European Solar and Energy Storage Solutions

Photovoltaic panel infrared image recognition

Overview

How are infrared images used in PV modules?

The developed framework is qualitatively evaluated with experimental testing. For this purpose, new infrared images are taken for different PV modules (different from those images used during network training). Thermal signal or surface temperature of solar cells in PV modules is measured by thermal imager that gives us infrared images.

Can infrared imagery be used to identify anomalies in solar PV?

In order to combat the lack of publicly available data on infrared imagery of anomalies in solar PV, this project presents a novel, labeled dataset to facilitate research to solve problems well suited for machine learning that can have environmental impact. The dataset consists of 20,000 infrared images that are 24 by 40 pixels each.

How is a photovoltaic model based on infrared imaging?

The dataset is obtained from Infrared imaging performed on normal operating and defective photovoltaic modules with lab induced defects. An isolated learned model is trained from scratch using a light convolutional neural network design that achieved an average accuracy of 98.67%.

How to measure thermal signal of solar cells in PV modules?

Thermal signal or surface temperature of solar cells in PV modules is measured by thermal imager that gives us infrared images. The obtained images are electronically transferred to computer and fed to developed network in Anaconda integrated development environment for testing purpose. The testing and evaluation process are illustrated in Fig. 9.

Does a thermal image indicate a fault in a PV panel?

Considering that the change of the visual image does not necessarily mean the presence of a fault in a PV panel, the thermal image of the PV panel is

more favoured in the practice of PV panel condition monitoring (Kandeal et al., 2021a).

Can IR imaging detect hotspots in PV modules?

IR imaging (thermography) can be successfully used to locate these hotspots in PV modules. It is one of the mostly employed module monitoring approach (Tsanakas et al., 2016). In IR images, the defective regions or cells having abnormal temperatures are shown by different colors or varying brightness.

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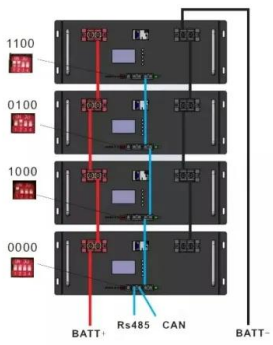
Photovoltaic hot spot detection of aerial infrared image based ...

Firstly, a photovoltaic panel recognition model was designed. The Yolov4 backbone feature extraction network was replaced by the lightweight MobileNetV2 network, and the standard ...

Photovoltaics Plant Fault Detection Using Deep ...

Solar energy is the fastest-growing clean and sustainable energy source, outperforming other forms of energy generation. Usually, solar panels are low maintenance and do not require permanent service. However, plenty of ...



Hot Spot Detection of Photovoltaic Module Infrared Near-field Image ...

This research uses a convolutional neural network training model to detect and classify the infrared near-field images of photovoltaic modules from small-scale photovoltaic ...

Intelligent Image Processing for Monitoring Solar Photovoltaic Panels

The images of all PV panels in a large solar power plant can be readily acquired using drones or other types of unmanned image acquisition platforms. For this reason, the PV ...

Applied imagery pattern recognition for photovoltaic modules

We present a literature review of Applied Imagery Pattern Recognition (AIPR) for the inspection of photovoltaic (PV) modules under the main used spectra: (1) true-color RGB, (2) long-wave ...

Improved Mask R-CNN Network Method for PV Panel Defect ...

Deep learning can automatically extract individual photovoltaic panels from images or videos, and perform the defect detection task on it. Deep Learning-based Method for PV Panels ...

Fault Detection in Solar Energy Systems: A Deep ...

While solar energy holds great significance as a clean and sustainable energy source, photovoltaic panels serve as the linchpin of this energy conversion process. However, defects in these panels can adversely ...

Automatic detection of photovoltaic module defects in infrared images

This research work deals with automatic detection of photovoltaic module defects in Infrared images with isolated deep learning and develop-model transfer deep learning ...

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