Sun Tracking Solar Panel

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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 east to west, the fixed solar panel may not be able to generate optimum energy. The proposed system solves this problem by an arrangement for the solar panel to track the Sun. This tracking movement is achieved by coupling a stepper motor to the solar panel such that the panel maintains its face always perpendicular to the sun to generate maximum energy. This is achieved by using a programmed microcontroller to deliver stepped pulses in periodical time intervals for 12 hours for the stepper motor to rotate the mounted panel in one direction and then return to the start point for next day light as desired. The Arduino controller used in this project is from the Arduino family. The Stepper motor is driven by an interfacing IC as the controller is not capable of handling the power requirements of the stepper motor. Furthermore, this project can be enhanced by using an RTC (Real Time Clock) to follow the sun. This helps in maintaining the required position of the panel even if the power is interrupted for some time.*

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

1. 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. In order to maximize power output from the solar 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 more cost effective solution than purchasing additional solar panels. This system is designed with specific methodology, this system using 89C51 Microcontroller, Dummy Solar Panel, Stepper Motor, Voltage Regulator, Diodes, Relay driver IC, Transformer. Solar panels collect solar radiation from the sun and actively convert that energy to electricity. Solar panels are comprised of several individual solar cells. These solar cells function similarly to large semiconductors and utilize a 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 solar panel allows electrons to be knocked out of their orbits 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 solar cells, the more total electrical output the solar panel can produce. The conversion of sunlight to usable electrical energy has been dubbed the Photovoltaic Effect. A solar tracker is a device that orients a payload toward the sun. The use of solar trackers can increase electricity production by around a third, and some claim by as much as 40% in some regions, compared with modules at a fixed angle. In any solar application, the conversion efficiency is improved when the modules are continually adjusted to the optimum angle as the sun traverses the sky. As improved efficiency means improved yield, use of trackers can make quite a difference to the income from a large plant.

Commercial purpose of solar tracking system:

• Increase Solar Panel Output.

• Maximum efficiency of the panel.

• Maximize Power per unit area.

• Able to grab the energy throughout the day.

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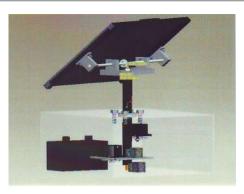• Able to grab the energy throughout the day.

Figure 1 Solar tracking system

2. METHODOLOGY

Irjet Template sample paragraph .Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.
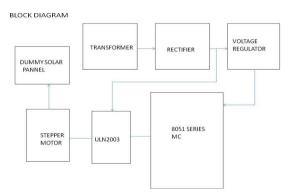

Figure 2 Block Diagram

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"; this software is created on .c assembly language, with the help of this software we can move the solar panel in our desired direction on one axis, this software uses the parallel port to communicate, when the system using practically.
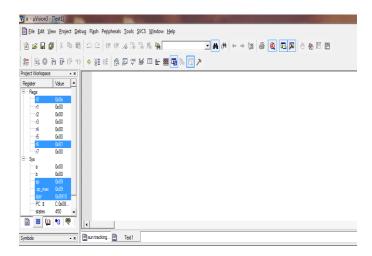

Figure 3 Keil Software window

Figure 4 Program in keil

Flowchart

Figure 6 Flow chart

IMPLIMENTATION AND RESULT

Figure 4 Program for stepper motor on keil

Working

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 east to west, the fixed solar panel may not be able to generate optimum energy. This tracking movement is achieved by coupling a stepper motor to the solar panel such that the panel maintains its face always perpendicular to the sun to generate maximum energy. This is achieved by using a programmed microcontroller to deliver stepped pulses in periodical time intervals for 12 hours for the stepper motor to rotate the mounted panel in one direction and then return to the start point for next day light as desired. The microcontroller used in this project is from the 8051 family.
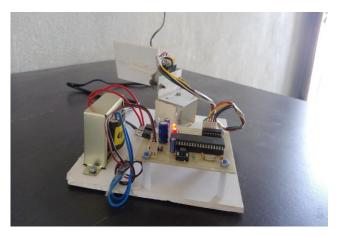
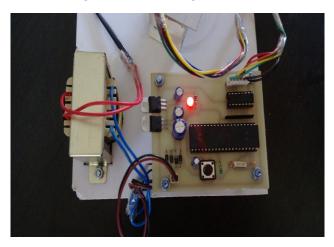**REPRESENTATION OF CIRCUIT**

Figure 7 Sun Tracking Solar Panel
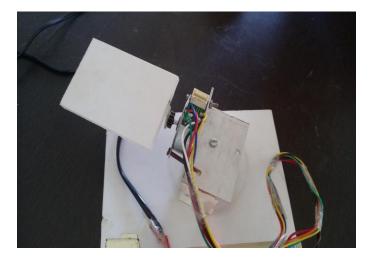

Figure 8 Aurdino Board
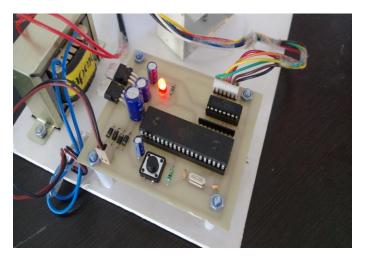
Figure 9 Solar panel

Figure 10 Transformer

3. 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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