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SMART PLANETARY ENERGY MANAGING SYSTEM BUILT ON CLIMATE FACTS USING IoT

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ABSTRACT

Solar power plants need to be monitored for optimum power output. This helps retrieve efficient power output from power plants while monitoring for faulty solar panels, connections, and dust accumulated on panels lowering output and other such issues affecting solar performance. So here we propose an automated IoT based solar power monitoring system that allows for automated solar power monitoring from anywhere over the internet. We use arduino based system to monitor a 10Watt solar panel parameters. Our system constantly monitors the solar panel and transmits the power output to IoT system over the internet. Here we use IoT Gecko to transmit solar power parameters over the internet to IoT Gecko server. It now displays these parameters to the user using an effective GUI and also alerts user when the output falls below specific limits. This makes remotely monitoring of solar plants very easy and ensure best power output.

Introduction

Internet of things (IoT) is playing a major and crucial role in the daily life of humans by enabling the connectivity of many and most of the physical devices through internet to exchange the data for monitoring and controlling the devices from a remote location, where the devices are becomes intelligent. This technology can connect a wide range and varieties of things such as animals, humans, smart transport, smart grids, virtual power grids, smart cities, vehicles, heart monitoring systems, environmental sensing, shopping systems, automated homes, energy management, assistance for disabled and elderly individuals, cochlear implants, tracking of things, equipment manufacturing, agriculture, emergency monitoring systems, electronics tool collection systems, vehicle control etc. according to the survey there is an increase of 31% i,e 8.4 billion internet connected devices. The connected device may increase to 30 billion by 2020 and which makes the business market around 7.1 trillion dollars by 2020. By using the IoT we can enable the machine-to-machine communication M2M or device to device communication without human intervention. In the

modern life electricity became the important and essential part of the life. For any work now, a day we require electricity like lighting, heating, refrigeration, cooling, transportation systems what not all the home appliance works on electricity. In day-to-day life the consumption of electricity is increased but not decreased. To compete with the requirement of the public more and more electricity is to be generated and give to the end users. As the population increases the consumption also increases.

Keywords

IoT, Temperature Sensor, Voltage Sensor, Solar Panel, Arduino, Wireless Sensor Network

Related Work

K.G.Srinivasan, Dr.K.Vimaladevi & Dr.S.Chakravarthi et al presented a Solar Energy Monitoring System by IOT. The Internet of Things has a vision in which the internet extends into the real world, which incorporates everyday objects. The IoT allows objects to be sensed or controlled remotely over existing network infrastructure, creating opportunities for pure integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. This technology has many applications like Solar cities, Smart villages, Micro grids and Solar Street lights and so on. As Renewable energy grew at a rate faster than any other time in history during this period. The proposed system refers to the online display of the power usage of solar energy as a renewable energy. This monitoring is done through raspberry pi using flask framework. Smart Monitoring displays daily usage of renewable energy. This helps the user to analysis of energy usage. Analysis impacts on the renewable energy usage and electricity issues.

K. Dinesh, Lakshmi Priya. A, Preethi. T, Sandhya. M, Sangeetha. P et al presented a IoT Based Solar Panel Tracking System with Weather Monitoring System. Solar power is the burgeoning method of continual energy. The assignment is designed and carried out the use of dual axis sun tracker system. In order to maximize power era from solar, it's important to introduce sun ray monitoring systems into solar electricity production. A dual-axis tracker can boom power through monitoring solar rays from switching photovoltaic cells in various directions. These photovoltaic cells can rotate in all directions. The LDR (Light Dependent Resistor) have been used to feel the depth of mild at 30 degree every or at 180 degrees general and ship the information to microcontroller. This assignment also can be used to experience rain drop, temperature and humidity using sensor and they may be displayed on LCD. We can save the Solar energy in battery.

Vignesh Mani, Abhilasha, Gunasekhar et al presented a IoT Based Smart Energy Management System. Energy is a very important aspect for any household, industries, agriculture and so. Managing the energy efficiently and conserving it intelligently for appliances is very much important. The energy usage is directly affected with Coal, oil and so towards power generation. Towards this, there has been lot of research work carried out in developing some smart lighting system pertaining to classroom for conserving the energy. In one another research, researchers have developed Android based Smart home system for monitoring the usage of power to avoid any kind of anomaly. In none of the research, researchers have worked towards automating the appliance control towards conserving the energy. Most of them concentrate on controlling the appliances using android devices. So, with the upcoming of machine-to-machine communication where devices can be connected wirelessly leading to IoT, we here have developed an IoT based Smart Energy Management system where appliances like Fan and Bulb to start with

are controlled wirelessly based on humidity and light intensity information. These inputs are used towards controlling the appliances intelligently rather than just switching on or off. In addition, the system also keeps computing throughput the day power consumption of the appliances which gives the user knowledge on power being consumed over a period of time. These details are updated in Cloud server. This prototype system developed have achieved energy conservation at every household.

