AUTOMATED DUAL AXIS SOLAR TRACKING SYSTEM

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ABSTRACT

Solar energy is rapidly gaining notoriety as an important means of expanding renewable energy resources. It has emerged as one of the most promising renewable energy source characterized by a huge potential of conversion into electrical power. The problem is that, the conventional solar panel power system is stationary, means the solar panel will not always be facing to the direction of sun, this make the light intensity falling on the solar panel is not maximum level so the solar panel will not always work in its maximum performance. It will include the design and construction of "Dual axis solar tracking system by using LDR". Our solar move in any direction (horizontal as well as vertical). The LDR (light dependent resistor had been used to sense the intensity of light and sent the data to the comparator. This comparator will compare the data and rotate a geared motor to right direction. The sun tracking is performed by changing the solar panel orientation in horizontal and vertical direction by two motors. A working system will ultimately be demonstrated to validate the design.

INTRODUCTION

When it comes to the development of any nation, energy is the main driving factor. There is an enormous quantity of energy that gets extracted, distributed, converted and consumed every single day in the global society. The world population is increasing day by day and the demand for energy is increasing accordingly. Oil and coal are the main source of energy nowadays but there is a fact that the fossil fuels are limited and hand strong pollution. Even the price of petroleum has been increasing year by year and the previsions on the medium term there are

not quite encouraging. Utilization of this resources increases the emission of carbon monoxide (CO), hydrogen chloride (HCL), Nitrogen Oxides, and Sulphur Oxides which are responsible for the global warming and greenhouse effect. This results the devastating effect in the environment. With the view point of minimizing above mentioned problems, many researched have been carried since late 19th century by researchers and engineers. Renewable energy sources as an alternative to fossil fuel were the major found out. They are derived from natural processes that are replenished constantly. Renewable energies are inexhaustible and clean. The energy comes from natural resources such as sun, wind, tides, waves, and geothermal heat. Solar energy is quite simply the energy produced directly by the sun. The history of solar energy is as old as humankind. In general, solar energy is radiant light and heat from the sun harnessed using a range of technologies such as photovoltaic and concentrator. In the last two centuries, we started using Sun's energy directly to make electricity. In 1839, Alexandre Edmond Becquerel discovered that certain materials produced small amounts of electric current when exposed to light.

In 1876, When William Grylls Adams and his student, Richard Evans Day, discovered that an electrical current could be started in selenium solely by exposing it to light, they felt confident that they had discovered something completely new. Werner von Siemens, a contemporary whose reputation in the field of electricity ranked him alongside Thomas Edison, called the discovery "scientifically of the most far -reaching importance." This pioneering work portended quantum mechanics long before most chemists and physicist had accepted the reality of atoms. Although selenium solar cells failed to convert enough sunlight to 2 power electrical equipment, they proved that a solid material could change light into electricity without heat or any moving parts. Later in 1905 Albert Einstein published the first theoretical work describing the photovoltaic effect titled "Concerning a Heuristic Point of View toward the Emission and Transformation of Light." In the paper, he showed that light possesses an attribute that earlier scientists had not recognized.

OBJECTIVE

To design and fabricate a dual axis PV system that tracks the sun path is the specific objective of the model and to study different solar parameters and methods of harvesting solar energy is the general objective of the solar tracker. It will increase the energy observing quantity of the solar panel by changing its angle of the model. Our model is designed for the two objectives of the real time environment one is specific objective and the general objective .Our model will produce three times higher energy than the normal solar panel setup. It will increase the energy observing quantity of the solar panel by changing its angle of the model. Our model is designed for the two objectives of the real time environment one is specific objective and the general objective . It will increase the energy observing quantity of the solar panel by changing its angle of the model.

