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IOT BASED SOLAR STRING FAULT DETECTION AND CONTROL USING WIFI MODEM

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Abstract: Energy is one of the major issues that the world is facing in India, the supply of energy has been one of the major problems for both urban and rural households. About 60% to 70% of the energy demand of the country is met by fuel wood and agriculture residues. Solar energy is renewable source of energy, which has great potential and it is radiated by petroleum. Solar power has become source of renewable energy and solar energy applications should be un enhanced. The solar PV modules are generally employed in dusty environment which are case trophical countries like India.

Keywords: IOT, Solar String, Fault Detection, WIFI, Adafruit IO

I. INTRODUCTION

The things of real world shall integrate into the virtual world, enabling any time, anywhere connectivity. The number of everyday physical objects and the devices connected to the internet was around 12.5 billion in 2015. The number of values expected to double to 25 billion in 2025 as the number of more smart devices per person increases, as far as to a further 50 billion by 2030. The web of things vision to successfully emerge the completing criterion will need to go beyond traditional mobile computing sensors that used smart phones and portables, and evolved into connecting everyday existing objects and embedded intelligence into our environment. A Huge amount of users in internet makes IOT easier and smarter and implement communication quickly. IOT means storing all those related things since early days solar energy are are in use and also human believe that solar energy provides energy for future. Solar panel consist of more number of solar PV cells that tend to entire system to failure so detecting those cells to work an normal way the monitoring process is done. The main of this project is based on implementation of new cost-effective methodology based on IOT to remotely monitor a solar photovoltaic plant for performance evolution.

The Sun emits energy at an extremely large rate hence there is abundant availability of solar energy in the nature If all solar energy could be converted into usable forms, it would be more enough to supply the world energy demand. However, this is not possible because of conditions in the atmosphere such as effect of clouds, dust and temperature. Solar energy can be converted to more usable energy forms through solar panels. There is unprecedented interesting renewable energy, particularly solar energy, which provides electricity without giving rise to any carbon dioxide emission . The efficiency of solar panel is limited due to natural conditions so it is very much essential to take care of parameters like dust, humidity and temperature. In this regards the work has been taken up to study the efficiency of solar panels.

Embedded system is programmed by controller and it consists of hardware and mechanical parts. It is controlled by RTOS (Real time operating system). The hardware of the embedded system can be a microcontroller or microprocessor. Embedded system software is written in high level setup and is used to perform specific function. The main characteristic of the embedded system is to produces output within its time limit. It consumes less power and operates at a fast rate. It is highly reliable and is economical. The term IOT is the interconnection via internet of computing devices. It is used for monitoring and supervisory actions.

It can collect information and send it and it can also receive information and act on it. Here the information is collected by providing the sensors accordingly to the use of the organization. So with the combination of internet and the sensors it is possible to sense the information to make accurate decisions automatically and also by gathering the data we can reduce the human performance or effort, cost and losses. For instant, when any physical objects are connected to IOT, it starts to monitor and control the objects automatically without any human effort. As the non-renewable energy resources are dwindling, the utilization of renewable resources for producing power is increasing. Solar panels are getting increasing popularly. A solar panel gathers solar energy, then converts it to electrical energy, and stores it in a battery. This energy can be used as needed or as a straight replacement for grid power.

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The Sun's position with respect to the solar panel changes due to the rotation of the Earth. For solar panels to be most efficient, they need to be continuously oriented toward the Sun. Continuous orientation is the only way to maximize solar energy production. Therefore, the solar panel should always face the direction of the Sun. To get the most out of a solar power plant, it is critical to keep an eye on it. In order to keep an eye on the output of these power plants, Solar panel defects, such as dust and other contaminants, can reduce the solar panel's output.

Using an IoT-based solar power monitoring system, the cloud- based system provides solar monitoring and checks if there is a problem in solar panel connection by lowering output. NODE- MCU ESP8266 is the controller that monitors all the solar panel parameters. Monitor the solar panel and transmit the data to the Internet of Things (IoT). As soon as an output falls below a predetermined threshold, an alert is issued to notify users of an issue with solar panel connections or dust on the panel. This makes it possible to monitor the solar panel and ensure that it is producing the best amount of electricity possible.

II. PROBLEM STATEMENT

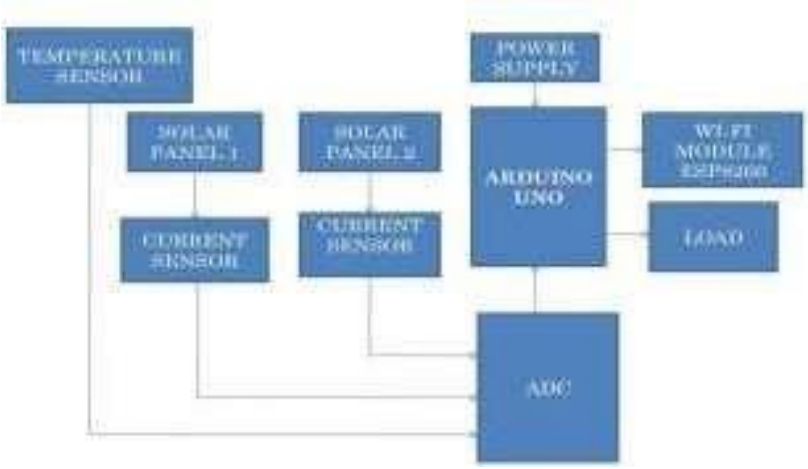
A number of environmental factors such as wind speed, humidity, ambient temperature, solar radiation, atmospheric dust and direction influence the power generation process using installed solar photovoltaic modules. Dust build – upon solar module surface is an issue of great worry, particularly in desert provinces where in frequent to regular dust storms do occur. The glass covers transmittance decreases because of acceration of dust and the surface of PV module, which ultimately decreases the amount of solar irradiation reaching the cells.

