Photovoltaic panel contamination image recognition

Overview

This study presents a comprehensive evaluation of five state-of-the-art object detection models: YOLOv3, Faster R-CNN, RetinaNet, EfficientDet, and Swin Transformer, for identifying physical and electrical defects as well as surface contaminants such as dust, dirt, and bird. This study presents a comprehensive evaluation of five state-of-the-art object detection models: YOLOv3, Faster R-CNN, RetinaNet, EfficientDet, and Swin Transformer, for identifying physical and electrical defects as well as surface contaminants such as dust, dirt, and bird. To address this, we propose an enhanced U-Net-based deep learning model for accurately identifying surface deposits on PV panels. Our method employs a two-stage semantic segmentation approach consisting of coarse recognition (CR) and fine recognition (FR). In the CR stage, a convolutional block. This study introduces an automated defect detection pipeline that leverages deep learning and computer vision to identify five standard anomaly classes: Non-Defective, Dust, Defective, Physical Damage, and Snow on photovoltaic surfaces. This study presents a comprehensive evaluation of five state-of-the-art object detection models: YOLOv3, Faster R-CNN, RetinaNet. Photovoltaic panels are the core components of photovoltaic power generation systems, and their quality directly affects power generation efficiency and circuit safety. To address the shortcomings of existing photovoltaic defect detection technologies, such as high labor costs, large workloads.

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ResNet-based image processing approach for precise detection

The technology preserves the efficiency of solar modules and encourages clean energy solutions by accurately identifying PV panel faults.

Surface defect and contamination detection in photovoltaic panels ...

These comparative results demonstrate that PV-YOLOv8n exhibits a strong capability in detecting visually similar small-scale surface defects and contamination on PV panels, significantly ...

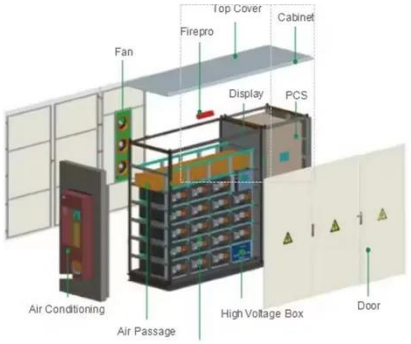
Water photovoltaic plant contaminant identification using visible light

This paper proposes a method of using visible light images (RGB colour space) captured by UAVs to automatically segment PV panels and automatically classify contaminated PV panels.

Intelligent Detection System for

Dirty Photovoltaic Panels Based on

This article proposes an intelligent detection system for photovoltaic panel contamination based on YOLOv8n, named, which establishes a six-level classification



ST-YOLO: A defect detection method for photovoltaic modules based ...

When addressing three obvious defect features in PV modules--point spots (DB), stripe spots (TB), and open circuits (DL)--we selected 1,692 representative infrared images of PV panels ...

Solar Panel Surface Defect and Dust Detection: Deep Learning

This study introduces an automated defect detection pipeline that leverages deep learning and computer vision to identify five standard anomaly classes: Non-Defective, Dust, ...

Multi-class soiling recognition method for photovoltaic panels based ...

To address this, we propose an enhanced U-Net-based deep learning model for accurately identifying surface

deposits on PV panels. Our method employs a two-stage semantic ...

Vision-Based Object Detection for UAV Solar Panel Inspection ...

A custom dataset, annotated in the COCO format and specifically designed for solar panel defect and contamination detection, was developed alongside a user interface to train and evaluate the models.

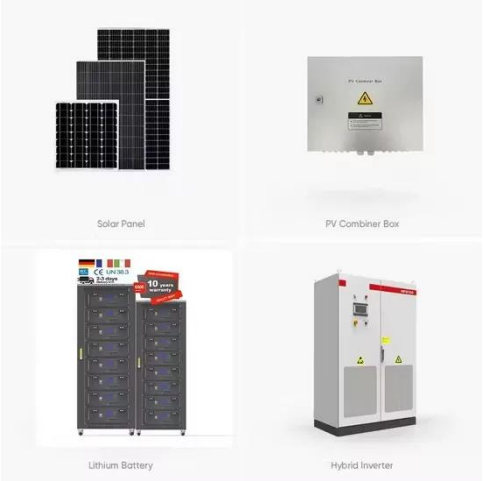
A Review on Image Processing Techniques for Damage detection on

This paper would like to investigate more detailed about the damages of photovoltaic module identification and the image processing techniques for the reasons of ensuring safe and ...

Research on detection method of photovoltaic cell surface dirt based ...

In this experiment, the UAV is used as

the image data platform, and the modern image processing technology is used to detect the surface dirt of photovoltaic panels in real time.



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