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Sun Tracking Solar System

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ABSTRACT

This project employs a solar panel mounted to a time-programmed stepper motor to track the sun so that maximum sun light is made incident upon the panel at any given time of the day. This is better compared to the light- sensing method that may not be accurate always – for example, during cloudy days. With the impending scarcity of non-renewable resources, people are considering to use alternate sources of energy. Barring all the other available resources, the solar energy is the most abundant and it is comparatively easy to convert into electrical energy. The usage of solar panel to convert Sun energy into electrical energy is very popular, but due to the transition of sun from easttowest,thefixedsolarpanelmaynotbeabletogenerate optimumenergy.Theproposedsystemsolvesthisproblemby an arrangement for the solar panel to track the Sun. The position of the Sun with respect to the solar panel is not fixed due to the rotation of the Earth. For an efficient usage of the solar energy, the Solar panels should absorb energy to a maximum extent. This can be done only if the panels are continuously placed towards the direction of the Sun. So, solar panel should continuously rotate in the direction of Sun. When the intensity of the light falling on right LDR is more, panel slowly moves towards right and if intensity on the left LDR is more, panel slowly moves towards left. In the noon time, Sun is ahead and intensity of light on both the panels is same. In such cases, panel is constant and there is no rotation.

TheArduinocontrollerusedinthisprojectisfromtheArduinofamily.TheSteppermotorisdrivenbyaninterfacingICast he controllerisnotcapableofhandlingthepowerrequirements of the stepper motor. Furthermore, this project can be enhancedbyusinganRTC(RealTimeClock)tofollowthesun. This helps in maintaining the required position of the panel even if the power is interrupted for sometime.

Key Words: Solar Panel, Stepper motor, Real Time clock, 89C51, Programmed Microcontroller.

I. INTRODUCTION

This project deals with the research and development of a Sun tracking system. Now a day's Renewable energy solutions are becoming increasingly popular. Maximizing power output from a solar system is desirable to increase efficiency.Inordertomaximizepoweroutputfromthesolar panels, one need is to keep the panels aligned with the sun, means that the tracking of the sun is required. This is a far morecost-

effectivesolutionthanpurchasingadditionalsolar panels. This system is designed with specific methodology, thissystemusing89C51Microcontroller,DummySolarPanel, Stepper Motor, Voltage Regulator, Diodes, Relay driver IC, Transformer.Solarpanelscollectsolarradiationfromthesun and actively convert that energy to electricity. Solar panels are comprised of several individual solar cells. Thesesolar cellsfunctionsimilarlytolargesemiconductorsandutilizea large area p-n junction diode. When the solar cells are exposed to sunlight, the p-n junction diodes convert the energy from sunlight into usable electrical energy. The energy generated from photons striking the surface of the solarpanelallowselectronstobeknockedoutoftheirorbits and released, and electric fields in the solar cells pull these free electrons in a directional current, from which metal contacts in the solar cell can generate electricity. The more solar cells in a solar panel and the higher the quality of the solarcells,themoretotalelectricaloutputthe solar panel can produce. The conversion of sunlight to usable electrical energy has been dubbed the Photovoltaic Effect. A solar trackerisadevicethatorientsapayloadtowardthesun.The use of solar trackers can increase electricity production by around a third, and some claim by as much as 40% insome regions,comparedwithmodulesatafixedangle.Inany solar application,theconversionefficiencyisimprovedwhenthe modulesarecontinuallyadjustedto the optimum angle as the sun traverses the sky. As improved efficiency means improvedyield,useoftrackerscanmakequitea difference to the income from a largeplant.

Commercial purpose of solar tracking system:

- Increase Solar PanelOutput.
- Maximum efficiency of thepanel.
- Maximize Power per unitarea.
- Abletograbtheenergythroughouttheday.

