

AID4PV

UAV-based decision-making and modular approach to support PV plant diagnosis using EL, RGB, IRT imagery, correlated with electrical data analysis and advanced reporting and geovisualization

Project duration: from 06.2021 to 11.2023

Report submitted: 09.2022

Publishable Summary

The efficiency and profitability of photovoltaic (PV) plants are highly controlled by their operation and maintenance (O&M) procedures. For example, an 18MWp plant with an availability of 99% (1% unavailability caused by uncontrolled failures) can cause economic losses up to 156k€/year.

Today, effective diagnosis of any possible fault in PV plants, remains a technical and economic challenge, especially when dealing with large-scale PV plants. Currently, PV plant monitoring is carried out by either electrical performance measurements or image processing. The former presents limited fault detection ability, it is costly and time-consuming and incapable for fast identification of the physical location of the fault. In the same token, Infrared Thermography (IRT) imaging has been used for the characterization of PV module failures, but their setup and processing are rather complex, and an experienced human operator is required. Additionally, Electroluminescence (EL) image analysis is a new method, which can be used to complement the defects obtained by IRT but is still used in laboratory conditions. Moreover, the processing of colour images (Red-Green-Blue images, RGB hereinafter) can be used to complement the processing of IRT images. So, EL, RGB, IRT imagery and electrical data analysis can be used for a full characterization of the PV plant.

This project aims to investigate, develop and demonstrate in operational environment an unmanned aerial vehicle (UAV) decision-making and modular approach to support PV plant diagnosis using EL, RGB, and IRT imagery, correlated with electrical data analysis. The results will be presented in an advanced reporting and geovisualization platform including geospatial analysis and visualization tools. The decision-making capabilities will be also investigated, adding the possibility to perform some kind of predefined actuations by the UAV-platform to perform remedy actions minimizing the timing since an anomaly is detected and certain actions are carried out. A very high-level view of the project is presented in the following figure.

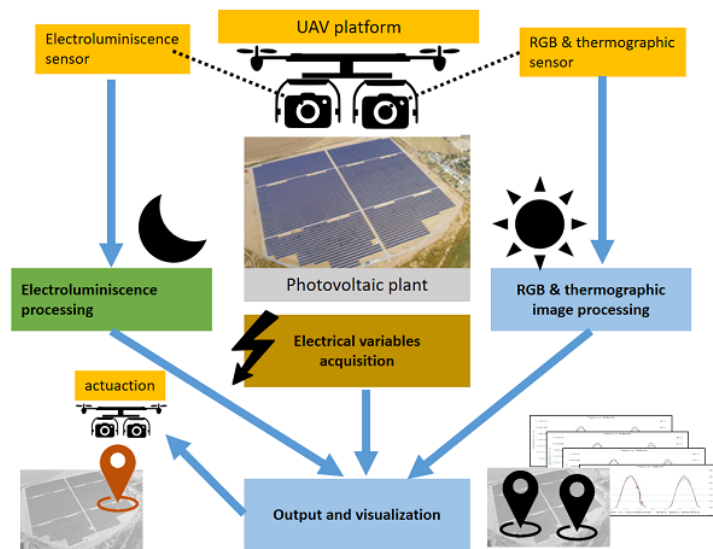


Fig. 1: High-level view of the AID4PV project.

Project consortium

Coordinator and all contact details:

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Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
Spain	1	451 932	102 943
Cyprus	1	174 000	174 000
Greece	1	199 900	199 900
<i>Total</i>	3	825 832	476 843

Funding agencies involved and contracts

Funding Agency	Contract N° and Title
CDTI - CENTRO PARA EL DESARROLLO TECNOLÓGICO INDUSTRIAL	ERA-20200018. SOLUCIÓN MODULAR BASADA EN UAVS PARA LA TOMA DE DECISIONES Y SOPORTE DE TAREAS DE DIAGNÓSTICO DE PLANTAS FOTOVOLTAICAS MEDIANTE EL USO DE IMÁGENES DE ELECTROLUMINISCENCIA, TERMOGRAFÍA Y CÁMARAS DE VISIÓN RGB, ANÁLISIS ELÉCTRICO Y GEOVISUALIZACIÓN. IDI-20210170
Research and Innovation Foundation (RIF) of Cyprus	P2P/SOLAR/1019/0012 Title: UAV-based decision-making and modular approach to support PV plant diagnosis using EL, RGB, IRT imagery, correlated with electrical data analysis and advanced reporting and geovisualization
General Secretariat for Research and Innovation (GSRI)	MIS code: 5161514, project code: T12EPA5-00042 and its duration is 18 months thus till 29 June 2023