LITERATURE SURVEY

1. DESIGN OF A REAL-TIME, LOW-COSTMONITORING SYSTEM FOR HYBRID SOLAR-WIND POWER GENERATION SYSTEM : Wagner De AnchietaMarques,VitorHugo Ferreira,Guilherme Gonçalves Sotelo - 2018 (SBSE)

It can presents the project of a real-time low-cost monitoring system for the hybrid solar-wind electric power generation system allowing the user to see in real time the operating status of the hybrid system. The Arduino board collects the reading of the voltage and current sensors, processes and obtains power and energy generation information from each of the sources, as well as the battery and the loads connected to the hybrid system. Once the quantities to be monitored have been processed by the Arduino microcontroller, it sends them to the computer via a USB port and through the execution of a macro in Excel. A small-scale model of the hybrid system was developed to establish a proof of concept of the proposed monitoring system.

2. **REMOTE MONITORING OF THE MICROWAVE REPEATER SYSTEMS WITH SOLAR AND WIND POWER SUPPLY :** Dragan Obradovic , Zoran Zivanovic ,Nemanja Mitrovic - 2009

It can be realization of the remote monitoring for the microwave repeater

systems with solar and wind power supply using GPRS technology. The microwave repeater systems are used instead of the passive plane repeaters. The microwave repeater systems have smaller dimensions, lower cost, easier installations and better performance then the passive plane repeaters.

3. HYBRID WIND-PHOTOVOLTAIC POWER SUPPLY FOR A TELECOMMUNICATION SYSTEM : M. Vilsan , I. Nita - 2007

It is well known that a stand-alone hybrid wind-photovoltaic power plant for a remote telecommunication system located on the Black Sea Coast. First, the wind and solar potential of the site and also the load profile were assessed. so it is possible to have a better energy utilization factor. As a consequence, the storage unit resulting is smaller than in the case of individual wind or PV systems. The power system consists of a 1500 W wind turbine and a 900 W photovoltaic array. Since solar and wind energy converters are finite sources of power, the energy capture efficiency is improved by using a power conditioner. A 220 V/50 Hz inverter was used. The power system was tested and monitored for one year under real conditions in the authors' test facility.

4. HYBRID SOLAR WIND DIESEL POWER GENERATION : Noor m. Al-enezi , samahir h. Abuarafah - 2015

There are many problems posed by conventional energy such as oil supply insecurity, extreme pollution, and climate change risks due to fossil fuel burning. Yet, the disadvantage is that it does not work when there is cloudy or rainy weather. This has created the need to combine solar energy with wind energy to obtain a solid power source known as a hybrid solar wind power generation system. In this the modification of a hybrid solar-wind power generation system in which the flow of power from different sources is monitored and controlled by using a wireless distant monitoring station and microcontroller. First, the energy of the proposed system is used wisely and efficiently by monitoring the load power and the available renewable energy to define the quantity of needed power and to select the best available source. Secondly, additional batteries are used as a dumped load in the proposed system,

which can be used if there is a shortage in the renewable energy source to minimize the usage of the diesel engine. In addition, a wireless monitoring system will be used to help in self-troubleshooting and a fast alarm system, which will minimize maintenance efforts.

5. WIRELESS SENSOR NETWORK IN WIND AND SOLAR HYBRID STREET LAMP APPLICATION : An Ce-ce ,Shi Xiao-Xia 2015 CCDC

At present, the wind and solar hybrid street lamps features wide distribution, hard to maintain, and impossible for real-time control, thus the wireless sensor network is applied to the wind and solar hybrid street lamps. In this paper the hardware system of the wireless monitoring system is produced, here ZigBee technology is used to realize the communication between the street lamps, at the same time to implement the real-time monitoring of the wind and solar hybrid street lamps. this paper the hardware system of the wireless monitoring system is produced, here Zig Bee technology is used to realize the communication

