Designing of Dual-axis Solar Tracking System

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Abstract: In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of non-renewable and polluting fossil fuels have to be investigated. One such alternative is solar energy. Solar panels consists of photovoltaic cells, converts the solar energy into electrical energy and this electrical energy is stored into a battery. Sun powered vitality is a period dependant vitality asset, during the evening or amid substantial overcast cover, sun based boards can't deliver vitality. Thus require has stimulated to build up a venture, which can be utilized to use the sun powered vitality adequately, when the sun is available.

The proposed venture work is intended to distinguish the nearness of the sun and can position the sunlight based board towards sun's bearing naturally, i.e., the framework turns the board consequently as per the sun position, with the goal that greatest sun based power can be used. Arrangement is made in this framework, so that amid daytime, if the sky is obfuscated and the board isn't getting any daylight, at that point the framework itself will be turned off consequently, by which valuable vitality of the sun, which is put away in the rechargeable battery can be spared. When the clouds are cleared, system energizes automatically and drives the panel towards the direction of sun.

The module consists of Solar panel, battery, logic circuit, charging circuit, light sensor (LDR), control circuit, etc and is designed as totally automatic to track the position of sun. Two DC motors with built in with reduction gear mechanism are used for the movement of the solar panel that tracks the sun automatically.

In this project work, for the demonstration purpose, a small solar panel is used and this is coupled to the motor shaft using proper mechanism. The total system including the DC motor that drives the 10 Watts solar panel is designed to operate at 12V DC, this voltage is derived from a 12v and 1.2Ah rating battery which is charged by the solar panel itself.

Keywords: *Microcontroller, Solar panel, Battery ,LDR, ADC, DC driver circuit*

I. INTRODUCTION

This is a sun powered following framework which can be utilized as a power producing technique from daylight. This strategy for control age is basic and is taken from regular asset. This needs just most extreme daylight to produce control. This task helps for control age by setting the hardware to get most extreme daylight consequently. This framework is following for most extreme power of light. At the point when there is diminish in power of light, this framework consequently alters its course to get greatest force of light.

In this task work controller is utilized for detecting the nearness and position of the Sun, as per the got data from the sensors, controller controls the board consequently. Microcontrollers are progressively being utilized to execute control frameworks. It is consequently imperative to comprehend the controlled framework well. This task report portrays about the plan and advancement of "Sun powered Tracking and Positioning System utilizing Microcontroller".

These days with the headway of innovation in the field of Microcontrollers, every one of the exercises in our everyday living have moved toward becoming piece of data innovation and we discover microcontrollers in every single application. Consequently, the pattern is coordinating towards microcontroller based venture works. However in this project work, the basic signal processing of daylight sensing circuit is designed with analog circuitry.

As the availability of fossil fuel declines, there is need to find alternate energy sources, of the many sources, solar energy available in abundance and renewable is the ultimate source of all known forms of energy. It is clear, safe and free that does not pollute the environment and thus will be an extremely viable alternative in the days to come.

One way to utilize the solar energy is to generate electricity directly from the sunlight by photovoltaic conversion. Since photovoltaic modules have now become extensively available in the country. Sun based vitality has for quite some time been viewed as a perfect vitality source however for the way that we knew little to tap or utilize it further bolstering our good fortune. The progression in science and innovation conveyed out by humankind had prompt advancements like the photovoltaic cell. Sunlight based boards involve various such PV Cells. The yield of the Solar Panel is relative to the force of occurrence radiation from the sun.

As the power generated is dependent on incident radiation and also the intensity varies with time and season at a particular point, the efficiency of the fixed system is far less to exploit commercially. For optimum generation of electric power the PV Panels need to be maintained or positioned normal always to the incident radiation. This technique, known as Solar tracking, is therefore essential for improved system performance and efficiency. The resulting increase in efficiency is significant enough to make the tracking a viable proportion in-spite of the enhancement in the system cost.

II. PROPOSED SYSTEM

The system is comprised of Microcontroller, Solar panel, Light dependent resistors, Analog to digital converter, DC motor driving circuit, and Clock generator as main components.

