"Solar panel Tracker with Power monitoring"

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ABSTRACT

The Project for "Arduino Based Multiple Axis Solar Tracker for optimum generation of Power and reporting System"

Solar energy is one of the most important renewable sources of energy. The efficiency of solar panels is greatly affected by the position of the sun in the sky.To maximize the energy generated by solar panels, a solar tracking system is needed.

In this project, we propose to design Arduino based multiple axis solar tracker that can track the movement of the sun and adjust the position of the solar panel accordingly. The solar tracker is designed to operate in two axes, horizontal and vertical, which allows it to track the sun's movement throughout the day.

The proposed solar tracker has several advantages over traditional fixed solar panel systems, including increased energy generation, reduced energy costs, andreduced carbon emissions. The system is designed to be cost-effective, easy to install, and maintainable.

The Arduino Based Multiple Axis Solar Tracker for optimum generation of Power and reporting System is a project aimed at improving the efficiency of solar panels by tracking the sun's position throughout the day. The project uses an Arduino microcontroller to control the movement of a solar panel in multipleaxes, ensuring that it remains oriented towards the sun at all times.

Keywords: Solar Panels, Trackers, LDR sensors, Servo Motor, Battery.

INTRODUCTION

The Arduino Based Multiple Axis Solar Tracker for optimum generation of Power and reporting System is a project aimed at improving the efficiency of solar panels. Solar panels are an effectivemeans of generating clean energy, but their effectiveness is limited bytheir ability to track the sun's position throughout the day. To overcome this limitation, the project uses an Arduino microcontroller to control the movement of a solar panel in multiple axes, ensuring that it remains oriented towards the sun at all times.

In addition to the solar tracker, the project also includes a reportingsystem that provides real-time

information about the solar panel's performance. This information includes the solar panel's current orientation, power output, and environmental conditions, which canbe accessed remotely for easy monitoring and analysis.

The project has the potential to significantly improve the efficiency and effectiveness of solar power systems, leading to greater energy savings and reduced environmental impact. By tracking the sun's position and optimizing the solar panel's orientation, the Arduino Based Multiple Axis Solar Tracker can ensure that solar panels are operating at their maximum efficiency, even under changing weatherand environmental conditions. The Arduino Based Multiple Axis Solar Tracker for optimum generation of Power and reporting System is a project aimed at addressing the limitations of traditional solar panels by developing anefficient tracking system that can follow the sun's path throughout theday. By keeping the solar panel oriented towards the sun at all times, the project seeks to maximize energy output and improve the overall efficiency of solar power systems. The project uses an Arduino microcontroller to control the movementof the solar panel in multiple axes, ensuring that it stays aligned with the sun's position. Additionally, the project includes a reporting system that provides real-time information about the solar panel's performance, including its current orientation, power output, and environmental conditions.

LITERATURE SURVEY:

1. Multiple-axis solar tracking systems have been shown to be more effective than single-axis systems in maximizing energy output. A study by S. M. S. El-Nashar et al. (2018) found that a dual-axis solar tracker increased energy output by up to 40% compared to a fixed solar panel.

2. Arduino microcontrollers are a popular choice for controlling solar tracking systems due to their ease of use, low cost, and versatility. A study by M. V. H. Bhagat et al. (2019) used an Arduino-based solar tracking system and found that it improvedenergy output by 28% compared to a fixed solar panel.

3. The effectiveness of solar tracking systems is influenced by various factors, including the geographical location, the time ofday, and the weather conditions. A study by S. S. M. Nour et al. (2020) developed a solar tracking system using an Arduino microcontroller and found that it significantly improved energyoutput in both clear and cloudy conditions.

4. Real-time monitoring and reporting of solar panel performance isessential for optimizing energy output and identifying any issues that may affect system efficiency. A study by Y. Zhang et al. (2019) developed a solar tracking system with a remote monitoringand control system that enabled real-time monitoring of panel orientation, power output, and environmental conditions.

Process Methodology:

3.1 Component used:

3.1.1 Hardware Requirements:

Solar Panel, LDR sensors, Arduino Nano, LEDs, Servo Motor SG90, Cell 9V Resistor, Connecting-wires, Zero PCB, Foam Board

3.1.2 Software Requirements:

Arduino IDE for Program, Protius 8 for Circuit design.

