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Patent Search

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Abstract:

The invention relates to an IoT-enabled dual-axis solar tracking system designed to maximize solar energy harvesting through intelligent, sensor-based orientation control. The system employs an ESP32 microcontroller interfaced with LDR sensors, servo motors, voltage and fire detection modules to dynamically adjust the solar panel's azimuth and elevation angles. Real-time data is transmitted via an IoT platform for remote monitoring, performance analytics, and fault alerts. The integrated safety mechanism enables fire detection and automatic notification through a mobile dashboard. The system significantly enhances energy efficiency, reliability, and user accessibility, providing a sustainable and intelligent solution for solar power generation within residential and industrial applications.

Complete Specification

Description:FIELD OF THE INVENTION

[001] The present invention relates to the field of renewable energy systems and, more particularly, to an Internet of Things (IoT) enabled dual-axis solar tracking system designed for intelligent orientation control and real-time performance monitoring of solar photovoltaic panels. The invention resides within the domains of embedded electronics, automation, and smart energy management, employing microcontroller-based control and IoT communication technologies to enhance solar power generation efficiency.

[002] Specifically, the invention pertains to a dual-axis solar tracking mechanism capable of dynamically adjusting the solar panel's azimuth and elevation angles in accordance with the sun's positional changes and environmental conditions such as solar irradiance, temperature, and light intensity. The system integrates sensors, servo motors, and a central microcontroller (ESP32) interfaced with a cloud-based IoT platform for monitoring, fault detection, and remote supervision.

[003] The invention is further directed toward improving operational safety and maintenance efficiency by incorporating fire detection, fault alerting, and predictive performance analytics through IoT connectivity. It is applicable in residential, industrial, and grid-level solar installations where automated solar alignment and remote energy management are desired, thereby contributing to sustainable, data-driven, and intelligent renewable energy utilization.

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