IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, June 2023

Performance Analysis Solar Tracking Systems

Rashi V. Jadhav[1], Prerana J. Pal[2], Vanshita N. Meshram[3], Sakshi V. Moon[4]
Purva M. Choudhari[5], Prof. Sunita Pandilwar[6]
Students, Department of Computer Science & Engineering[1,2,3,4,5]
Guide, Department of Computer Science & Engineering[6]
Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, Maharashtra, India

Abstract: *A Solar panel has been used increasingly in recent years to convert solar energy to electrical energy. The solar panel can be used either as a stand-alone system or as a large solar system that is connected to the electricity grids. The earth receives 84 Terawatts of power and our world consumes about 12 Terawatts of power per day. We are trying to consume more energy from the sun using solar panel. In order to maximize the conversion from solar to electrical energy, the solar panels have to be positioned perpendicular to the sun.itipositio perpendicular to the sun for maximum energy conversion at all time.*

Keywords: Arduino Uno, solar panel, USB cable, Jumper wire, 10k register, server motor.

I. INTRODUCTION

Energy consumption is the most important result of industrialization, technological development, and population increase. In the developing and growing world, the need for energy is increasing day by day. However, the share of fossil fuels in meeting energy demand is decreasing because human beings started to turn to clean sustainable energy sources to live in a cleaner environment. For this reason, renewable energy sources meet additional energy needs and are the most important sources because of environmentally friendly, clean, and sustainable. Moreover, energy production has been increasing rapidly with the use of renewable energy sources in the world in recent years.
Solar energy has an important place among renewable energy sources.
Solar energy power plant production costs are lower than other energy sources and in this sense, overcoming economic difficulties makes solar energy the energy source of the future. However, one of the biggest disadvantages of solar energy is undoubtedly the interruption of solar energy due to cloudy weather conditions. It is not possible to benefit from solar energy at night or to benefit from cloudy days. At the same time, solar irradiance values vary greatly between summer and winter months. The average daily value of solar energy for Turkey was measured as 3.6 kWh/m2. Therefore to benefit from solar energy efficiently, the sun must be tracked throughout the day (east–west) and year-round (north–south). For this purpose, solar tracking systems are the key devices to develop and utilize. Various researches have been carried out in recent years about solar tracking systems that will enable us to benefit more from solar energy. Researchers have performed many theoretical and experimental studies on solar tracking systems analysis, simulation, modeling, designing, fabrication, performance, and efficiency

II. LITERATURE REVIEW

Emmanuel Gbenga Dada et al "Machine learning for email spam filtering: review, approaches and open research problems", Heliyon 5 (2019) e01802 Received 3 September 2018; Received in revised form 25 February 2019; Accepted 20 May 2019
There is a rapid increase in the interest being shown by the global research community on email spam filtering. In this section, we present similar reviews that have been presented in the literature in this domain. This method is followed so as to articulate the issues that are yet to be addressed and to highlight the differences with our current review. Lueg presented a brief survey to explore the gaps in whether information filtering and information retrieval technology can be applied to postulate Email spam detection in a logical, theoretically grounded manner, in order to facilitate the introduction of spam filtering technique that could be operational in an efficient way. However, the survey did not present the details of the Machine learning algorithms, the simulation tools, the publicly available datasets, and the architecture of the email spam environment. It also fails short of presenting the parameters used by previous research in

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, June 2023

evaluating other proposed techniques. Wang reviewed the different techniques used to filter out unsolicited spam emails. The paper also to categorized email spams into different hierarchical folders, and automatically regulate the tasks needed to response to an email

Jai Batra et al "A comprehensive study of spam detection in e-mails using bio- inspired optimization techniques", International Journal of Information Management Data Insights 1 (2021) 100006 Received 20 October 2020; Received in revised form 30 November 2020; Accepted 19 December 2020

Spam messages sent by marketers to promote and advertise their products are considered as a nuisance by most people whose limited server storage is filled-up by these unwanted e-mails (Raad et al., 2010). The amount of time it takes to remove all the spam e-mails hinders the productivity of individuals on a daily basis

II. COMPONENTS

Software Requirement:

Arduino IDE :

A program for Arduino may be written in any programming language for a compiler that produces binary machine code for the target processor. Atmel provides a development environment for their microcontrollers, AVR Studio and the newer Atmel Studio

Hardware Requirements:

Solar Panel:

Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect are used to convert the light energy from the sun. Solar panels are made up of many independent solar cells which are formed by combining the elements like silicon, phosphorus and boron layers. These panels absorb the photons from sunlight and collaborate with the electrons which are present in the panels and generate electricity which can then be used for various purposes

Arduino UNO (Microcontroller) :

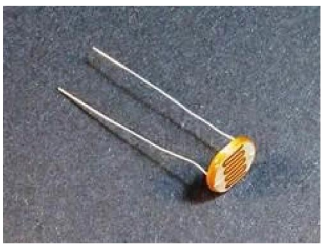
Arduino is an open source, computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The Arduino is an open source electronics platform based on easy to use hardware and software. The open source Arduino software makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X and Linux. The environment is written in java and based on processing and other open source software. This software can be used with any Arduino board. The Arduino software IDE contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common function. It connects to Arduino and Genuino hardware t+o upload programs and communicate with them

