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Iot Based Solar PV Remote Monitoring System

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Abstract

The cost of renewable energy technology is decreasing, promoting large-scale solar photovoltaic installations around the world. The majority of the installations serve as backup power sources. The majority of these are placed in inaccessible locales ranging from a rooftop to a desert. Hence they are in need of sophisticated method to monitor the solar plant using wide area networks. In this work, we will explore an Internet Of Things (IOT) Technology-based solar photovoltaic monitoring system that uses a Node MCU controller to wirelessly transport data collected in production, allowing access to solar plant data from anywhere on the planet over the internet. The Internet of Things (IoT) is a collection of intelligently connected devices and frameworks that connect and communicate with a variety of machines, environments, objects, and infrastructures, and radio frequency identification (RFID) and sensor network technologies will rise to meet this new challenge. The embedded programming includes solar power tracking for increased efficiency, as well as automatic tilting of the panel in response to light intensity. This helps to overcome the disadvantage of power loss over time. All of these approaches are contained in a controller that communicates with a Node MCU module to send data over the internet..This aids in the provision of real-time information regarding solar photovoltaic power generation, which improves panel performance, monitoring, and maintenance of the solar plant, as well as providing a record of all data at predetermined intervals. Solar energy is a clean, abundant, and simple to use source of energy. Solar energy is growing increasingly popular, despite its unreliability.With sophisticated monitoring and control systems, these sources of energy are becoming more reliable, and in a few years, they may fully replace conventional sources.

1. Introduction

Electricity is now included among the most essential demands in everyone's existence in the modern world. The graph of energy use is increasing day by day, but the graph of energy resources is decreasing. Various sources of electricity generation are employed to balance the lack of electricity. There are two methods for generating electricity: one is the traditional approach, and the other is the alternative method. Some energy carriers, such as fossil fuels and nuclear fuels, are also used, but they are non-conventional because they are not renewable resources (i.e., they are not replenished by nature). Solar power, in its broadest meaning, can be used to provide a sustainable power supply. Solar energy is widely available all around the planet.

Over the last few years, the concept of the Internet of Things (IOT) has gotten a lot of attention. Internet-connected gadgets such as smart phones and tablets are increasingly commonplace thanks to advancements in wired and wireless network technologies [1]. Solar photovoltaic (PV) energy is a renewable source of energy. Solar energy is emerging as a viable option for ensuring long-term energy supply. In general, the Internet of Things (IoT) is a data-sharing ecosystem that collects and distributes data through the cloud, allowing devices in everyday life to be connected to wired and wireless networks. This allows each and every thing in the world to be connected via a wireless sensor network

[2].

1.1 Overview

- As more solar photovoltaic systems are integrated into the current grid, there is a need to monitor real-time information on generation data collected from solar photovoltaic plants in order to maximise overall solar power plant performance and ensure grid stability.Because the installer cannot monitor the solar power plant on a continuous basis, remote monitoring is required for all solar power plants [3-5].
- By making data measurement and monitoring easier and more cost effective, the remote monitoring system reduces the limitations associated with traditional wired systems. The IoT-based solution takes a major step forward in monitoring and solar panel control by making intelligent decisions from the web.
- The direct beam of sunshine, which carries roughly 90% of the sun's energy, and the diffusion of sunlight in the atmosphere, which transports the remaining energy, are the two components of sunlight. On a clear day, the dispersed portion is the blue sky, which grows correspondingly on cloudy days.
- Because the sun provides the majority of the energy, sun tracking is required in order to obtain the maximum amount of energy from the sun. The energy is stored in the battery during the day and can be used afterwards.
- A typical solar panel transforms only 30% to 40% of incident sun irradiance into electrical energy. An automated system that makes the solar PV panel moveable is required to constantly rotate the solar panel towards the direction where the intensity of sunshine is highest [6-7].

2. Existing System

The present conceptual approach in this work is to use an IoT-based network to monitor the state of a solar system in order to regulate and record it remotely. The data from the sensors is sent out over a mobile radio network. To communicate data to the remote server, a module is used.The sensing layer, which includes current sensors, voltage sensors, a pyranometer for irradiance measurement, and other sensors, is at the bottom of the schematic diagram. This layer also incorporates microcontroller-based data processing of data obtained from the sensors.To initiate and transfer data to the server, the microcontroller interfaces with the wireless module. The application layer then uses the network layer, this procedure, and the stored data. This layer creates sophisticated web-based services depending on the data that has been collected, processed, and stored.

3. Proposed System

The suggested system employs an IoT module, which sends the parameters of the solar photovoltaic cell to a specified webpage. By just logging into the webpage, the user can monitor the status from anywhere in the world. Maximum power point tracking is a charge controller method that extracts the maximum available power from a PV module under specific conditions. Maximum power point refers to the voltage at which a PV module may output the most power. Here the micro controller is the flash type reprogrammable micro controller received two digital signals from the ADC and compares the signal.

