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A Low-Cost Monitoring Design for Photovoltaic System Using IOT

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Abstract- Internet of Things (IoT) technology in photovoltaic (PV) systems is an important aspect for monitoring, supervising and performance evaluation. The main aim of this system is to design a low-cost monitoring system for the maximum power point tracking in photovoltaic (PV) systems. In addition, the monitored real time data will be sent to the user's mobile app through IoT. The LDR is used to find the light intensity of sun and makes the photovoltaic cell to turn to the respected side. Based on the monitored data the users can identify the working of the system.

Keywords- Photovoltaic System, Renewable Energy, Solar Panels.

I. INTRODUCTION

The consumption of power is increasing everyday lives, and at the same time, other energy sources are depreciating day by day. PV monitoring system is required to diagnose and maintain the performance of the installed PV system. Various commercial PV monitoring products have been introduced to track the PV system, assess its performance, and detect system problems. Those PV monitoring products monitor the PV system at inverter level or string level. They cannot localize abnormal PV panels or help repair them for high performance.

Several previous studies proposed various panel-level PV monitoring schemes. Ando et al. presented a low-cost smart multisensory architecture equipped with voltage, current, irradiance, and temperature to monitor a PV system at panel level.

Solar PV system consistently generates enough amount of power. Non-renewable sources are not regenerated by nature after first use such Fossil Fuels, Coal, Natural Gas, Nuclear Fuel while Renewable Sources can be utilized again and again which is not depreciating never such as sun, Geothermal, Wind Energy and Tidal Energy. Solar power is, therefore, is said to be a sustainable power source. Solar power has become more popular in the world as it is available in plenty amount with minimal impact on the environment.

II. TRANSMITTER UNIT

1. Step Down Electrical Device:
A step-down electrical device transformer could be a sort of electrical device that converts the high voltage and low current from the first facet of the electrical device to the low voltage and high current worth on the secondary facet of the transformer.

2. Bridge Rectifier:
A bridge rectifier could be a full wave rectifier consisting of a bridge with the same rectifier in every of the four arms. A bridge rectifier is employed to form positive that the present attending to the DC path circuit is often at the right polarity.

3. Filter Circuit:
A filter circuit is one that removes the ac element gift within the corrected output and permits the dc element to achieve the load.

4. Transformer:
A transformer could be a system designed to mechanically maintain a relentless voltage. A transformer uses easy feed-forward style. It's going to use AN mechanical device mechanism, or electronic elements. Reckoning on the planning, it uses to control one or a lot of AC or DC voltages.

III. PHOTOVOLTATIC UNIT

1. Mems Sensor:
MEMS element MEMS could be a chip-based technology, referred to as a small Electro-Mechanical System. Sensors are composed of a suspended mass between a try of electrical phenomenon plates. once tilt is applied to the sensor, the suspended mass creates a distinction in potential. The distinction is measured as a amendment in capacitance.

2. Voltage Sensing Element:
A voltage sensing element could be a sensing element wont to calculate and monitor the number of voltage in an object. Voltage sensors will verify the AC voltage or DC voltage level. The input of this sensing element is that the voltage, whereas the output is that the switches, analogue voltage signal, a current signal, or AN loud signal

3. Temperature Sensing Element:
A temperature sensing element could be a device wont to live temperature. This could be air temperature, liquid temperature or the temperature of solid matter. There ar differing types of temperature sensors available and that they every use completely different technologies and principles to require the temperature measurement

4. ADC:
The sensing element output voltage span rarely equals the analog- to-digital convertor (ADC) input voltage span. Sensing element knowledge is lost and/or ADC dynamic varies isn't absolutely used as a result of the spans isunequal; begin at completely different DC voltages, or both.

5. Buzzer Alarm:
A buzzer or electronic device is AN audio device, which can be mechanical, mechanical device, or electricity (piezo for short). Typical uses of buzzers and beepers embrace alarm devices.

6. Motor Controller:
A motor controller could be a device or cluster of devices which will coordinate during a preset manner the performance of an electrical motor.

7. DC motor:
A DC motor is any of a category of rotary electrical motors that converts DC electrical energy into energy. The common varieties trust the forces made by magnetic fields.

8. Nodemcu:
NodeMCU is AN open supply Lua primarily based microcode for the ESP8266 wireless fidelity SOC from Espressif and uses AN on-module flash-based SPIFFS filing system. NodeMCU is enforced in C and is bedded on the Espressif NON-OS SDK.

III. IMPLEMENTATION

1. IoT code:
IoT code addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware. These individual and master applications square measure responsible for information assortment, device integration, time period analytics, and application and method extension inside the IoT network.

They exploit integration with vital business systems (e.g., ordering systems, robotics, scheduling, and more) within the execution of connected tasks.

2. Information Assortment:
This code manages sensing, measurements, light-weight information filtering, light-weight information security, and aggregation of information. It uses bound protocols to help sensors in connecting with time period, machineto-machine networks. Then it collects information from multiple devices and distributes it in accordance with settings. It additionally works in reverse by distributing information over devices. The system eventually transmits all collected information to a central server.

3. Device Integration:
Code supporting integration binds (dependent relationships) all system devices to make the body of the IoT system. It ensures the mandatory cooperation and stable networking between devices. These applications square measure the process code technology of the IoT network as a result of without them; it's not associate IoT system. They manage the assorted applications, protocols, and limitations of every device to permit communication.

4. Application and method Extension:
These applications extend the reach of existing systems and code to permit a wider, more effective system. They integrate predefined devices for specific functions like permitting bound mobile devices or engineering instruments access. It supports improved productivity and additional accurate information assortment.

IV. RESULT

In the final implementation of the application the first screen the user can view is the humidity, temperature, light intensity shown in Figure 5.1 and 5.2.

Fig 1. Output of Light intensity.

Fig 2. Output of Temperature, humidity.

V. CONCLUSION

The sun is a renewable energy source. Fossil fuels will eventually run out, butsunlight won't. For that reason, solar energy is highly reliable. And unlike fossil fuels which are expensive to mine and utilize, it doesn't cost anything to receive sunlight. A one-time installation of solar equipment is all that's needed to reap the benefits. In this project a low-cost monitoring system for maximum power tracking in a photovoltaic module is designed.

The IoT technique is used in order to monitor data such as voltage, current and temperature level of solar photovoltaic system. This technology makes it possible in particular to improve the monitoring, the performance and the maintenance of the photovoltaic system. The designed system can analyses and /or check the status of parameters being measured in a photovoltaic system. Solar tracking was implemented successfully.

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