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, June 2023

Servomotor:

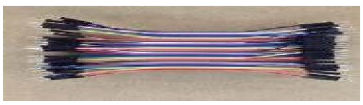
A servomotor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servo motors. Servomotors are not a different class of motor, on the basis of fundamental operating principle, but uses servomechanism to achieve closed loop control with a generic open loop motor. Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing

Light Dependent Resistor (LDR)



An LDR light dependent resistor, photocell, photoconductor. It is a one type of resistor whose resistance varies depending on the amount of light falling on its surface. When the light falls on the resistor, then the resistance changes. These resistors are often used in many circuits where it is required to sense the presence of light. These resistors have a variety of functions and resistance. For instance, when the LDR is in darkness, then it can be used to turn ON a light or to turn OFF a light when it is in the light. A typical light dependent resistor has a resistance in the darkness of 1MOhm, and in the brightness a resistance of a couple of KOhm

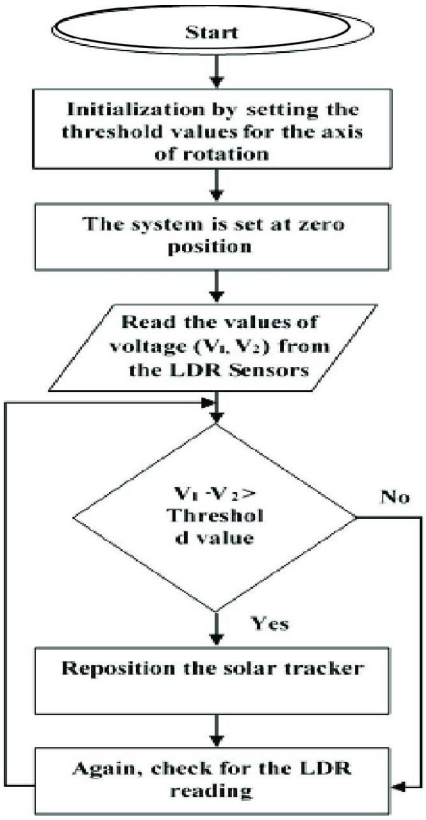
Jumper wire:



Jumper are tiny metal connectors used to close or open a circuit part. They have two or more connection points, which regulate an electrical circuit board. Their function is to configure the settings for computer peripherals, like the motherboard. Suppose your motherboard supported intrusion detection

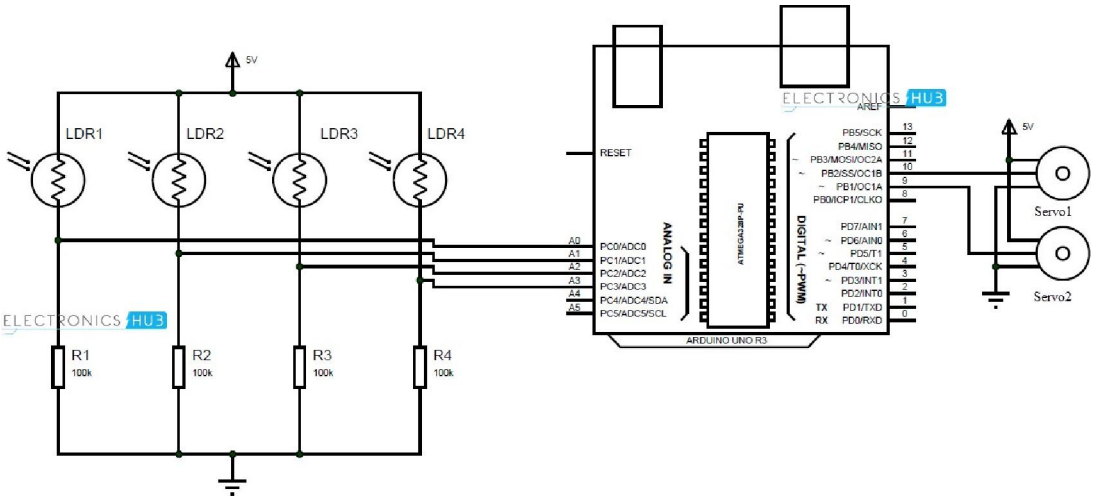
IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, June 2023