Figure 1 Solar tracking system

II. METHODOLOGY

The Sun tracking solar panel consists of two LDRs, solar panel and a DC motor and L293D Micro controller. Two light dependent resistors are arranged on the edges of the solar panel. Light dependent resistors produce low resistance when light falls on them. The servo motor connected to the panel rotates the panel in the direction of Sun. Panel is arranged in such a way that light on two LDRs is compared and panel is rotated towards LDR which have high intensity i.e. low resistance compared to other. Servo motor rotates the panel at certain angle. When the intensity of the light falling on right LDR is more, panel slowly moves towards right

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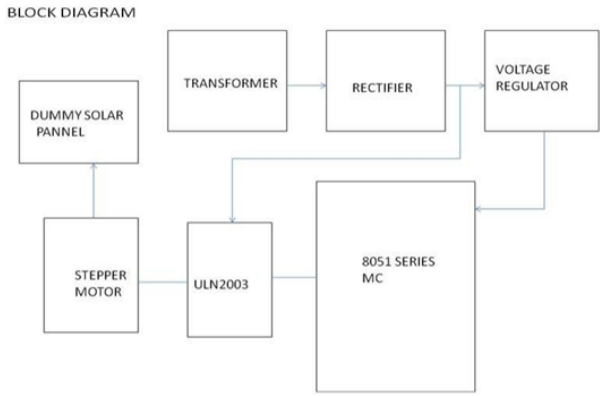

Figure 2 Block Diagram

HARDWARE REQUIREMENTS:

89C51 Microcontroller, Dummy Solar Panel, Stepper Motor, Voltage Regulator, Diodes, Relay driver IC, Transformer.

SOFTWARE REQUIREMENTS:

Keil compiler, Languages: Embedded C or Assembly

There are many different components and also the methods used to track the sun. This system has a simple combination of electronic circuit. This project contains the basic component which deals with the Solar panel, Stepper motor, Microcontroller (89C51), Relay, keil software.

Transformer

In this project we used step down transformer the main function of step-down transformer is to make higher voltage to lower voltage. The output of transformer is connected to bridge rectifier.

Bridge rectifier

Output of transformer is given to input of bridge rectifier we used full wave bridge rectifier. Main function of rectifier is to convert ac to dc voltage. Output of bridge rectifier is given to regulator.

Regulator

ICLM7805 is used as a voltage regulator which regulates the voltage. output of regulator is connected to input of IC 89C51.

Microcontroller (89C51)

The microcontroller 89C51 has a basic role in this project; it takes action according to its program.

Stepper motor

The stepper motor plays an important role in this project; it directed the panel towards the sun.

Solar Panel

All the system works to keep the solar panel directed towards the sun, the solar panel generate the DC voltage

Input power

This system is using +5V DC power, as the input, for the all the three units and also +12V DC for the stepper motor of unit

SOFTWARE

In manual tracking we used software named “Keil Compiler”;thissoftwareiscreatedon.cassemblylanguage, withthehelpofthissoftwarewecanmovethesolarpanelin our desired direction on one axis, this software uses the parallel port to communicate, when the system using practically.

