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Remotely Monitoring Health of the Solar Power System Using Arduino

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Abstract – *Using the Internet of Things Technology for Monitoring solar power generation can significantly increase the performance and maintenance of the solar panel. This Project is based on implementation of new cost actual methodology based on IoT to remotely monitoring a solar plant for performance evaluation. This will smooth the way of preventive maintenance, fault detection of the solar panel in addition to real time monitoring. 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 planned system mentions to the online display of the power usage of solar energy as a renewable energy. This monitoring is done through Arduino using Thingspeak server. Smart Monitoring displays daily usage of renewable energy. This helps the user to study of energy usage. Analysis impacts on the renewable energy usage.*

Key Words: Solar Panel, Arduino Uno, Voltage Divider, Current Sensor, LCD 16×2, ESP8266 Wi-Fi Module, Thingspeak.

1. INTRODUCTION:

Solar power plants need to be monitored for most proper power output. This helps assess actual power output from power plants while monitoring for defective solar panels, connections, and dust amassed on panels lowering output and other such issues disturbing solar performance. So here we propose an programmed 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 solar panel parameters. Our system continuously monitors the solar panel and transmits the power output to IOT system over the internet. Here we use IOT Thingspeak to convey solar power parameters over the internet to IOT Thingspeak server.

A. Project Objective:

1. The main objectives of proposed system to design and implement an intelligent smart monitoring and management system that is capable of monitoring the solar plant and stores parameters in the cloud database in order to analyze performance of the system through an easy manageable web interface.
2. In this proposed work power of the system monitored using the Current and voltage Parameters.

B. Block diagram:

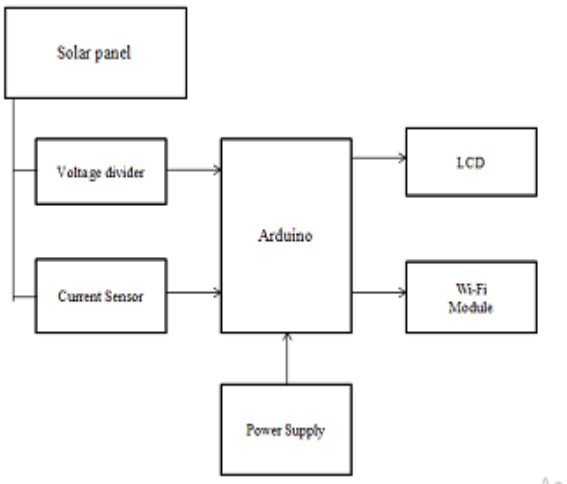

Fig.1 remotely monitoring health of the solar power system using Arduino Uno.

C. Methodology

When the data received from solar power unit the connection between IOT Thingspeak and Arduino Uno are initialized. After initializing Thingspeak now the data are collected from SPU and stored in temporary buffers. When all the parameter received from the SPU, then Arduino Uno starts to transmit the data to a Wi-Fi module serially. Now the Wi-Fi Module will host the data in cloud server in specified time interval. Thus, the ESP8266 Wi-Fi module has hosted all the parameter in the webpage via internet. Then the display data in the Thingspeak channel are processed and manipulated with help of C language finally, the parameters are displayed in a LCD and webpage. After the successful connection to the server for monitoring the parameters of Solar power unit.

C. Components:

1. **Arduino Uno:**

Arduino is a microcontroller which is used to read the sensor values. Current sensor is connecting to the Arduino. While Keeping in mind the economic parameters and its simplicity, Arduino Uno has been used which reduce the programming complexity. Analog pins are used to sense analog voltage and current with the help of these values, monitoring solar power system.

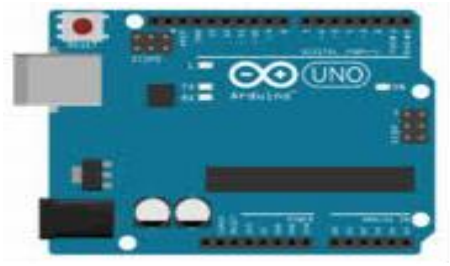

Fig.1 Pin diagram of Arduino Uno

2. **Voltage Divider:**

The analog inputs of an Arduino Uno can measure up to 5V. Two resistors form voltage divider that is used to lower the voltage being measured to a level that the Arduino can read. 10kohm and 100kohm register are used to decrease the voltage circuit to 5V.Breadboard is used for build this circuit. The Analog pin of an Arduino gives the voltage value. This actually spreads the range that can be used. The formula for calculating values in a voltage divider is:

$$V_{out} = (R2 / (R1 + R2)) \times V_{in}$$

If the divider present in the Arduino Uno voltmeter is functioning correctly, then output voltage will be a maximum of 5V, and so you can calculate the maximum input voltage to the circuit:

$$V_{max} = 5.0 / (R2 / (R1 + R2))$$

D. Current Sensor:

For the purpose of current measurement we will use current sensor ACS 712 (30 A). ACS 712Measure positive and negative 30Amps, corresponding to the analog output 66mV/A. This sensor gives the readings of the current and voltage. Those values are used in the given system for calculate the in power.to gives power supply battery is used. Other remaining pins of sensor is connects to the Arduino.

D. Liquid Crystal Display (LCD):

LCD is used for displaying the value of measured by sensor. When product is keep into cart after scanning, it will show the current and voltage value and if second values are scanned, then value of current and voltage will get added and it will be displayed on LCD.

E. Wi-Fi Module (ESP8266):

The calculated data by Arduino Uno is further processed by Wi-Fi Module in order to store on IoT (Internet of Things) Server or Cloud. In order to examines this data on daily, weekly and monthly basis we are using popular IoT platform Thing speaks.

Results:

The output of purposed system as shown in below figures:

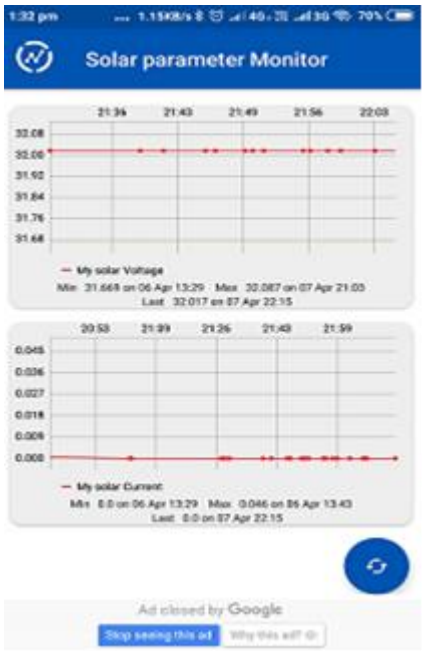

Fig.2 Output on Mobile Display from ThingView App

Fig.3 Output on Thingspeak window

Conclusion:

The given system keeps continues monitoring the solar power system, the daily, weekly, and monthly investigation become 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 system.

Future scope:

The purposed system can measure temperature, flux, Humidity, gas, pressure, speed, light Intensity etc. Also with the help of motor and controller it is possible to tracking the sun for better power generation.

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