Algorithm

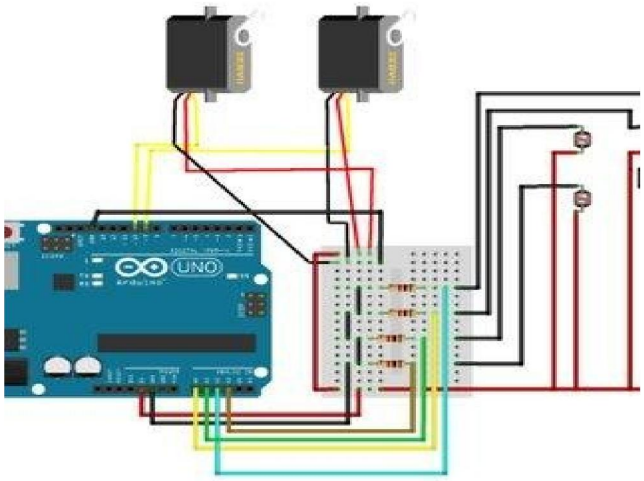


IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, June 2023

Dataflow:



UML diagram:



Database description:

A database is not typically a fundamental component of a solar tracking system itself, as the system primarily focuses on the physical movement and orientation of solar panels. However, a database can be used to store and manage relevant data associated with the solar tracking system. Here is a description of how a database can be utilized in the context of a solar tracking system:

- Tracking data: The solar tracking system can generate and collect data related to the position of the sun, the orientation of the solar panels, and the energy output. This data can be stored in a database for analysis, monitoring, and reporting purposes. It allows for historical tracking data to be reviewed and analyzed to identify patterns, performance trends, and potential improvements.
- Configuration settings: The database can store configuration settings related to the solar tracking system. This includes parameters such as geographical location, time zone, tracking algorithm preferences, and system-specific settings. Storing these settings in a database allows for easy access and modification when needed.
- Maintenance and service records: The database can track maintenance activities and service records for the solar tracking system. This includes information on routine maintenance tasks, repairs, component replacements, and any other relevant service activities. By maintaining these records in a database, it becomes easier to track the system's performance, identify recurring issues, and schedule maintenance activities.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 2, June 2023

- Weather data: The database can store historical and real-time weather data relevant to the solar tracking system's location. This data can be used for analysis and correlation with the system's performance. Weather data may include parameters such as temperature, humidity, wind speed, and cloud cover. By integrating weather data into the database, it becomes possible to assess the impact of different weather conditions on the solar tracking system's efficiency.
- Energy production and consumption: The database can store energy production and consumption data associated with the solar tracking system. This includes the amount of energy generated by the solar panels, energy storage levels (if applicable), and energy consumption by the tracking system itself. By analyzing this data, it becomes possible to evaluate the system's overall energy efficiency and performance

III. FUTURE SCOPE

The future scope of solar tracking systems is promising, with several potential advancements and developments on the horizon. Here are some areas of future growth and potential improvements for solar tracking systems:

1. Advanced Tracking Algorithms: The development of more sophisticated tracking algorithms is expected, incorporating advanced computational techniques, machine learning, and artificial intelligence. These algorithms can enhance the accuracy and efficiency of solar tracking systems by adapting to changing weather conditions, optimizing energy capture, and learning from historical data.
2. Integration with Energy Storage: Solar tracking systems can be integrated with energy storage technologies, such as batteries or other energy storage systems. This integration enables the capture and storage of excess energy produced during peak sunlight hours. By combining tracking technology with energy storage, solar tracking systems can provide more consistent and reliable power output, even during low-light or nighttime periods.
3. Internet of Things (IoT) Connectivity: Integration with IoT technologies can enable remote monitoring, control, and data analysis of solar tracking systems. IoT connectivity allows for real-time monitoring of system performance, proactive maintenance, and efficient troubleshooting. It can also enable centralized control and coordination of multiple solar tracking systems in large-scale installations.
4. Hybrid Solar Tracking Systems: Hybrid solar tracking systems combine solar photovoltaic (PV) panels with other renewable energy technologies, such as wind turbines or concentrated solar power (CSP) systems. These hybrid systems can optimize energy production by harnessing multiple renewable energy sources and adjusting their orientation accordingly. Hybrid systems offer the potential for increased overall energy generation and improved efficiency.
5. Lightweight and Compact Designs: Advancements in materials and engineering techniques may lead to the development of lightweight and compact solar tracking systems. These systems would be easier to install, require less space, and have reduced maintenance and transportation costs. Lightweight designs could also be suitable for portable or mobile applications, such as solar-powered vehicles or temporary installations.
6. Energy Optimization and Grid Integration: Solar tracking systems can be further optimized for grid integration and compatibility with smart grid technologies. By integrating with the power grid and leveraging real-time energy demand and pricing data, solar tracking systems can intelligently adjust their energy production and feeding into the grid, maximizing energy generation during peak demand periods and minimizing strain on the grid.
7. Cost Reduction and Market Penetration: As solar tracking technology continues to evolve and mature, it is expected that costs will decrease, making it more accessible and economically viable for a wider range of applications. Increased market penetration of solar tracking systems can lead to economies of scale, further driving down costs and promoting the adoption of solar energe.

IV. CONCLUSION

solar tracking systems offer significant advantages in maximizing the energy production and efficiency of solar panels. By continuously adjusting the orientation of the panels to face the sun, these systems can significantly increase energy output compared to fixed installations.