

IoT Enabled Solar Panel battery Monitoring System

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Abstract: At the present time, the resources that we use for electricity are costly and inefficient. That is why we must rely on those that are of in the least harmful to the environment and inexpensive. There are also additional benefits: Photo voltaic panels and photovoltaic plants use the natural sunlight for additional lighting. photovoltaic cells are used in applications that allow the use of taking solar energy and expanding it into electricity most of the solar systems are situated in sparsely populated regions, large-scale agricultural communities, as well as in medium-sized farm sites and smaller, agricultural local agricultural production facilities that have power grids For a machine to function, it must be operated by a human. This is a hardware- timed sensor system that tracks various variables, like temperature, voltage, current, and battery percentage and reports them on the cloud so you can see exactly when everything has reached the right value.

1. Introduction:

This system allows monitoring of a Solar panel in real time which is uploaded on cloud. With the limited resources of non-renewable energy sources and with their increased consumption it has become necessary to move towards renewable energy sources like solar power and wind power. Out of which solar power has emerged as the important renewable energy resource in last some years so to improve the utilization of solar energy resources, real time wireless solar power monitoring system has become important nowadays. As such systems are implemented using wired communication but there some shortcomings while collecting data from remote places. So to overcome these problems we have introduced wireless system to monitor parameters like voltage, current, humidity and temperature using advanced LPC 2148 Arduino processor.

2. Problem statement and objective

• Problem statement:

Now a days people are facing lots of problem on electricity supply and there bills in our country farmer are also facing lot of problem some are attempting a suicide. so we are creating a system that can be crating a electricity by using solar panel.

• Objective:

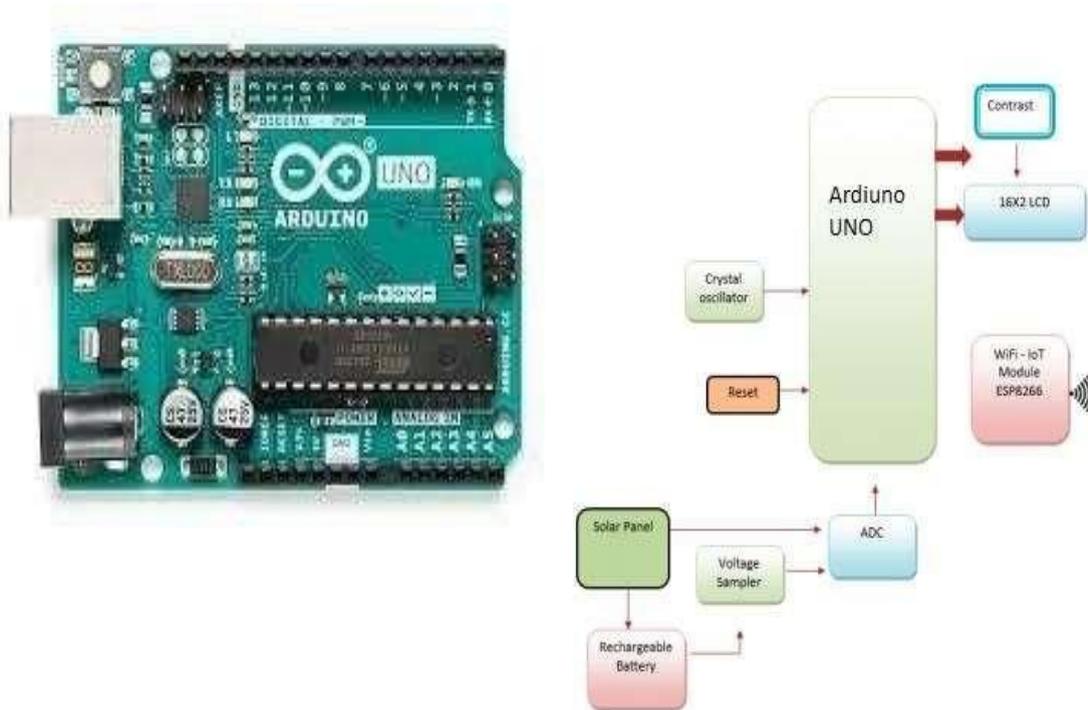
- To design a Solar panel monitoring system using Ardduino Uno

- To capture various reading of system are capture by sensors which are interface with Arduino Uno.

3. Methodology

When you've finished setting up this system, you can view it on the Cloud for the solar panel will be visible on the Monitor can be displayed on. While non-renewable energy sources are plentiful, it is now mandatory to expand to renewable energy sources like solar and wind due to their growing consumption. Nowadays, harvesting real-time wireless power from the sun has emerged as a more significant renewable energy resource. However, because the se systems are all implemented through wireless communication, there are short comings in collecting data from locations that are far away. to combat these difficulties, we have employed wireless system parameters like voltage, current, humidity, and temperature ,we have opted for using an Arduino UNO microcontroller that handle small of these parameters. The mentioned parameters will be transferred to the sun-powered 2.4GHz transmitter, which will be received by the local monitoring station, which is typically a PC, if any of them are surpassed alarm will be indicated on the PC as well

Figure no 5.1 Block Diagram



1. System specification:

- **6.1 Arduino UNO.**

Arduino Nano is a small, compatible, flexible and breadboard friendly Microcontroller board, developed by Arduino. It is based on ATmega328P (Arduino Nano V3.x) / ATmega168 (Arduino Nano V3.x). It comes with exactly the same functionality as in Arduino UNO but quite in small size. It comes with an operating voltage of 5V, however, the input voltage can vary from 7 to 12V. Arduino Nano Pin out contains 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins. Each of these Digital & Analog Pins are assigned with multiple functions but their main function is to be configured as input or output. They are acted as input pins when they are interfaced with sensors, but if you are driving some load the use the same as output. Functions like pin Mode and digital Write are used to control the operations of digital pins while analog Read is used to control analog pins. The analog pins come with a total resolution of 10 bits.

