AXIS DUAL SOLAR TRACKING SYSTEM WITH WEATHOR SENSOR

Presented by:

R.V.S. Rukmini (11179C191)

S.Surya Vara Lakshmi (11179C218)

T. Vishnu(11179C230)

Guided by:

Dr. S. Om Kumar
Associate professor / ECE

PLAN OF PRESENTATION

- Abstract
- Introduction
- Literature survey
- Existing System Vs Proposed System
- Block Diagram of the Project
- Hardware Requirements
- Software Requirements
- Modules of the Project
- Advantages of the Project
- Disadvantages of the Project
- Applications of the Project
- Progress of the Project so far

ABSTRACT

- Solar power is the fastest growing means of renewable energy. The project is designed and implemented using simple dual axis solar tracker system. In order to maximize energy generation from sun, it is necessary to introduce solar tracking systems into solar power systems. A dual-axis tracker can increase energy by tracking sun rays from switching solar panel in various directions. This solar panel can rotate in all directions. This dual axis solar tracker project can also be used to sense weather, and it will be displayed on LCD. This system is powered by Arduino, consists of servo motor, stepper motor, rain drop sensor, temperature and humidity sensor and LCD.

- Keywords: Dual-axis, Solar Tracker, Arduino, Light Dependant Resistor.

INTRODUCTION

- A high demand on the green and sustainable energy has been triggered research on solar energy harvesting to be one of the most popular research topics on engineering, particularly on renewable energy [1]. Many research study focus on designing and developing efficient and reliable solar power systems. To improve and optimize efficiency on solar energy absorption, solar tracking system and control have been becoming one of the most important components on the solar power system
- The aim of this project is to analyze the performance of dual-axis solar tracking system. It consists of three main structures which are the inputs, the controller and the output. The inputs are from the LDRs, the Arduino as the controller and, the servo motor as the output. In this project, the main controller which is the Arduino receives analog input from LDRs and it converts the input into digital signal by using analog-to-digital (A- D) converter. Then the controller sends the signal to the servo motor in order to determine the movement of the solar pane

LITERATURE SURVEY

Tracking process for the dual axis sun tracker

Author: Ahmed Rhif
Publish: International Journal of Control Theory & Computer Modeling Vol.2

- the sun tracker considered in our project has two degrees of freedom and is significant. In this way, the tracker will have a set of sun positions at every second during the day for a period of five years. After sunset, the tracker goes back to the initial position corresponding to sun rise.
- Experimental measurements show that this autonomic dual axis sun tracker increases the power production by over 40%. Experimental results show the effectiveness of the sliding mode control in the tracking process, its robustness and the high estimation quality of the sliding mode observer.

A microcontroller based design which consists of light dependent resistors

AUTHOR : Md. Tanvir Arafat Khan

- The prototype represents a method for tracking the sun in both normal and bad weather condition.
- Moreover, the tracker can initialize the starting position by itself which reduces the need of any more photo resistor
- We have proposed a microcontroller based design which consists of light dependent resistors as sensor, to be used as a tracking mechanism for PV Panels, of which one prototype is also constructed.

Existing System Vs Proposed System

- Existing System

- Unreliable performance of solar pannel in cloudy or overcast weather.