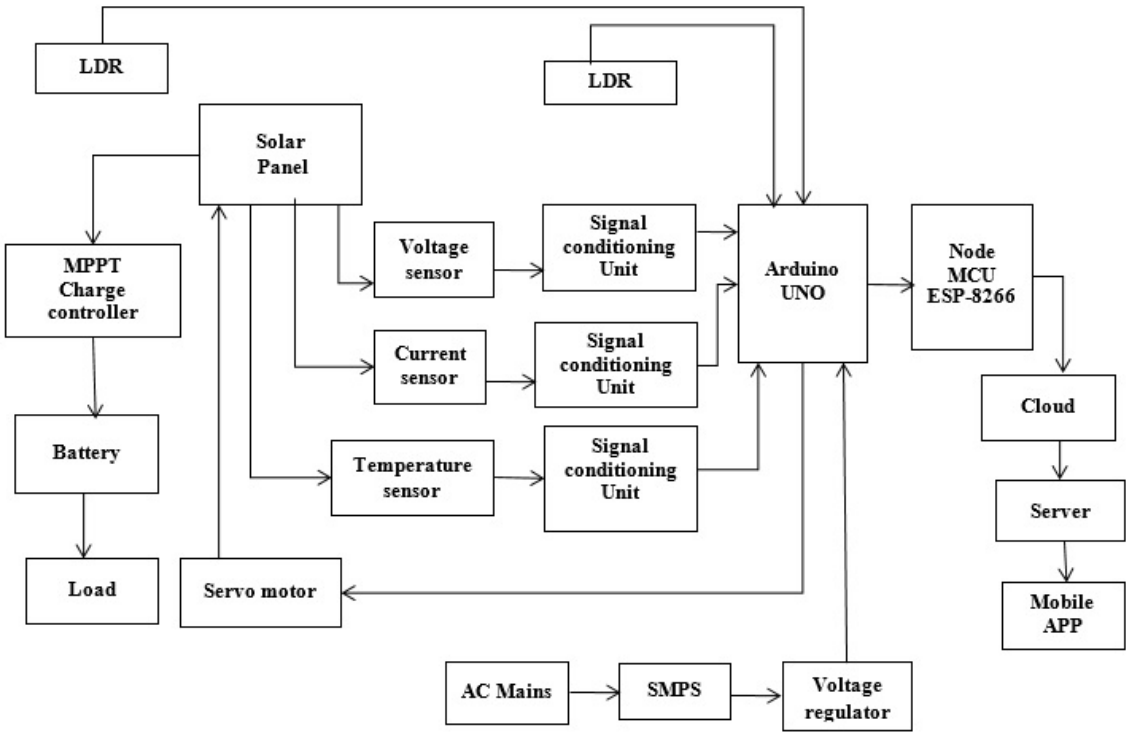

Figure 1.Block Diagram of Remote Monitoring Solar Pv System

The microcontroller displays the corresponding information on the LCD Display. The maximum power point tracking is basically a load matching problem. Inorder to change the input resistance of the panel to match the load resistance, a DC to DC Converter is required. MPPT output is connected to battery to store the maximum output power from the panel. The battery is connected to the load which is driven by the power stored in the battery. The Arduino board which is interfaced with Node MCU which has an inbuilt wifi connection with programming mode. It transfers the data to cloud which gets stored for each and every intervals of time.

4. Flowchart

Figure 2. Shows the detailed flow model of data storage in cloud serve. Microcontroller unit is Initialized and check the connection status then the data are stored in cloud server over the internet.

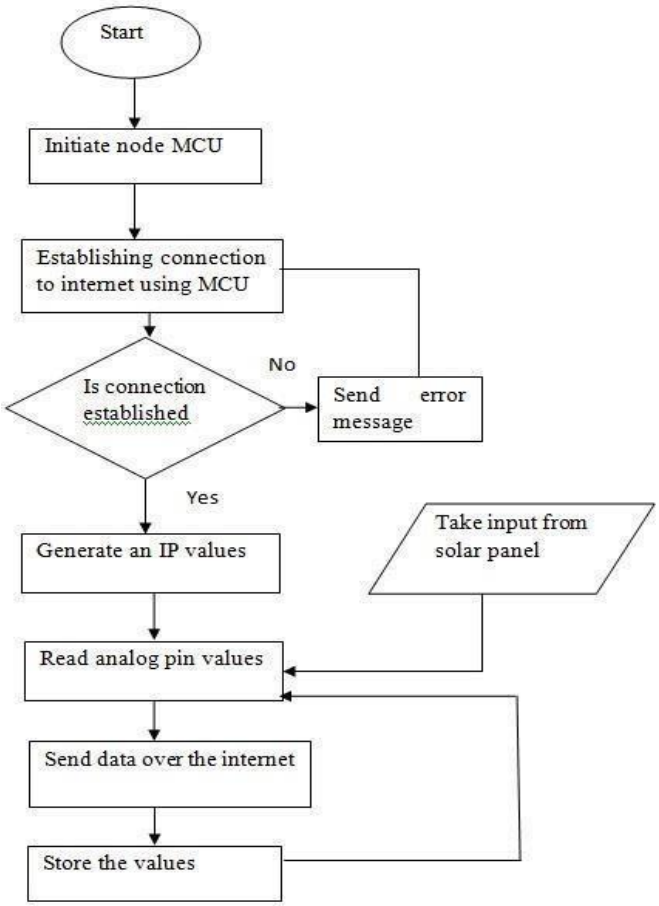

Figure 2.Flow Chart cloud Data Storage

5. Conclusion

As renewable energy sources become more integrated into the utility grid, using IOT to monitor a solar power plant is a crucial step. As a result, the automation and intellectualization of solar power plant monitoring will improve future decision-making for large-scale solar power plants and their grid integration. The approach is investigated, developed, and successfully achieved the remote transmission of data to a Server for supervision through the web server in this project, IoT based remote monitoring system for solar power plant. IoT-based remote monitoring will increase the system's energy efficiency by utilizing low-power sophisticated wireless modules, consequently lowering the carbon footprint. The use of a Web Console-based interface will greatly save manual supervision time and aid in the scheduling of plant management tasks.

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