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RTC Based Dual Axis Solar Tracking System with Priority Based Load

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Abstract: The recent decades have seen the increase in demand for reliable and clean form of electricity derived from renewable energy sources. One such example is solar power. The challenge remains to maximize the capture of the rays from the sun for conversion into electricity. This paper presents fabrication and installation of a solar panel mount with a dual-axis solar tracking controller. This is done so that rays from the sun fall perpendicularly unto the solar panels to maximize the capture of the rays by pointing the solar panels towards the sun and following its path across the sky. Thus electricity and efficiency increased. Today, although there are many new IT services, they cause other problems. There is increasing the diversity of services and quality of service, but there is also much higher energy consumption. Related solutions are being developed and marketed by many companies, but these products have a passive ownership. That is, such solutions need to include the intelligent management due to the passive operation according to the variation per hour or battery status. For example, although there are several variables such as future demands for energy generation state depending on the climatic conditions, and the current battery status, current solutions do not account for these variables, so is difficult to expect high efficiency. Therefore, for a much higher efficiency of renewable energy, we need an intelligent system to control these states and provide appropriate management.

Keywords: Liquid-Crystal Display (LCD), Programmable and Erasable Read Only Memory (PEROM), CMOS.

I. INTRODUCTION

Electrical energy from solar panels is derived by converting energy from the rays of the sun into electrical current in the solar cells. The main challenge is to maximize the capture of the rays of the sun upon the solar panels, which in turn maximizes the output of electricity. A practical way of achieving this is by positioning the panels such that the rays of the sun fall perpendicularly on the solar panels by tracking the movement of the sun. This can be achieved by means of using a solar panel mount which tracks the movement of the sun throughout the day. Energy conversion is most efficient when the rays fall perpendicularly onto the solar panels. Thus, the work is divided into three main parts namely the mounting system, the tracking controller system and the electrical power system. In solar tracking systems, solar panels are mounted on a structure which moves to track the movement of the sun throughout the day. There are three methods of tracking: active, passive and chronological tracking. These methods can then be configured either as single axis or dual-axis solar trackers. In active tracking, the position of the sun in the sky during the day is continuously determined by sensors. The sensors will trigger the motor or actuator to move the mounting system so that the solar panels will always face the sun throughout the day. This method of sun-tracking is reasonably accurate except on very cloudy days when it is hard for the sensor to determine the position of the sun in the sky thus making it hard to reorient the structure. Passive Tracking unlike active tracking which deter-mines the position of the sun in the sky, a passive tracker moves in response to an imbalance in pressure between two points at both ends of the tracker. The imbalance is caused by solar heat creating gas pressure on a "low boiling point compressed gas fluid that is driven to one side or the other" which then moves the structure. How-ever, this method of sun-tracking is not accurate. A chronological tracker is a timer-based tracking system whereby the structure is moved at a fixed rate throughout the day. The theory behind this is that the sun moves across the sky at a fixed rate. Thus the motor or actuator is programmed to continuously rotate at a "slow average rate of one revolution per day (15 degrees per hour)". This method of sun-tracking is very accurate. However, the continuous rotation of the motor or actuator means more power consumption and tracking the sun on a very cloudy day is unnecessary.

II. HARDWARE SYSTEM

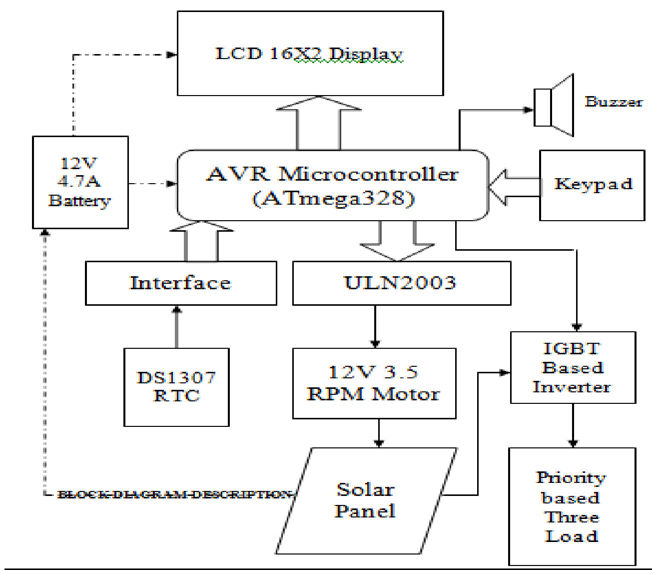

Fig 1: Block Diagram

III. METHODOLOGY

A. Microcontroller ATmega 328/P:- It is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory PEROM). The device is manufactured using Atmel's high density non-volatile memory technology and is compatible with the MCS-51 instruction set and pin diagram. The on-chip flash allows the program memory to be reprogrammed in-system or by a conventional non-volatile memory programmer. Microcontroller is used as signal sensing &decision making device.

Key: RTC, ULN drive2003, ATmega328, Solar Panel

B. Motor Driver (L293D): L293D is bidirectional Dual Pair motor Driver. Single IC can drive four motor unidirectional & two bidirectional. It's operate on +5 V & Switch the 12V with maximum 2A current. DC motors are typically controlled by using a transistor configuration called an "H-bridge". This consists of a minimum of four mechanical or solid-state switches, such as two NPN and two PNP transistors. One NPN and one PNP transistor are activated at a time. Both NPN and PNP transistors can be activated to cause a short across the motor terminals, which can be useful for slowing down the motor from the back EMF it creates. H-bridge. Sometimes called a "full bridge" the H-bridge is so named because it has four switching elements at the "corners" of the H and the motor forms the cross bar. The switches are turned on in pairs, either high left and lower right, or lower left and high right, but never both switches on the same "side" of the bridge. If both switches on one side of a bridge are turned on it creates a short circuit between the battery plus and battery minus terminals. If the bridge is sufficiently powerful it will absorb that load and your batteries will simply drain quickly. Usually however the switches in question melt.

C. Motor (12V DC, 1/2 kg Torque): 12V DC permanent magnet motor with torque of 1/2kg & 30 RPM is used. Voltage: 12V DC. Current: 250mA. RPM: 30 Torque: 1/2kg. A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

D. LCD Display: Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. Display: 16 characters X 2 lines. Backlight: Yellow. Operating temperature: 0˚C to 50˚c. Operating Voltage: 4.5V to 5.5V. Backlight Voltage:-5.0V (100mA).

IV. CONCLUSION

This article was proposed by the system of dual-axis sun tracking based on type of microcontroller ATmega 328. This article has shown the development and implementation of dual-axis sun tracking system with minimal effort. The mechanical structure was very simple the environment and reliable, it has been designed in such a way that entire controller card should fit into the platform tracking and implementation of hybrid automatic solar system. The scheme was designed with a minimal number tracking system of components to minimize cost and to simplify the power engineering assembly have been integrated onto a single board.

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