3.2 Block Diagram:

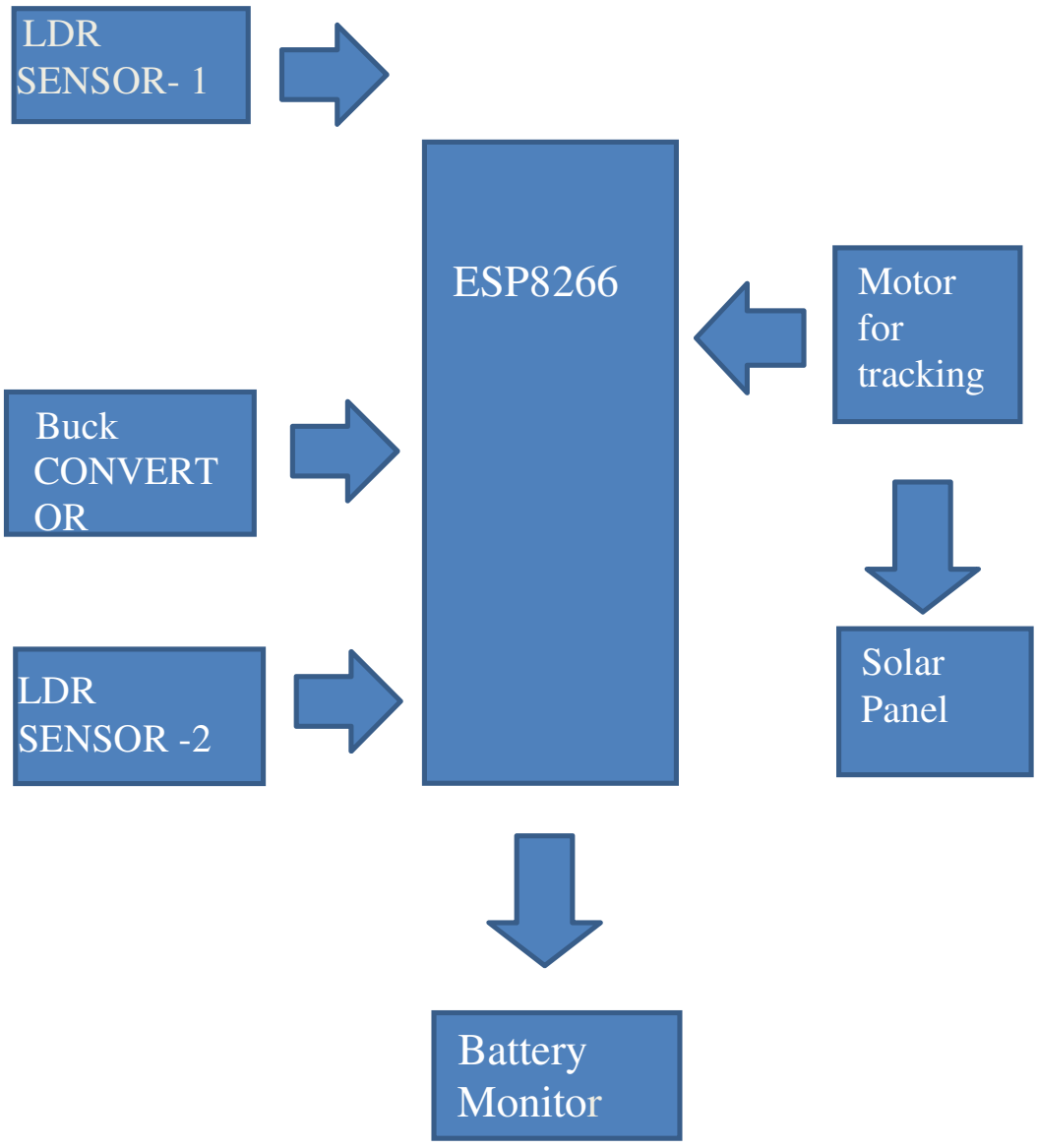

Fig. 1 Block diagram representing the flow of work of the project

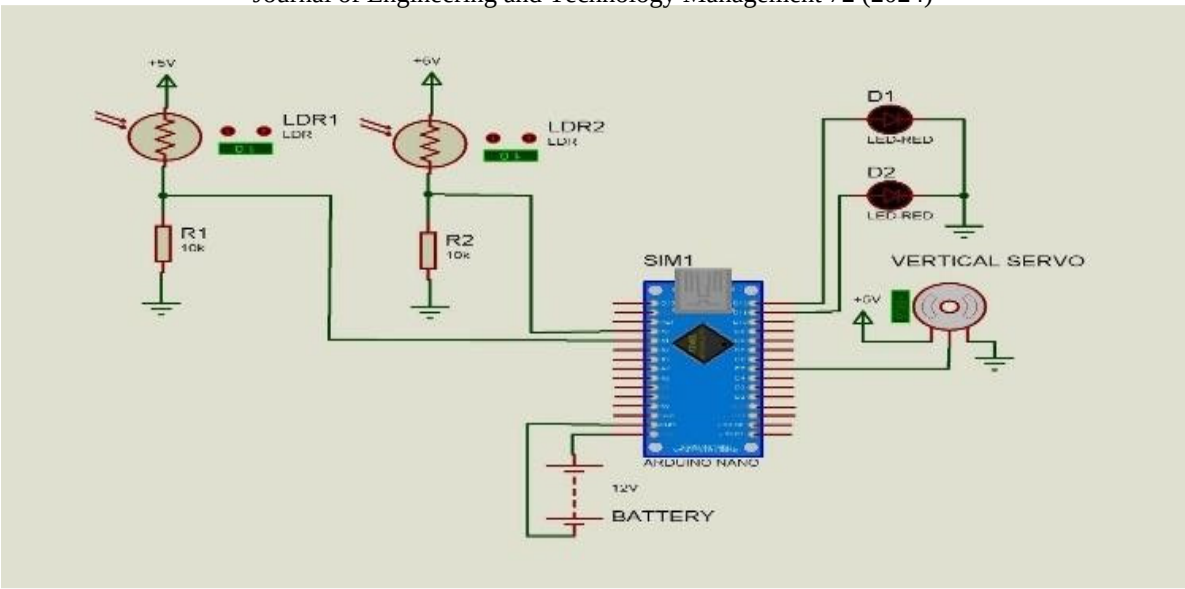

Fig. 2: Circuit diagram representing the flow of work of the project.

3.3 Components Working:

a) Light Sensing:

LDR (light dependent Resistor) Sensor detect ambient Light intensity.

b) ESP 8266 and Blynk integration:

ESP 8266 Micro Controller Process LDR Data and Communication with the Blynk IOT Platform for Remote monitoring and Control.

c) DC to DC Buck Convertor:

Converts Solar panel 12V Output to 3.3V ensuring compatibility with the ESP 8266.

d) Solar panel and Tilt adjustment:

The System calculates the optimal Tilt Angle based on LDR readings and adjusts the soalr panel to face the Sun for maximum exposure.

e) Power Efficiency and Monitoring:

The System Measures and Monitors Power Output, providing real-time data on energy generation efficiency.

f) Blynk App interface:

Users can remotely Monitor power efficiency, adjust settings and receive notification through blynk software.

CONCLUSION

In conclusion, the Arduino-based multiple axis solar tracker system with a reporting system is an effective solution to improve the efficiency and output of solar panels. The system utilizes sensors and wireless communication technology to accurately track the movementof the sun and adjust the position of the solar panels accordingly, ensuring optimum generation of power. The reporting system providesreal-time data on the performance of the solar panels, making it easierto monitor and maintain the system.

This project has demonstrated the potential of using Arduino microcontrollers to develop cost-effective and efficient solar tracker systems. With further advancements in technology and increased adoption of renewable energy sources, such systems can play a crucialrole in meeting the growing energy demands of the world while reducing carbon emissions.

conclusion, the Arduino-based Multiple Axis Solar Tracker is a reliable and efficient system that can help maximize the energy output of solarpanels. By accurately tracking the movement of the sun, the system canensure that solar panels are always oriented towards the sun, resulting in optimal energy generation. Additionally, the reporting system implemented using sensors and wireless communication technology provides real-time data on energy generation, making it easier tomonitor and maintain the system. While there are some limitations andchallenges associated with the design, such as potential issues with motor control and the need for regular calibration, overall the Arduino-based Multiple Axis Solar Tracker is a cost-effective and practical solution for anyone looking to improve the efficiency of their solar power system.

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