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AgroSYS - Development of an autonomous collaborative robotic system for precision viticulture integrating electric UAVs and UGVs and small-scale solar PV charging stations

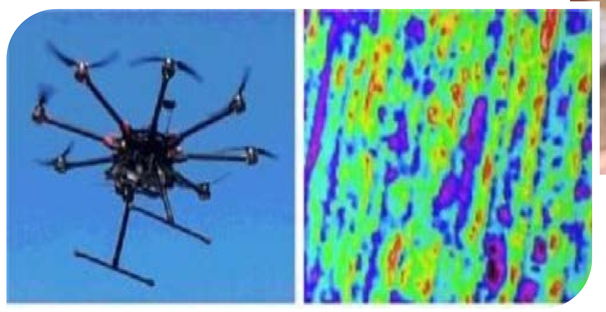
Introduction

Global population growth requires food production increase, which is threatened by climate change, labour shortages and productivity performance costs. **Smart Farming Technologies (SFTs)** appears to be a reliable solution to these challenges, including Farm Management Information Systems (FMIS), Precision Agriculture (PA), agricultural automation and robotic applications that (a) increase yield, (b) improve product quality, (c) increase input and energy use efficiency and (d) protect soil and water resources.

Technical Challenges

Robotic systems are not widely used in agriculture, even if crop monitoring and agricultural practices could be performed with **autonomous electric** Unmanned Aerial Vehicles (UAVs) and Unmanned Ground Vehicles (UGVs), increasing productivity, profitability, work safety and environmental sustainability. This would be even more appealing if UAVs and UGVs act as a **combined system regarding energy autonomy and free movement in the fields** helping each other to achieve their goals.

The path towards a fully automated vineyard utilizing solar energy and unmanned vehicles



Objectives

- ✓ Establishment of a **combinatorial sensing system** for vineyards using UAVs' and UGVs' sensors and decision-making for agricultural practices (irrigation, fertilization, selective harvesting)
- ✓ Development of a **safe navigation system** for UAV/UGV fleet operating in vineyards by integrating appropriate sensors in the vehicles and algorithms to identify and avoid obstacles
- ✓ Construction of **autonomous small-scale solar charging stations** for electric UAVs and UGVs that will be installed in vineyard
- ✓ Modulation and programming of **autonomous robotic arms to connect** UAVs and UGVs to the charging source
- ✓ Deployment of an **integrated and optimally managed autonomous fleet** system of UAVs and UGVs
- ✓ **On-site testing in a pilot vineyard** to optimize the system for at least one growing season
- ✓ Investigation of the **environmental and economic impact** of the proposed system on a viticultural business and analysis of possible commercial exploitation

OUR PARTNERS

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS — iBO Institute for Bio-Economy and Agri-Technology

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Funded by the European Union NextGenerationEU