Direct and Indirect Sensing Two Axis Solar Tracking System

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Abstract— The main goal of this project is to verify precise solar tracker. The project is split into 2 parts; hardware and software system. Hardware part generally composed of solar panel, Servo motors with gearbox, LDR sensor module, RTC and electronic circuit. Software half represents the thinking behavior of the system, that is how the system acting under several weather conditions. In this work sensing of the sun position carried out in two stages primary and secondary. Primary stage or indirect sensing performed via sun-earth relationship as a rough adjustment and second stage or direct sensing performed via set of LDR sensors as output standardization to trims the azimuth and altitude angles. If the weather is cloudy or unclean, the tracking system uses primary stage or sun-earth geometrical relationships only to identify the location of the sun; so the system tracks the position of the sun regardless the atmospheric phenomenon. The energy extracted from photovoltaic (PV) or any solar furnace depends on star irradiance. For maximum extraction of energy from the sun, the solar collector panel should always be normal to the incident radiation solar trackers moves the solar collector to follow the sun path and keeps the orientation of the solar collector at an optical tilt angle. Solar trailing system improves considerably the energy potency of electrical phenomenon (PV) panel. In this paper, an automatic dual axis solar tracking system is designed and developed using Light Dependent Resistor (LDR) and DC motors on a mechanical structure with gear arrangement. Two-axis star trailing (azimuth angle similarly as altitude angle) is enforced through Arduino UNO controller supported Sun-Earth pure mathematics. The results indicated that the automated star trailing system is additional reliable and economical than mounted one.

Key words: Arduino UNO; LDR; Photovoltaic (PV) Panel; Dual Axis Solar Tracking System; Azimuth Angle; Elevation Angle

I. INTRODUCTION

At the present time, climate change on the world is at a delicate level. Climate change can be divided into two classes, human and natural causes. Natural causes of climate changes are current, star variations and earth orbital changes. The major part of climate changes caused by human is man-made greenhouse gases emission.

Global warming can be shown through some of the natural phenomenon around the globe like the severe weather conditions. Solar energy is the energy derived from the sun in the form of solar irradiation. Solar energy is the most inexhaustible, renewable source of energy known to humanity. In order to increase the efficiency of solar energy systems, solar tracker is added at the expense of system's complexity and cost. The two basic classes of trackers are single axis and twin axis. Single axis tracker has one axis of freedom, vertical or horizontal. Dual axis tracker has both a vertical and a horizontal axis of freedom, so it able to track the position of the sun precisely.

With the fast increase in population and economic development, the issues of the energy crisis and heating effects are nowadays a cause for increasing concern. The utilization of renewable energy resources is that the key answer to those issues. Solar energy is one in all the first sources of fresh, abundant and inexhaustible energy that not only provides alternative energy resources, but also improves environmental pollution.

The most immediate and technologically enticing use of alternative energy is thru electrical phenomenon conversion. The physics of the PV cell (also known as star cell) is incredibly the same as the classical tangency diode. The PV cell converts the daylight directly into DC (DC) electricity by the electrical phenomenon result [1, 2]. A PV panel or module may be a packaged interconnected assembly of PV cells. In order to maximize the facility output from the PV panels, one needs to keep the panels in an optimum position perpendicular to the solar radiation during the day. As such, it's necessary to possess it equipped with a Sun hunter. Compared to a hard and fast panel, a mobile PV panel driven by a Sun hunter might boost systematically the energy gain of the PV panel.

A. Solar Tracker:

Solar Tracker is a Device which follows the movement of the sun as it rotates from the east to the west every day. The main operate of all trailing systems is to supply one or 2 degrees of freedom in movement. Trackers square measure won't to keep star collectors/solar panels headed directly towards the sun because it moves through the sky a day.

1) Passive Tracking Systems

The passive trailing system realizes the movement of the system by utilizing an occasional boiling purpose liquid.
This liquid is volatilized by the supplemental heat of the sun and therefore the center of mass is shifted resulting in that the system finds the new equilibrium position.

2) Active Tracking Systems

The two basic varieties of active star hunter square measure single-axis and double-axis.

a) Single axis trackers

The single axis following systems realizes the movement of either elevation or angle for an alternative energy system.

Which one among these movements is desired, depends on the technology used on the hunter further because the area that it's mounted on.

For example the parabolic through systems utilize the azimuthally tracking whereas the many rooftop PV-systems utilize elevation tracking because of the lack of space.

A single-axis hunter will solely pivot in one plane – either horizontally or vertically.