The dust density of the surface, orientation, the tilt angle, exposer period, dominating wind direction, and site climatic conditions determinants the reduction in glass transmittance. The density of deposited dust, the composition of the dust and its particle distribution determinants the effect of the effect of dust on the power output and current -voltage characteristics of PV modules.

III. PROPOSED SYSTEM

To increase the current solar cells are connected in parallel and to increase the voltage they are connected in series. We consider only few cells but to generate high power in practical photovoltaic cells are connected either in series or in parallel. If a fault occurs in any one panel it is difficult to find fault in large area. The current sensor is connected to the output of each panel.

The output of the sensor is in the form of analog value and using Analog to digital converter (ADC) it is converted into digital value. These values are given to the Arduino UNO. If any fault occurred in the solar panel the current value will be less than that of the threshold value. Then this information is send to the monitor control unit with the help of Wi-Fi module. By this the fault is detected in the solar panels and the information is updated immediately to the monitoring unit.



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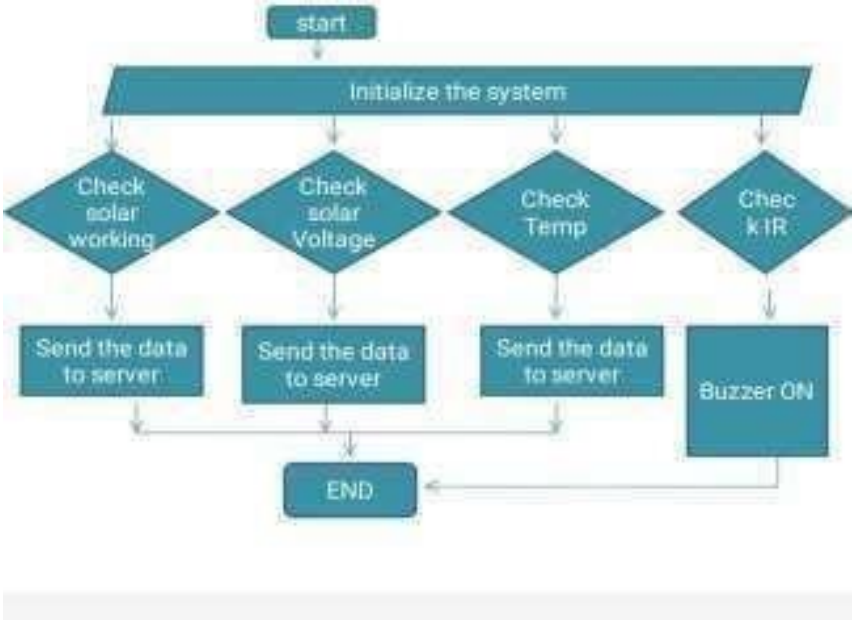
IV. FLOW CHART



V. SOFTWARE DESCRIPTION

Arduino IDE

Arduino is an open-source project, enabling hobby is to easily take advantage of the powerful Atmega chips. The Arduino IDE is the software where you can write code and upload it to the Atmega chip. The code is then executed on the chip. Most 3D-printer electronics are Arduino-compatible, they use the Atmega chip and enable the user to upload their code using Arduino. This includes Megatronics, Minitronics andRAMPS. Before you can start using the electronics you need software firmware that translates machine instructions into actual moments there are few options here including marlin and sprinter and repetier. The actual firmware is not discussed in this document. You can use arduinio to upload the firmware on to your electronics.

Adafruit IO

Adafruit IO is a system that makes data useful. Our focus is on ease of use and allowing simple data connections with little programming required. IOT includes client libraries that wrap our REST and MQTT APIs. IO is built on ruby on rails and node. Adafruit IO is currently in beta.

Embedded C

The extension of C programming language is known as embedded C. It is generally utilized for creating microcontroller based applications.

VI. APPLICATIONS

1. It is used for agricultural or Green House security Systems.
2. Useful for Weather monitoring systems.
3. Useful in solar power plant monitoring system

VII. ADVANTAGES

- Real time monitoring
- Simplicity of the system.
- Portable
- Low cost

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VIII. CONCLUSION

This method have continues tracking solar energy weekly monthly and daily basis. The analysis became simpler and more Convenient and economically additional. Non conventional Energy which can be endlessly relished by process. As this system keeps continues track of solar power plant the daily Weekly and monthly analysis it is possible to detect any fault Occurred within powerplant as the generated power may show Some inconsistency in data of solar power plant.

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