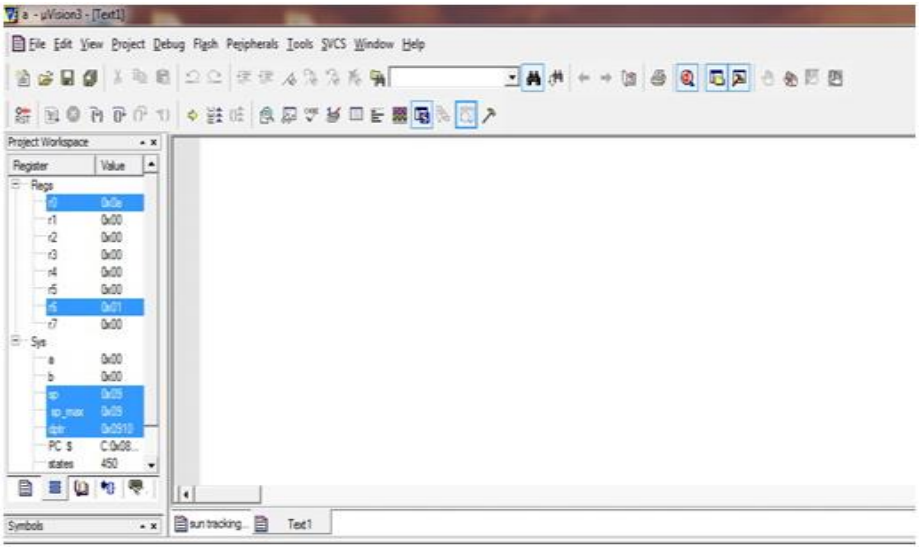

Figure 3 Keil Software window

Flowchart

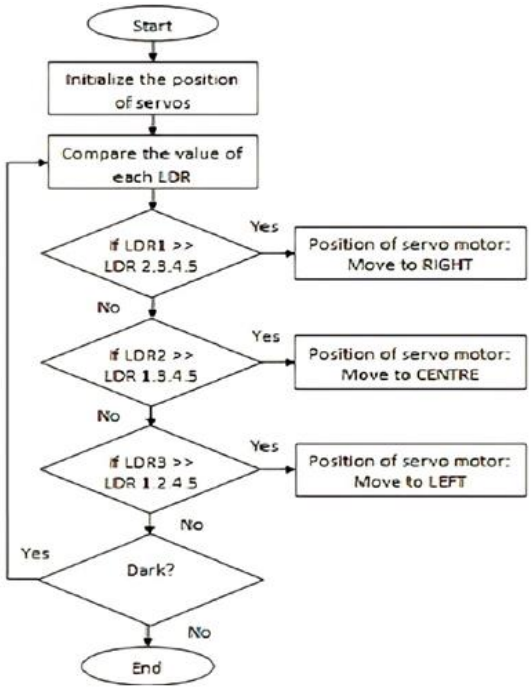

Figure 4 Flow chart

III. IMPLIMENTATION AND RESULT

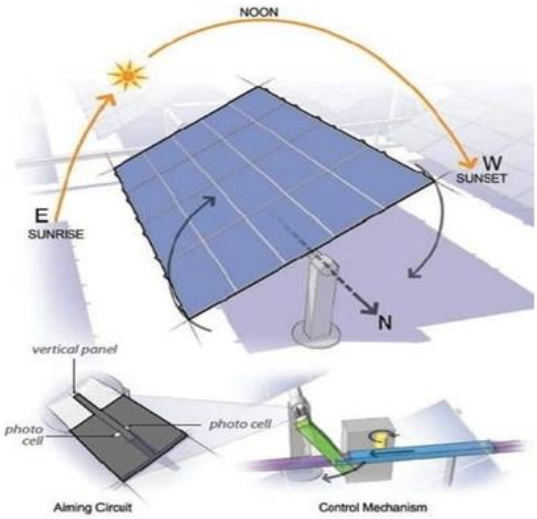

Figure 5 Program for stepper motor on keil

WORKING PRINCIPAL

The Sun tracking solar panel consists of two LDRs, solar panel and a DC motor and L293D Micro controller.Two light dependent resistors are arranged on the edges of the solar panel. Light dependent resistors produce low resistance when light falls on them. The servo motor connected to the panel rotates the panel in the direction of Sun. Panel is arranged in such a way that light on two LDRs is compared and panel is rotated towards LDR which have high intensity i.e. low resistance compared to other. Servo motor rotates the panel at certain angle.When the intensity of the light falling on right LDR is more, panel slowly moves towards right and if intensity on the left LDR is more, panel slowly moves towards left. In the noon time, Sun is ahead and intensity of light on both the panels is same. In such cases, panel is constant and there is no rotation.

REPRESENTATION OF CIRCUIT

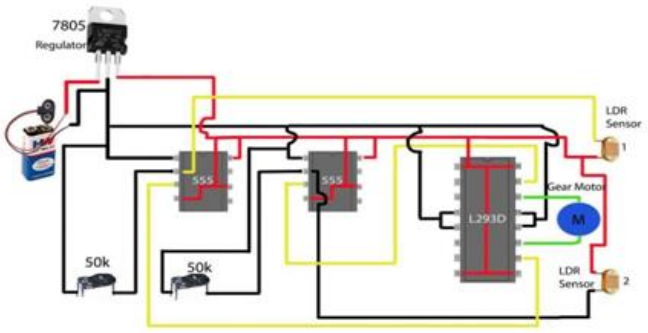

Figure 6.Basic Circuit

IV. CONCLUSION

In this project, the sun tracking system is developed based on 89C51 microcontroller. The microcontroller 89C51 based circuit is used in this system with a minimum number of components and the use of stepper motors enables accurate tracking of the sun. It has been shown that the sun tracking systems can collect maximum energy than a fixed panel system collects and high efficiency is achieved through this tracker, it can be said that the proposed sun tracking system is a feasible method of maximizing the light energy received from sun. This is an efficient tracking system for solar energy collection.

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