Bits which measure the value from zero to 5V. The Arduino Uno is a open-source microcontroller board based on the Microchip.

Crystal Oscillator



A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a precise frequency. This frequency is often used to keep track of time, as in quartz wristwatches, to provide a stable clock signals for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used in quartz crystal, so oscillator circuits incorporating them became known as crystal oscillator. A gem oscillator, especially one made of quartz precious stone, works by being twisted by an electric field when voltage is applied to a cathode close or on the gem. This property is known as electrostriction or opposite piezoelectricity. At the point when the field is taken out, the quartz which waver in an exact recurrence creates

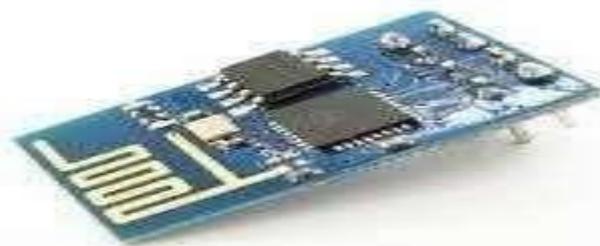
an electric field as it gets back to its past shape, and this can produce a voltage. The result is a quartz gem

behaves like an RLC circuit. This frequency is often used to keep track of time, as in quartz wristwatches, to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers



- **LCD(16*2):**

Liquid crystal display a type of display used in digital watches and many portable computers. This is a basic (16x2) 16 character by 2 line display. Black text on Green back ground. LCD display utilize two sheets of polarizing material with a liquid crystal solution between them. An electric current passed through the liquid crystal causes the crystal to align so that light cannot pass through them .Each crystal, therefore ,is like a shutter ,either allow in light to pass through or blocking the light. They are usually controlled by microcontroller. They make complicated equipment easier to operate. It runs off a 5V DC supply and only needs about 1mA of current. The display contrast can be varied by changing the voltage into pin 3 of the display usually with at rim pin. A fluid precious stone presentation (LCD) is a level board show or other electronically balanced optical gadget that utilizes the light-regulating properties of fluid gems joined with polarizers. Fluid gems don't discharge light straightforwardly, rather utilizing a backdrop illumination or reflector to create pictures in shading or monochrome. LCDs are accessible to show self-assertive pictures (as in a universally useful PC show) or fixed pictures with uninformed substance, which can be shown or covered up, like preset words, digits, and seven-section shows, as in a computerized clock.



ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Espressif system. It is mostly used for development of IoT embedded applications. It is used for interfacing the microcontroller to the cloud server. The ESP8266 is a low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller capability, produced by Express if Systems in Shanghai, China. The chip first came to the attention of Western makers in August 2014 with the ESP-01 module, made by a third-party manufacturer Ai-Thinker. This small module allows

microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted. The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.

Current sensor:



It is a device which detects the electrical current passing through any material and then generates signals which are same to the electrical current. This signal can be an analog signal or a digital signal. The current signals are passed through an ammeter for measuring current. In electrical engineering, flow detecting is any of a few methods used to quantify electric flow. The estimation of current reaches from pico amps to a huge number of amperes. The determination of a current detecting strategy relies upon necessities like extent, precision, transfer speed, vigor, cost, disengagement or size. The current worth might be straightforwardly shown by an instrument, or changed over to computerized structure for use by an observing or control framework. Current detecting procedures incorporate shunt resistor, current transformers and Rogowski curls, attractive field based transducers and others.

Voltage sensor



Solarpanel



A photovoltaic (PV) module is a packaged, connected assembly of typically 6*10 photovoltaic solar cells. Photovoltaic module constitute the photovoltaic array of a photovoltaic system that generate and supplies solar electricity. These PV modules use photons from the sun light and generate electrical energy. Which is then stored in batteries and supplies to homes, offices etc. The sun's radiation has variations to handle these variations we use specific sensors. Each module is rated by its DC output power under standard test condition (STC), and typically ranges from 100 to 365 Watts (W). The efficiency of module determines the area of the modules given same rated output an 8% efficient 230W module will have twice the area of a 16% efficient 230W module. A sun-oriented board, or photovoltaic (PV) module, is a get-together of photovoltaic cells mounted in a system for establishment. Sun-oriented boards use daylight as a wellspring of energy and create direct flow power. An assortment of PV modules is known as a PV Board, and an arrangement of Boards is an Exhibit.

8. Conclusion

We proposed a method which helps us, monitoring the solar panel and battery use. The installation of this system will go smoothly and without problems if we follow the guide above. A plant-like environment will be well-monitored with the availability of Internet of Things (IoT) it is earnings in the company can project, expand, or display of yield managing systems such as tweets, text messages, and Facebook feed. Expanding capacity allows the best way to monitor the plants to become more efficient. The cost and presentation of photovoltaic (PV) generation, photovoltaic (PV) consumption, and self-consumption supposedly a safe maximum daily intake. The operation of [of an automatic and intelligent loads] the use of Live Data

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