IOT BASED SOLAR PANEL MONITORING SYSTEM

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ABSTRACT: The biggest crisis we are facing is over usage fossil fuels. To overcome this we need to switch to renewable resource. One of the most prominent kind of renewable energy is solar energy, Solar radiation from the sun is collected by the solar panels and converted into electrical energy. So we need to monitor the solar panel for collecting the data. This research presents an IoT-based system for real-time monitoring and management of solar power generation. By leveraging IoT technology, the system aims to enhance the efficiency and reliability of solar energy systems. The proposed system utilizes sensors to collect data on various parameters such as temperature, voltage, and current. This data is then transmitted to a central cloud platform for analysis and visualization.

Key Words: IOT, Solar Panel, Arduino microcontroller, Current, Voltage, power, Temperature, Monitoring unit.

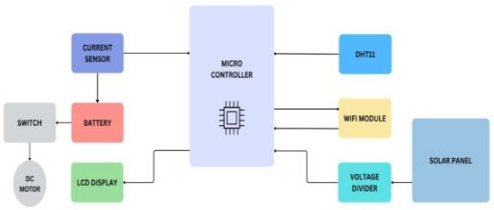
INTRODUCTION

In today's era of smart technologies, energy management and IOT is playing a major role. By implementing the IOT on Energy generation provide real-time monitoring and control of electrical devices, making energy management more efficient and accessible. By leveraging the Internet of Things (IoT) technology, the system collects data on power consumption, and reports it to a central server. The analysis and visualization of this data help users identify inefficiencies and optimize energy usage. The system also includes features such as remote control, Arduino (microcontroller), wifi module allowing for proactive energy management and device control, directly from a smartphone or PC

COMPONENTS REQUIRED

1) Arduino (microcontroller)
2) Current sensor
3) DC Motor
4) Battery
5) Voltage divider circuit
6) Power hub circuit
7) Switch
8) LCD Display
9) WIFI Module ESP8266
10) DHT11
11) Solar panel
12) Jumper wires

BLOCK DIAGRAM



WORKING

An IoT-based solar panel monitoring system utilizes sensors and connected devices to collect real-time data on solar panel performance, including energy output, temperature, and environmental conditions. This data is transmitted to a cloud platform where it can be analyzed for efficiency and performance trends. Users can access this information through a web or mobile application, enabling them to monitor energy production, identify issues, and optimize maintenance. Additionally, alerts and notifications can be generated for any anomalies, ensuring proactive management of the solar energy system.

SENSORS

The solar panel is monitored with various sensors like temperature sensor, current sensor, voltage sensor.

TEMPERATURE SENSOR

It can continuously measuring the temperature of the solar panels and their environment. This data is collected and transmitted to a central monitoring system. By monitoring temperature variations, the system can assess the efficiency of energy conversion, identify overheating issues, and optimize performance. Additionally, the temperature data can be integrated with other environmental metrics, enabling predictive maintenance and enhancing the overall reliability and efficiency of the solar energy system

VOLTAGE SENSOR

It can continuously measuring the voltage output of the solar panels. The sensor converts the analog voltage levels into digital signals, which are then transmitted to a microcontroller or IoT platform. This data allows for real-time monitoring of the solar panel's performance, enabling users to assess energy production efficiency and detect any anomalies or faults.

CURRENT SENSOR

It is used to measure the current flowing from the solar panel to the load or battery. The sensor generates a voltage signal proportional to the current, which is then converted from analog to digital using the system's microcontroller. This data is processed to calculate power output and transmitted to an IoT platform via communication modules like Wi-Fi or GSM.

WIFI MODULE

the ESP8266 Wi-Fi module enables wireless communication between the solar monitoring hardware and the cloud platform. The microcontroller collects data from sensors such as current and voltage sensors, processes the information, and then uses the ESP8266 to transmit the data to an IoT platform over Wi-Fi. The ESP8266 connects to a local Wi-Fi network and communicates with the server via standard protocols like HTTP or MQTT. This allows users to monitor solar panel performance remotely in real-time through a web dashboard or mobile app,

ensuring efficient system management and alerts for any detected issues.

DATA ACQUISITION

The sensors collect data and transmit it to a central processing unit (CPU).

DATA PROCESSING AND ANALYSIS

The CPU processes the collected data, performs calculations, and generates. Advanced algorithms analyze the data to determine factors like: Energy generation, Total power output, peak power, and energy consumption, System efficiency.

DATA TRANSMISSION AND VISUALIZATION

The CPU transmits the processed data to a cloud-based platform or local server using wifi module(ESP8266). The data is presented in a mobile app, providing real-time visualizations, charts, and reports. Users can access the monitoring system from anywhere with an internet connection. The system can send alerts for critical issues, such as low energy generation, panel malfunctions, or system failures.

FUTURE PROPOSAL

Proposals are in planning stages; the blind people have sensor enabled smart glass to examine which object it is and also have distance sensor detects depth or height the staircase step and tells to people. The proposedsystem deals with the cheaper and effective obstacle detection with a wide range of coverage. The advantages are Low cost, Easy touse and helps the care taker to monitor that person.

CONCLUSION

In conclusion, smart glasses for the blind are innovative devices that leverage technology to enhance the lives of visually impaired individuals. These glasses utilize sensors, computer vision, and various feedback mechanisms to provide real-time information about the user's environment, enabling them to navigate, recognize objects and people, access information, and engage more fully in daily activities. With applications ranging from obstacle detection and indoor navigation to facial recognition and colour identification, smart glasses for the blind hold the promise of increasing independence, safety, and social inclusion for those with visual impairments.

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