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Intelligent Real-Time Photovoltaic Panel Monitoring System Using Iot

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ABSTRACT: The photovoltaic panel device must be in good working order in order to harvest reliable energy efficiently. This necessitates constant upkeep and control. However, dependable energy yields will change due to weather. This necessitates constant upkeep and control. However, dependable energy yields will change due to weather. We proposed a novel real-time monitoring system based on a small but powerful artificial neural network that can operate on a low-cost system. An intelligent monitoring device is needed due to environmental conditions, or is not usual due to a faulty, shaded, or dust-covered screen. The presented PV monitoring system will determine whether a photovoltaic panel is degrading due to environmental factors.

1. INTRODUCTION

The use of renewable resources is needed to meet the world's ever-increasing energy demands and to address global environmental issues. Solar panels have the most promising future prospects among renewable energy technologies. An artificial neural network-based intelligent comparison analytical module for real-time individual photovoltaic panel monitoring. We go over the overall implementation of the device, as well as the mathematical module that underpins its intelligent reference model and its hardware implementation. In comparison to the previous four decades, the contribution of solar PV energy has increased dramatically. After wind and hydro, PV energy is now the third-largest source of renewable energy.

Arduino

Arduino is an open-source electronics platform that uses simple hardware and software to make it easy to use. Arduino boards can read inputs - such as light from a sensor, a finger on a button, or a Twitter message - and translate them to outputs - such as turning on an LED, triggering a motor, or publishing something online.

Fig 1. Arduino Board

Solar panel

Fig 2. Solar panel

A solar panel is a set of solar photovoltaic modules that are electrically connected and installe d on a frame. A photovoltaic module is a solar cell assembly that has been packaged and attac hed.

Temperature sensor

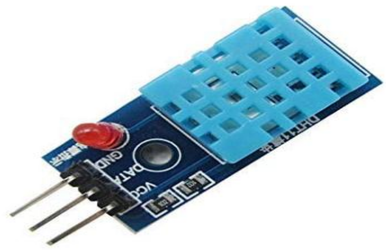

Fig 3. Temperature sensor

A humidity sensor detects, monitors, and records the relative humidity in the air on a regular basis. It can tell you how much moisture is in the air as well as how hot it is.

Rain sensor

A rain sensor, also known as a rain switch, is a rain-activated switching system. Rain sensors have two key applications. The first is a water-saving device that is attached to an automatic irrigation system and causes it to shut down if it rains

Fig4. Rain sensor

Dust sensor

Dust Sensor is a straightforward air monitoring module with a Sharp GP2Y1010AU0F onboa rd. It can detect fine particles with a diameter of more than 0.8m, such as cigarette smoke.

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LCD display unit

Fig 5. LCD display

A liquid crystal display (LCD) is a flat panel display, electronic visual display, or video display that makes use of liquid crystals' light modulating properties. Liquid crystals do not specifically emit light.

EXISTING SYSTEM

A low-cost web server that collects real-time photovoltaic data and enables the user to manually track it. A framework for gathering information from photovoltaic parks. The information was gathered from PV park instruments, measurement systems in the park's vicinity (weather stations), and data sources on the internet.

As the word "internet of things" (IOT) becomes more widely known, applications such as "intelligent community," "smart house," and others have exploded. The Internet of Things eliminates human effort by adding machine-to-machine connectivity, which is used to make the management of different device modules easier. To ensure the reliability and continuity of the proposed system, the discussed monitoring system connects to remote services through the internet, which includes a cloud database for data logging. This enables the recording and tracking of the PV panel's environmental conditions and data in real time. Furthermore, any possible configuration changes will be made simpler as a result of this.

As a result, in recent years, researchers have developed numerous techniques to assist in the analysis of collected PV data in order to detect early faults[24-27]. Built a monitoring system that could track four PV panels at the same time. They use the mean voltage of PV panels and a voltage drop threshold to detect faults. Developed a mathematical method for tracking photovoltaic condition and detecting hotspots They track the parameters in the circuit model of a PV panel (Cp (.) and Rp (.)) and use these parameter estimates to predict when the PV panel is partially shaded or in a hot-spot state.

PROPOSED SYSTEM

As an alternative energy source, photovoltaic panels are becoming increasingly popular. The photovoltaic panels device must be in good working order in order to harvest reliable energy efficiently. Sensors such as a temperature sensor, a dust sensor, and a rain sensor are used in this device. The temperature is calculated using a temperature sensor. The dust sensor will have a high sensitivity, and the rain sensor will be used to calculate the rain value and display it on the LCD display. All sensor data has been upgraded to IOT.

BLOCK DIAGRAM

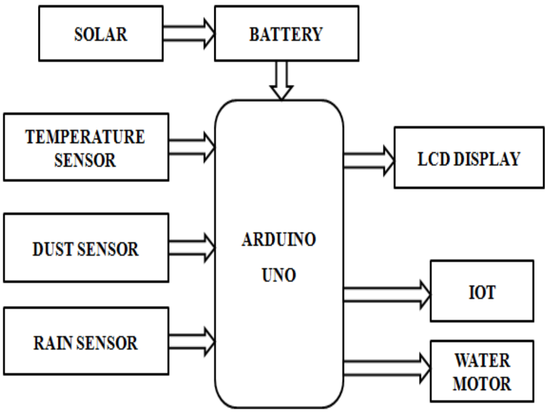

Fig 6. Block diagram

ADVANTAGE

• Real-time recording and tracking of the PV panel's environmental conditions and data
• Artificial neural network allows the monitoring system to predict the daily activity of a PV panel on a low-cost system

2. RESULTS AND DISCUSSIONS

Fig 7. Display of high output

Rain sensor Output. This shows that the process in system. Initially it is in off condition when it senses the rain will come suddenly it intimates us in that particular side power production will be low. So we can easily understand the situation and take the prior steps to be taken for power production.

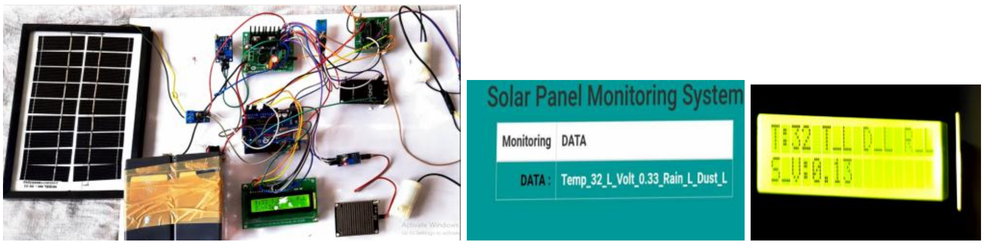

Fig 8. Display of low output

Dust sensor Output This shows the process of output in the system. Initially panel is in clean once after sometimes it will have some dust particles at the time motor will switched on to clean the dust particles.

Temperature Sensor Output In this diagram it shows the output of Temperature sensors Initially it is in low temperature then sometimes after it will change to high temperature t the time automatically motor will starts to run.

3. CONCLUSION

The monitoring system for solar panels is presented with high predictive accuracy. The hardware design and implementation of the low cost microcontroller monitoring system was discussed. The monitoring system has the capability to identify any individual PV panels that require maintenance. The more PV panels connected to the monitoring system; The lower the additional cost per PV panel. The monitoring system will provide a maintenance PV panel if the expected output power for that PV panel is obtained from the artificial neural network model. The actual output power of the PV panel, obtained from the sensors, has a percentage difference of more than 10%.

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