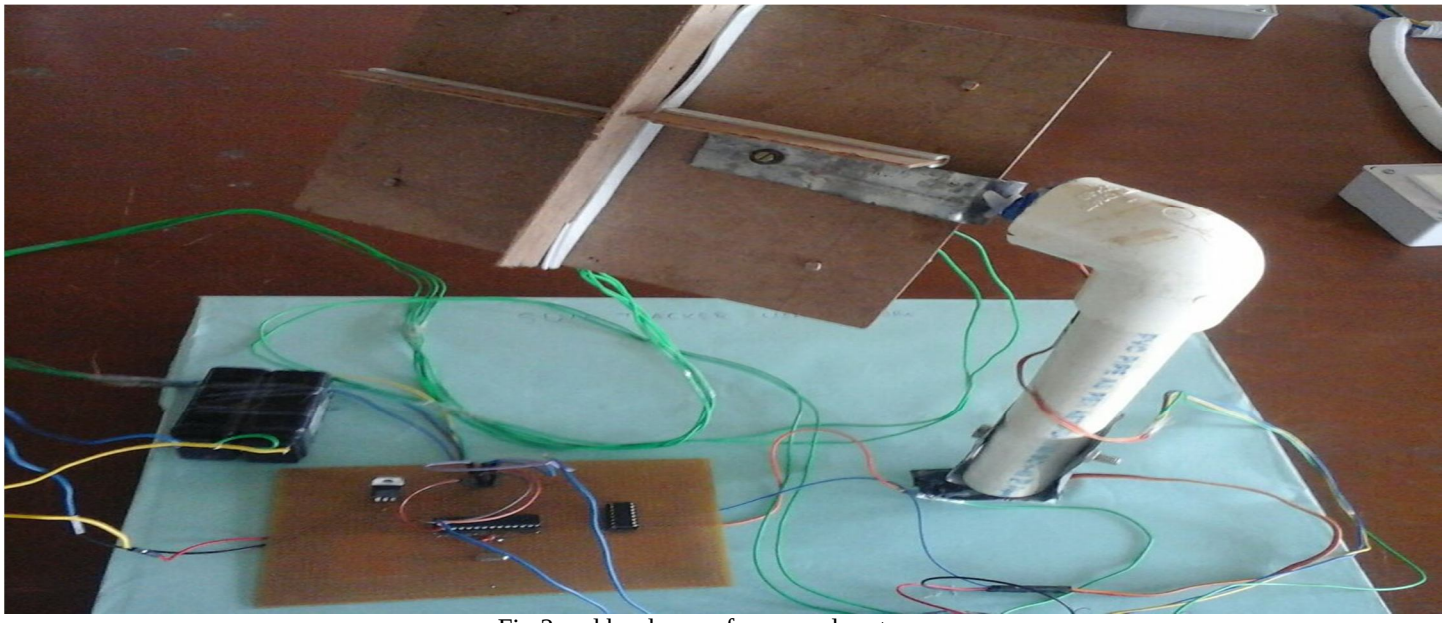

Fig.2 real hardware of proposed system

VI. CONCLUSION / FUTURE SCOPE

We can use more efficient sensors, but which are cost effective and consume little power. Various time slots will use for tracking purpose. The irradiation calculation also plays a vital role so there is a need of adding it to the project which can be extended.

VII. ACKNOWLEDGEMENT

I wish to express my profound and sincere gratitude to Prof. MR KUNAL SINGH SIR Department of Electronics and Communication Engineering, RTCIT, who guided me into the intricacies of this project with matchless magnanimity. I am indebted to him for his ideas, valuable guidance and the encouragements.

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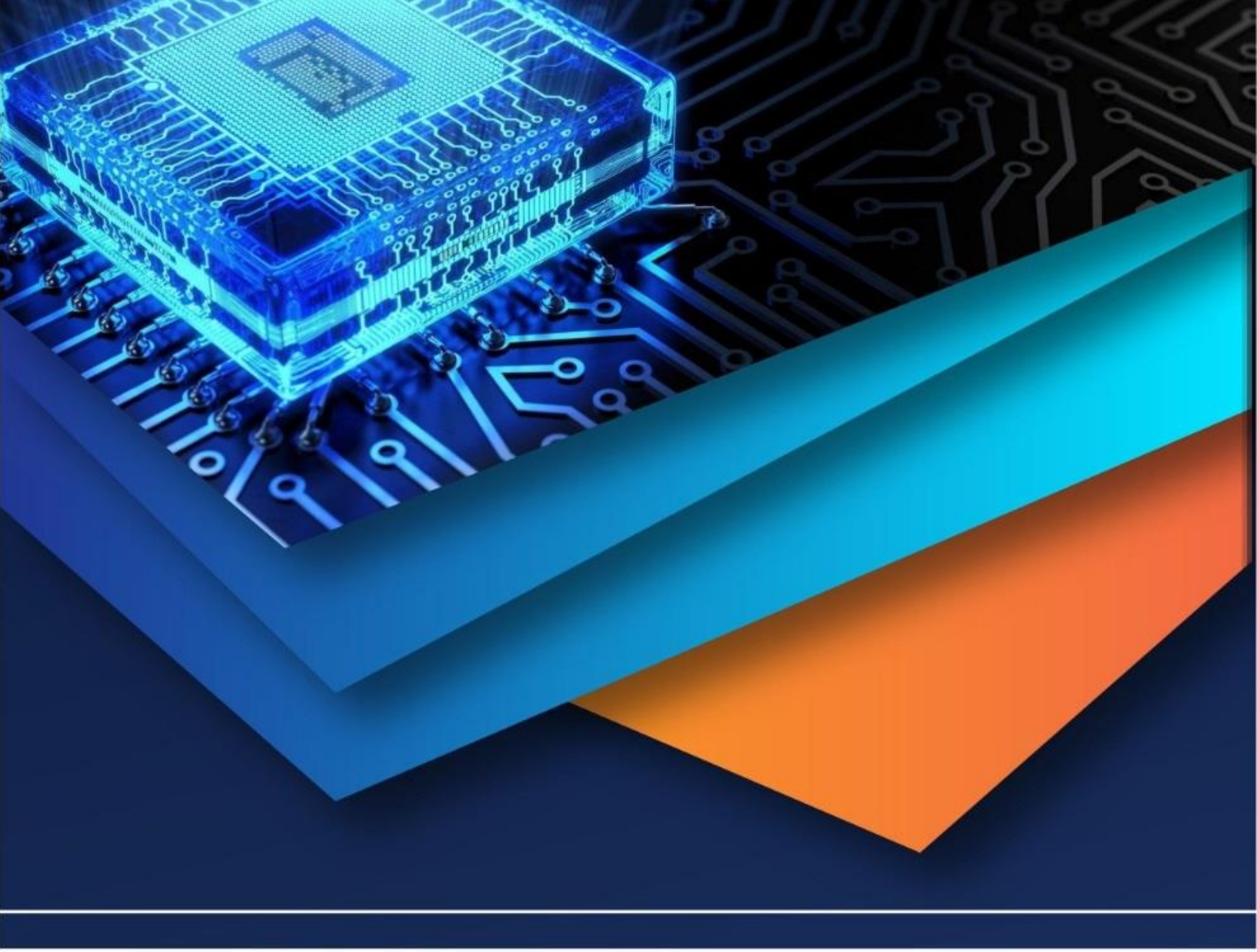

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