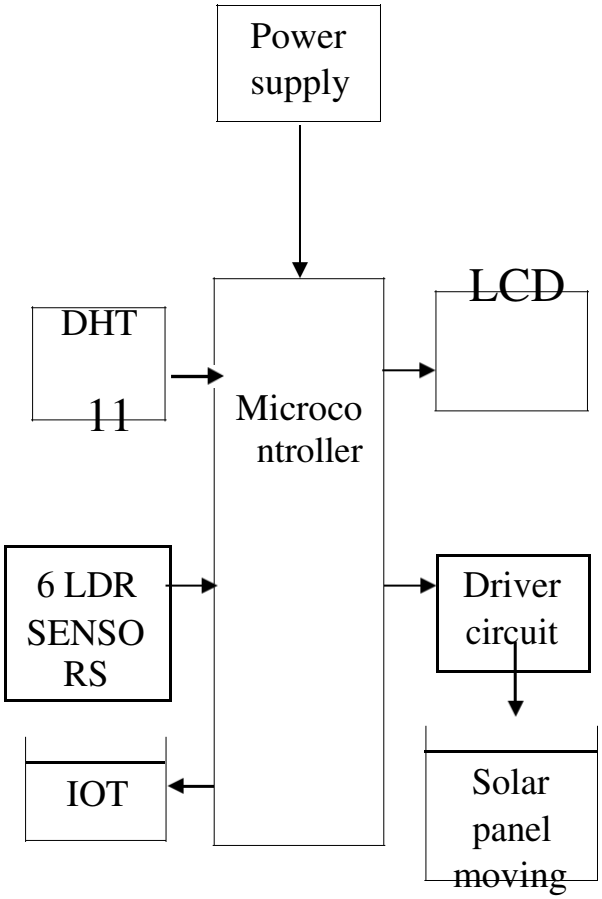
EXISTING SYSTEM

In worldwide many projects have been done using photo voltaic cells (PV) in collecting solar radiation and converting to electrical energy, but most of these projects did not take into account the difference of sun angle of incidence by installing the panels in fixed orientation which very highly influences the solar energy collected by the panel.

PROPOSED SYSTEM

In our proposed system, we are implementing a LDR based solar tracking mechanism. Here we are using LDR sensors to track high intensity of light and the sensor details will be sent to microcontroller. And now the microcontroller will compare the sensor values and will give command to the driver circuit to move the solar panel towards the high intensity of light falling. In addition to that, temperature and humidity values will be obtained by the sensors all the details will be constantly updated in the webpage using IOT. All status will be displayed in the LCD.

ARCHITCTURE DIAGRAM



LIST OF MODULES

The following are the modules of the project along with the way they are implemented and that is planned with respect to the proposed system, while overcoming existing system and also providing the support for the future enhancement system. There are totally three modules used in our project which is listed below. Each module has specific usage in the project and is description is given below followed by the list of modules.

1. Software phase
2. Hardware phase
3. Assembly of software and hardware phases

MODULE DESCRIPTION

A "module" is a high-level description of a functional area, consisting of a group of processes describing the functionality of the module and a group of packages implementing the functionality. The following are the various modules in automated dual axis solar tracking system.

SOFTWARE PHASE

High-level language programming has long been in use for embedded-systems development. However, assembly programming still prevails, particularly for digital-signal processor (DSP) based systems. DSPs are often programmed in assembly language by programmers who know the processor architecture inside out. The key motivation for this practice is

performance, despite the disadvantages of assembly programming when compared to high-level language programming.

HARDWARE PHASE

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits.The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino

project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

ASSEMBELY OF SOFTWARE AND HARDWARE PHASE

Embedded C is designed to bridge the performance mismatch between Standard C and the embedded hardware and application architecture. It extends the C language with the primitives that are needed by signal-processing applications and that are commonly provided by DSP processors. The design of the support for fixed-point datatypes and named address spaces in Embedded C is based on DSP-C. DSP-C [1] is an industry-designed extension of C with which experience was gained

since 1998 by various DSP manufacturers in their compilers. For the development of DSP-C by ACE (the company three of us work for), cooperation was sought with embedded-application designers and DSP manufacturers.

CONCLUSION AND FUTURE ENHANCEMENT

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is

programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing).The renewable sources of energy are becoming one of the utmost priorities of the present day world due to their innumerous advantages. In particular, solar energy is progressing as a potential inexhaustible and non-polluting energy source to suffice our ever-increasing energy requirements. The designed solar tracker system could track the movement of the sun with the help of microcontroller and Light Dependent Resistor. This system can work properly irrespective of weather conditions. In future stepper motor will used to change its angle in accurate measurement. Mirrors can be added to the sides of the panel and they also been controlled by the separate motors to get high intensity of light.