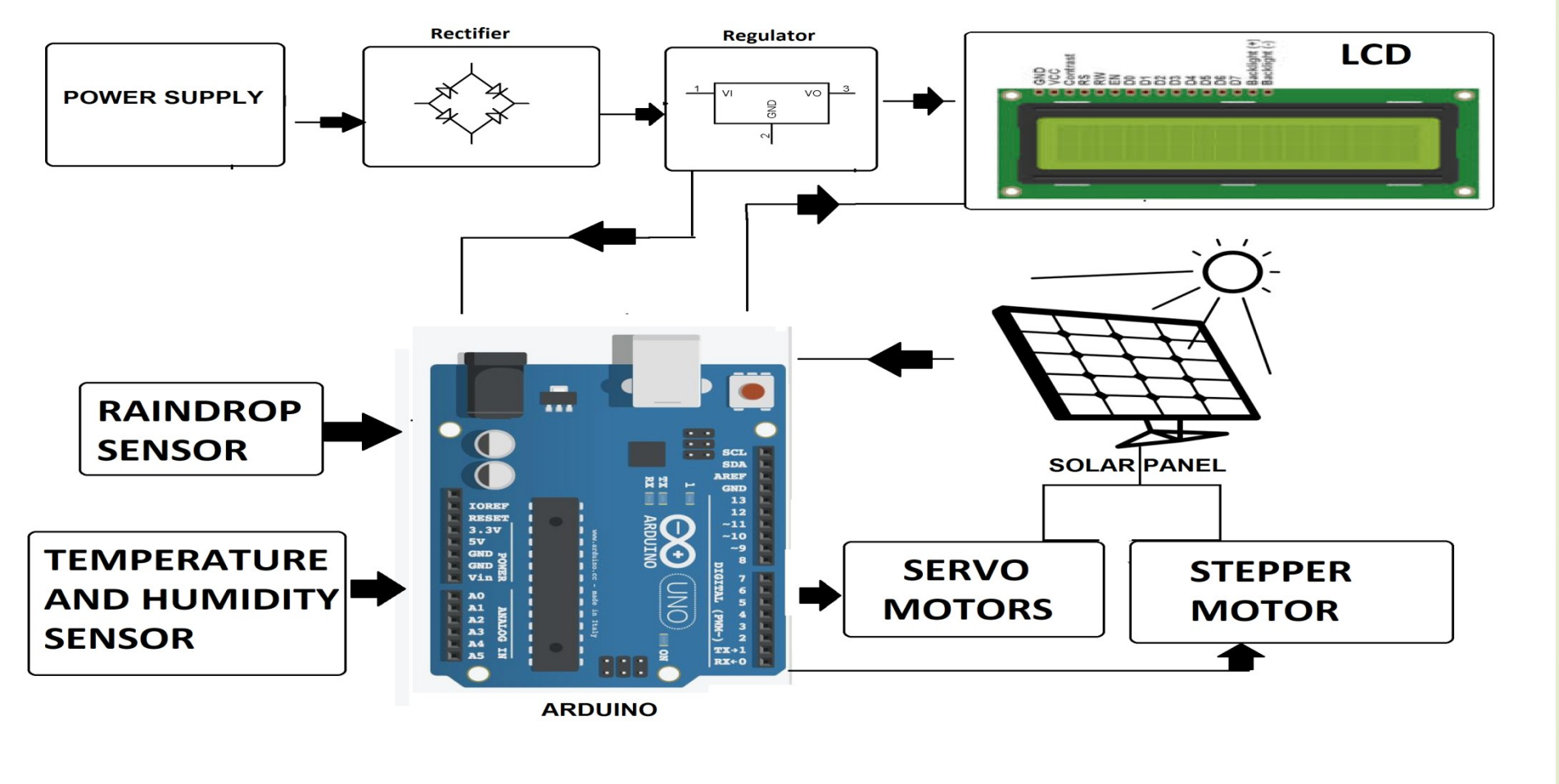
- Lower Lifespan.
- Lower Reliability.

- Proposed System

- solar panels, with a record breaking efficiency of more than 22 %(highest efficiency panels commercially available), use cells with a unique one of a kind design that capture a broader range of the sun's light including red and blue wave lengths.

- Greater lifespan.
- Greater Reliability.

Block Diagram Of Project



MODULES OF THE PROJECT

- Microcontroller
- Analog to Digital Converter
- LDR
- Dual-axis
- Solar Tracker
- Arduino
- Temperature, Humidity, Rain Drop Sensors
- Servo Motors

HARDWARE REQUIREMENTS

1. Atmega microcontroller
2. Solar Panel
3. Servo Motor
4. DC Motor
5. Rain Sensor
6. Humidity Sensor
7. Temperature Sensor
8. Resistor
9. Capacitors
10. Transistors
11. Diodes
12. PCB and Breadboards
13. LED
14. Transformer/Adapter
15. Push Buttons
16. Switch
17. IC
18. IC Sockets
19. Cables and Connectors

SOFTWARE REQUIREMENTS

- Embedded C
- Arduino Compiler

ARDUINO UNO

- The Arduino Uno is an open-source microcontroller board based on
- the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is
- equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to
- various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six
- capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino
- IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the
- USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It
- is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under
- a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino
- website. Layout and production files for some versions of the hardware are also available.