Siyun Chen et al (2020) gives a human-centric Smart Home Energy Management System (SHEM) with the intention of mechanism at the "butler" plane. Based on this structure, our SHE system provide smart military to make happy the supplies of user as a butler aim not just to keep the electrical energy cost or decrease the max out load, but in addition to forecast user's stress and supervision "servants." Smart grid strategies are incorporated keen on smart home systems; its willpower be harder and more complex for user to control all strategy wisely. In this proposed system a human-centric smart home construction by the combination of considerate the behaviors of person being, infer the user's weight and utilization preference and optimally running the energy plans in smart home. The SHE system can be comprehensive for respond to a variety of require response signal and contribution expensive maintain for programming and result make at all levels of usefulness based on the people-centric framework.

Jinsoo Han et al (2019) has proposed a smart Home Energy Management System (HEMS) structural design that considers together energy consumption and production concurrently. ZigBee base energy dimension module is used to manage the energy consumption of home appliance and illumination. A Power Line Communication (PLC) based Renewable Energy Gateway (REG) is use to check the energy age group of renewable energies. Smart HEMS constructions that consider both power consumption and invention based on ZigBee and PLC base REG correspondingly. This PLC monitor technology can supervise each planetary panel for protection. The home server cans estimation the energy production based on conditions predict. Using the obtain energy in sequence; the home server can manage the home energy use program to reduce the power price.

Existing System

Establishment of the Solar Parks have the potential of reducing the cost of electricity from solar power. The sensors are used to monitor and collect the information about the climatic condition of the farm like temperature, humidity, day/night mode and also to check the power generated on the field. GSM-based Wireless Sensor Network (WSN) has the features of high bandwidth and rate, non-line-transmission ability, large-scale data collection and high cost effective, and it has the capability of video monitoring, which cannot be realized with ZigBee. For the wireless section, GSM type network has been used because it is modern wireless sensor networks. Development of Real-Time atomization of solar power system with various parameters being controlled by a microcontroller and maintained using the low power by adaption of wireless technology. The status of the load is monitored and data is stored at EEPROM, depending on the requirement of load application adequate facilities is chosen by the controller. Things get interesting when smart devices combine with smart services to create compound applications.

Proposed System

The main objective of this project is to get an optimum power output from the solar panels during dust is accumulated on it. Also, if there is any malfunctioning of the solar panels will be displayed on and we can also

get information about whether the solar or battery connected for the loads. The system detects and alerts the user or the administrator when is fall below the pre-define conditions, and display on the GUI. A solar panel is used that keeps monitoring the sunlight. Here different parameters like voltage, current and temperature are displayed on the LCD by using IOT technology.

Module Description

A module is a software component or part of a program that contain one or more routines. One or more independently developed modules make up a program.

ARDUINO UNO

The Microcontroller used here is an Arduino UNO. The UNO is a Microcontroller board based on ATMEGA 328P. The ATMEGA 328P has 32kB of flash memory for storing code. The board has 14 digital input and output pins, 6 analog inputs, 16 MHz quartz crystal, USB, an ICSP circuit and a reset button. The UNO can be programmed with the Arduino software.

SENSORS

A sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes depends upon transducer in its environment and send the information to other electronics, frequently a microcontroller. A sensor is always used with other electronics.

ESP8266 WIFI

The ESP8266 arduino compatible module is a low-cost Wi-Fi chip with full TCP/IP capability, and the amazing thing is that this little board has a MCU (Micro Controller Unit) integrated which gives the possibility to control I/O digital pins via simple and almost pseudo-code like programming language. This device is produced by Shanghai-based Chinese manufacturer, Espresso if Systems.