REFERENCES

[1] N. Femia, G. Petrone, G. Spagnuolo, and M. Vitelli, "Optimization of perturb and observe maximum power point tracking method," IEEE Trans. Power Electron., vol. 20, no. 4, pp. 963–973, Jul. 2005.

[2] J. H. Lee, H. Bae, and B. H. Cho, "Advanced incremental conductance MPPT algorithm with a variable step size," in Proc. 12th Int. Power Electron. Motion Control Conf., Aug./Sep. 2006, pp. 603–607.

[3] P. Sivakumar, A. A. Kader, Y. Kaliavaradhan, and M. Arutchelvi, "Analysis and enhancement of PV efficiency with incremental conductance MPPT technique under non-linear loading conditions," Renew. Energy, vol. 81, pp. 543–550, Sep. 2015.

[4] W. Xiao and W. G. Dunford, "A modified adaptive hill climbing MPPT method for photovoltaic power systems," in Proc. IEEE 35th Annu. Power Electron. Spec. Conf., Jun. 2004, pp. 1957–1963.

[5] T. Esram and P. L. Chapman, "Comparison of photovoltaic array maximum power point tracking techniques," IEEE Trans. Energy Convers., vol. 22, no. 2, pp. 439–449, Jun. 2007.

[6] A. Mohapatra, B. Nayak, P. Das, and K. B. Mohanty, "A review on MPPT techniques of PV system under partial shading condition," Renew. Sustain. Energy Rev., vol. 80, pp. 854–867, Dec. 2017.

[7] J. P. Ram, T. S. Babu, and N. Rajasekar, "A comprehensive review on solar PV maximum power point tracking techniques," Renew. Sustain. Energy Rev., vol. 67, pp. 826–847, Jan. 2017.

[8] C.-S. Chiu and Y.-L. Ouyang, "Robust maximum power tracking control of uncertain photovoltaic systems: A unified T-S fuzzy modelbased approach," IEEE Trans. Control Syst. Technol., vol. 19, no. 6, pp. 1516–1526, Nov. 2011

[9] B. Tarek, D. Said, and M. Benbouzid, "Maximum power point tracking control for photovoltaic system using adaptive Neuro- Fuzzy 'ANFIS,"' in Proc. IEEE 8th EVER Conf., Mar. 2013, pp. 1–7.

[10] A. Messai, A. Mellit, A. Guessoum, and S. A. Kalogirou, "Maximum power point tracking using a GA optimized fuzzy logic controller and its FPGA implementation," Sol. Energy, vol. 85, no. 2, pp. 265–277, 2011.

[11] X. Li, Y. Li, J. E. Seem, and P. Lei, "Detection of internal resistance change for photovoltaic arrays using extremum-seeking control MPPT signals," IEEE Trans. Control Syst. Technol., vol. 24, no. 1, pp. 325–333, Jan. 2016.

[12] E. Bianconi, J. Calvente, R. Giral, E. Mamarelis, G. Petrone, C. A. Ramos-Paja, G. Spagnuolo, and M. Vitelli, "A fast current-based MPPT technique employing sliding mode control," IEEE Trans. Ind. Electron., vol. 60, no. 3, pp. 1168–1178, Mar. 2013.

[13] C.-C. Chu and C.-L. Chen, "Robust maximum power point tracking method for photovoltaic cells: A sliding mode control approach," Sol. Energy, vol. 83, no. 8, pp. 1370–1378, Aug. 2009.

[14] M. Rezkallah, S. K. Sharma, A. Chandra, B. Singh, and D. R. Rousse, "Lyapunov function and sliding mode control approach for the solarPV grid interface system," IEEE Trans. Ind. Electron., vol. 64, no. 1, pp. 785–795, Jan. 2017.