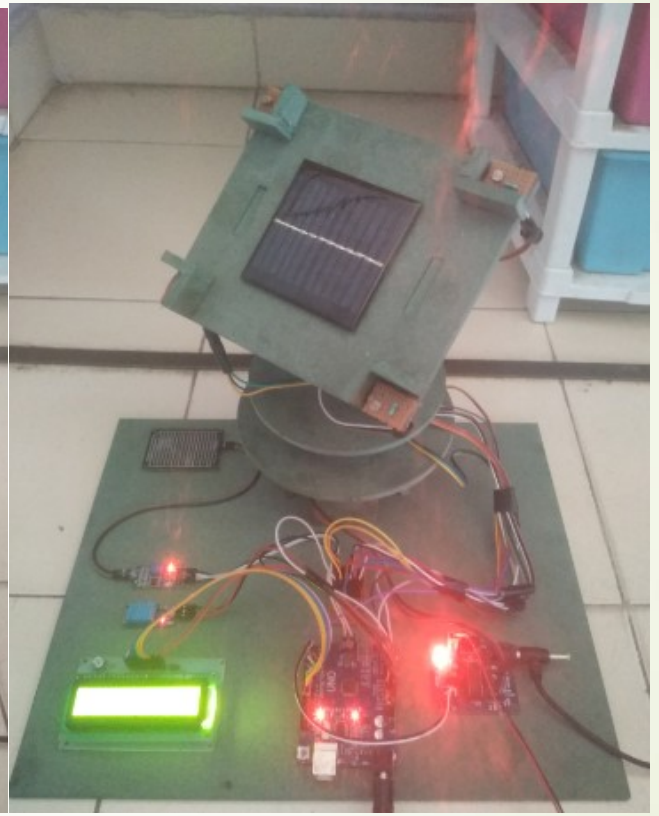
ADVANTAGES OF PROJECT

- Trackers generate more electricity than their stationary counterparts due to increased direct exposure to solar rays. This increase can be as much as 10 to 25% depending on the geographic location of the tracking system.
- As there are many different kinds of solar trackers, such as single-axis and dual-axis trackers, all of which can be the perfect fit for a unique job site. Installation size, local weather, degree of latitude and electrical requirements are all important considerations that can influence the type of solar tracker best suited for a specific solar installation.
- Solar trackers generate more electricity in roughly the same amount of space needed for fixed-tilt systems, making them ideal for optimizing land usage.
- It is beneficial to generate a greater amount of electricity during these peak times of the day. Using a tracking system helps maximize the energy gains during these peak time periods.

APPLICATIONS OF THE PROJECT

- Standard Dual Axis Tracker
- Solar Photo Voltaic Tracking System

RESULT/DISCUSSION



RESULT/DISCUSSION

RESULT/DISCUSSION

- There is an add on feature, in this project we have added a switch and real time clock so that by pressing it shifts its mode to rtc where solar panel tends to rotate according to time it can be helpful whenever there is less sunlight and cloudy or dust particles.
- Moreover the output values of 2 sensors are displayed in lcd display. To monitor the humidity and temperature value we have used dht11 and to detect the rainfall value we used rain sensor.

FUTURE SCOPE OF THE PROJECT

- **single-axis and dual-axis photovoltaic tracking system, with appropriate control systems, the electrical energy can increase from 22–56%, compared to fixed PV system.**
- **Combinations of microprocessor- and sensor-based control systems represent the most commonly used control method as well as the most efficient.**
- **Active tracking systems use electrical drives to move the axis, which can consume a huge amount of electrical energy because of improper control systems. Therefore, it is necessary to optimize the power consumption of electrical drives, which can be done by reducing the number of motor movements.**
- **Sensor-based photovoltaic tracking systems are more expensive because of additional sensor devices, but provide lower tracking error (0.14◦), compared to sensor less photovoltaic tracking systems (0.43◦).**
- **Electric motors used in PV tracking applications are exposed to weather conditions and are therefore designed to withstand strong winds, and high temperatures and humidity.**
- **The most commonly used electric motor is permanent magnet brushless DC motors as they are easy to maintain.**
- **Novel innovative tracking systems will include dynamic weather forecasting and cooling of the PV system with wind or water.**

CONCLUSION

- Solar tracking mechanisms improve the energy gain of solar power plants. A dual-axis tracking system is generally the one that reaches the highest energy gain in every region. It is therefore the most versatile system, since it can be installed anywhere, guaranteeing a high energy gain. Solar trackers are recommended everywhere from an energetic point of view, since they always increase the amount of collected energy. Two degrees of freedom orientation is feasible. Arduino Uno controller is used to control the position of DC motors which ensures point to point intermittent motion resulting from the DC geared motors. Altitude angle is restricted between 0' to 8 r and azimuth angle is restricted between 60' to 300' in Baghdad. Standalone working and wireless communication is achieved with computer which makes the system reliable and observable. The use of LDR sensors and high precision angle sensors guarantees a more accurate and efficient tracking system. We can know the whether condition surrounding it in LCD display.

REFERENCE

- [1]Power from the sun. (n.d.). Retrieved from http://www.powerfromthesun.net/Boo kl [2] The Sun's Position. (2013, March 28). Tn Photovoltaic Education Network, from http://pveducation.org/pvcdrom/properties-of-sunlightl suns position
- [3] Zhan, T., Lin, W., Tsai, M. and Wang, G. Design and Implementation of the Dual-axis Solar Tracking System. TEEE.37th Annual Computer Software and Applications Conference. pp.276-277 (20 II)
- [4] Zolkapli, M., AI-Junid S. A., Othman Z., Manut, A., and MohdZulkifli A. High-efficiency dual-axis solar tracking developement using Arduino .IEEE .International Conference on Technology, Informatics, Management, Engineering & Environment.pp.43-47 (2013)
- [5] Alexandru, C.; Pozna, C. Simulation of a dual-axis solar tracker for improving the performance of a photovoltaic panel. Proc. Inst. Mech. Eng. Part A J. Power Energy 2010, 224, 797–811. [CrossRef]
- [6] Alexandru, C.; Pozna, C. The optimization of the tracking mechanism used for a group of PV panels. In Proceedings of the International Conference on Renewable Energies and Power Quality (ICREPQ), Valencia, Spain, 15–17 April 2009.
- [7] Alexandru, C.; Comsit, M. The energy balance of the photovoltaic tracking systems using virtual prototyping platform. In Proceedings of the 5th International Conference on the European Electricity Market (EEM), Lisbon, Portugal, 28–30 May 2008; pp. 1–6.

VIDEO EXPLAINING THE DEMO OF THE PROJECT

Queries

THANK YOU