A. Microcontroller

Miniaturized scale controller unit is built with ATMEL 89C52 Micro-controller chip. The ATMEL AT89C52 is a low power, higher execution CMOS 8-bit microcomputer with 8K bytes of glimmer programmable and erasable read just memory (PEROM). Its high-thickness non-unpredictable memory perfect with standard MCS-51 guideline set makes it a capable controller that gives very adaptable and financially savvy answer for control applications. The AT89C52 is a low-control, prevalent CMOS 8-bit microcomputer with 8K bytes of Flash programmable and erasable read just memory (PEROM).By joining a versatile 8-bit CPU with Flash on a strong chip, the Atmel AT89C52 is a fit microcomputer which gives an astoundingly versatile and monetarily smart response for some introduced control applications. The proposed framework makes utilization of Micro-controller works as indicated by the program written in it. The program is composed in such a way, with the goal that the yield from the ADC will be changed over into its equal voltage and in view of the extent of the voltage, it figures the parameter esteem. Contingent upon this information, the controller takes the suitable choice and controls the two DC engines. The DC engines are driven through L293D IC called as H - Bridge chip.

B. DC Motor

An electric engine is a machine, which changes over electrical vitality into mechanical vitality. It depends on the rule that when a current-conveying conductor is put in an attractive field, it encounters a mechanical power whose bearing is given by Fleming's Left-hand lead and whose greatness is given b Force, F = B I L Newton Where 'B' is the attractive field in weber/m 'I' is the current in amperes and 'L' is the length of the curl in meter. The power, current and the attractive field are all in various ways.

An immediate current (DC) engine is a genuinely basic electric engine that utilizations power and an attractive field to create torque, which turns the engine. At its most straightforward, a DC engine requires two magnets of inverse extremity and an electric curl, which goes about as an electromagnet. The anti-agents and alluring electromagnetic powers of the magnets give the torque that causes the DC engine to turn.

In this venture, the double H-connect engine driver IC utilized is L293D. "The L293D is a solid coordinated, high voltage, high ebb and flow, 4-channel driver". The L293D bolsters two DC engines. So with one IC we would interface be able to two DC engines which can be controlled in both clockwise and counter clockwise course and on the off chance that you have engine with settle bearing of movement then we can make utilization of all the four I/Os to associate up to four DC engines.

Engine drivers are the most straightforward modules that give control enhancement to low-level control signals like PWM and bearing provided by the client.

C. Solar Panel

Solar panels are the transducers which convert solar energy into electrical energy. Mono crystalline, poly crystalline and thin film are the main types of solar panels. The proposed system makes the use mono crystaline type of solar panel because they are more efficient than other type.

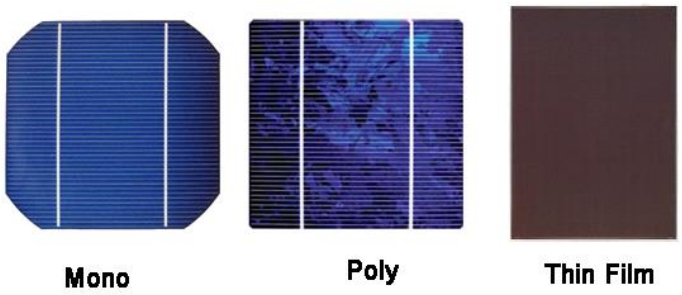

Fig 2. Types of Solar Panel

D. Light Dependent Resistor

The light dependent resistor (LDR) also known as photoresisto or photocell is a light controlled variable resistor. The resistance of this LDR is inversely proportional to light intensity falling on it.The variation resistance of LDR with changing light intensity is shown in figure 3

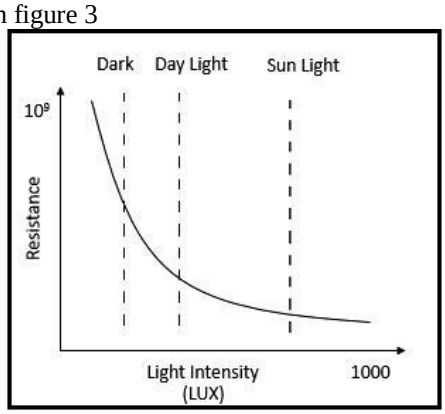

Fig. 3 Resistance v/s Light intensity

In this project work two LDR's (light dependent resistors) are used as light sensing devices. The first LDR is used for detecting the intensity of sun light irrespective of its position, for energizing the system and the second LDR is used for detecting the position, to drive the panel towards the sun direction.

E. Clock Generator

The clock generator circuit is designed using 555 Timer IC. This IC is configured in Astable Mode of operation (free running oscillator). The frequency can be adjusted using external resistor and capacitor. The required frequency is more than 100 KHz.

The output of this IC is fed to the A - D converter.

III. REFERENCES

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