Send Sensor Data Privately to the Cloud

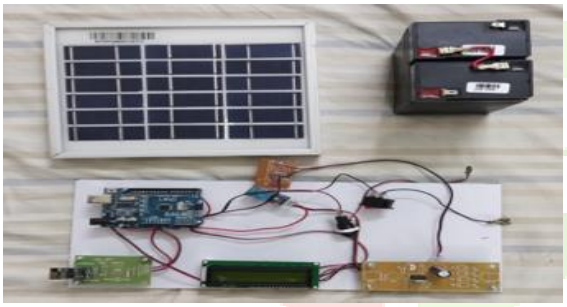
There are sensors all around—in our homes, smart phones, automobiles, city infrastructure, and industrial equipment. Sensors detect and measure information on all sorts of things like temperature, humidity, and pressure. And they communicate that data in some form, such as a numerical value or electrical signal. Sensors, or things, sense data and typically act locally. ThingSpeak enables sensors, instruments, and websites to send data to the cloud where it is stored in either a private or a public channel. Thing Speak stores data in private channels by default, but public channels can be used to share data with others. Once data is in a Thing Speak channel, you can analyze and visualize it, calculate new data, or interact with social media, web services, and other devices.

Analyze And Visualize your Data with Matlab

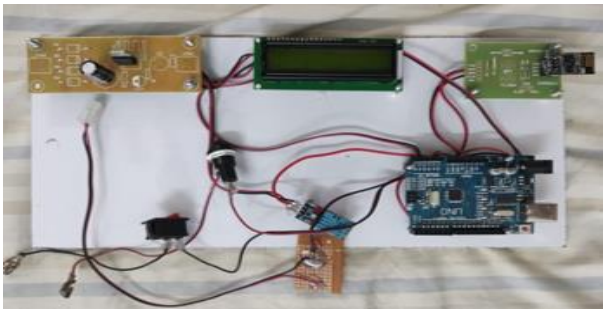
Storing data in the cloud provides easy access to your data. Using online analytical tools, you can explore and visualize data. You can discover relationships, patterns, and trends in data. You can calculate new data. And you can visualize it in plots, charts, and gauges. Storing data in the cloud provides easy access to your data. Using online analytical tools, you can explore and visualize data. You can discover relationships, patterns, and trends in data. You can calculate new data. And you can visualize it in plots, charts, and gauges

Results and Discussion

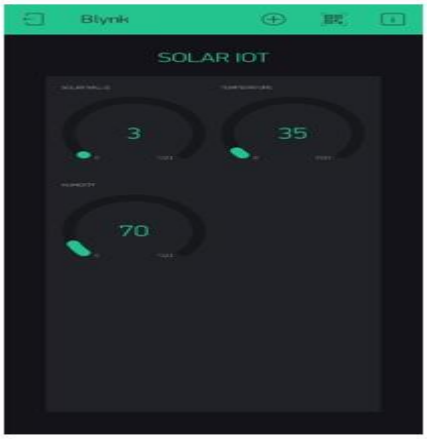
The objective of a system finds its shape in terms of output. The analysis of the objective of a system leads to determination of outputs. Outputs of a system can take various forms. The most common are reports, screens display printed form, graphical drawing etc. the outputs vary in terms of their contents, frequency, timing and format. The users of the output, its purpose and sequence of details to be printed are all considered. When designing output, the system analyst must accomplish things like, to determine what information to be present, to decide whether to display or print the information and select the output medium to distribute the output to intended recipients. Internal outputs are those, whose destination is within the organization. It is to be carefully designed, as they are the user's main interface with the system. Interactive outputs are those, which the user uses in communication directly with the computer.



The data is stored in MySQL, which is highly reliable and simpler to use, the user level security is managed with the help of password options and sessions, which finally ensures that all the transactions are made securely. The application's validations are made, taken into account of the entry levels available in various modules. Possible restrictions like number formatting, date formatting and confirmations for both save and update options ensures the correct data to be fed into the database. Thus, all the aspects are charted out and the complete project study is practically implemented successfully for the end users.



As the software is to be implemented in a high standard industrial sector, various factors such as application environment, user management, security, reliability and finally performance are taken as key factors throughout the design phase. These factors are analyzed step by step and the positive as well as negative outcomes are noted down before the final implementation. Security and authentication are maintained in both user level as well as the management level



Conclusion and Future Work

As this system keeps continues track of solar power plant, the daily weekly and monthly analysis becomes easy and efficient also with the help of this analysis it is possible to detect any fault occurred within power plant as the generated power may show some inconsistency in data of Solar power plant. Since the system requires external power supply of 5 volts and 3.3 volts for its operation which can be taken rid of by utilizing the power generated by solar panel only. Also, with the help of motor and controlling it is possible to track the sun for better power generation. Apart from that by using various Machine Learning algorithms and model it is possible to make system smart enough to take decision about data and performance.

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