

NEXUS

Research Synergy to address major challenges in the nexus: energy-environment-agricultural production (Food, Water, Materials)
WP1 Primary Production

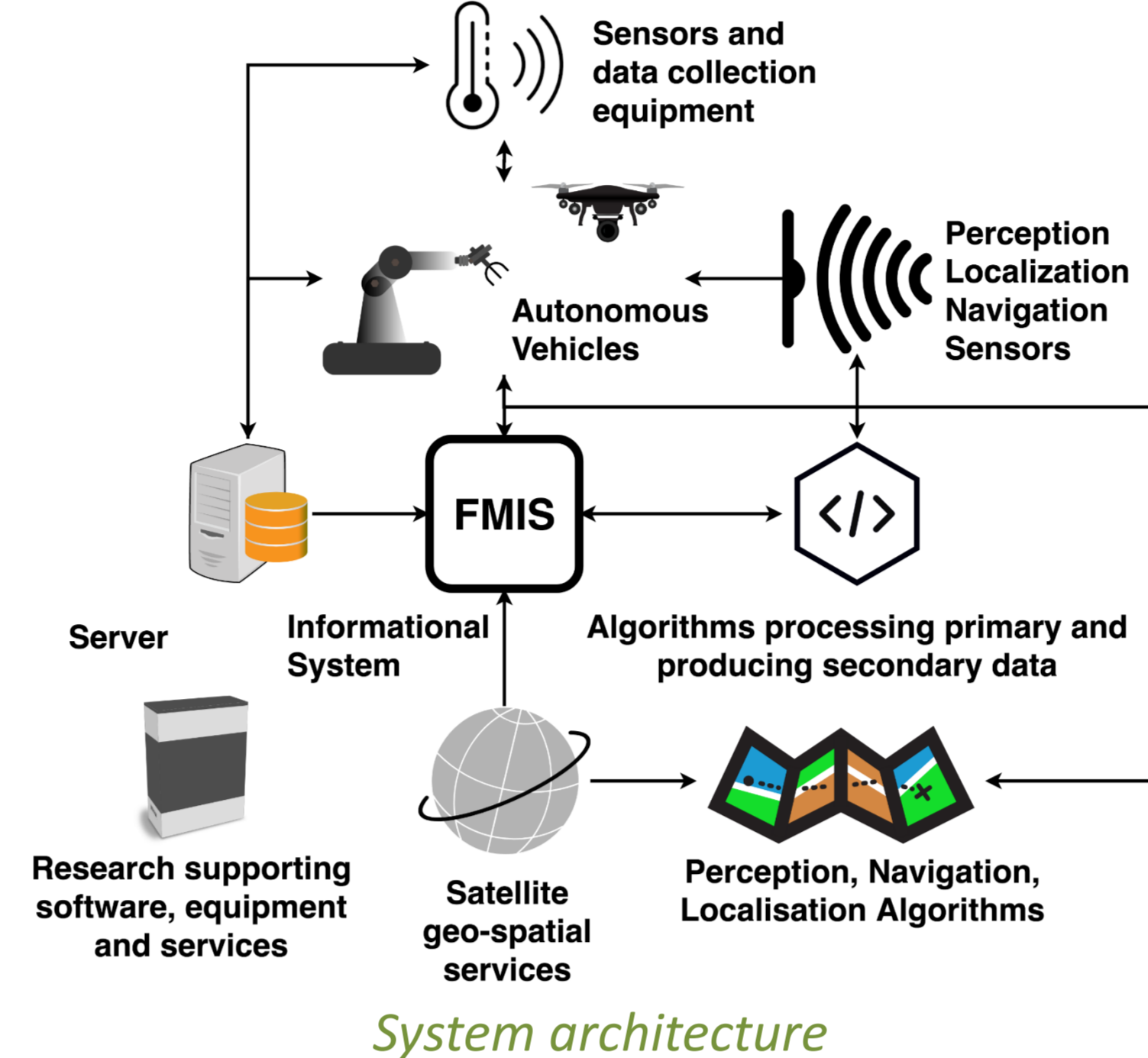
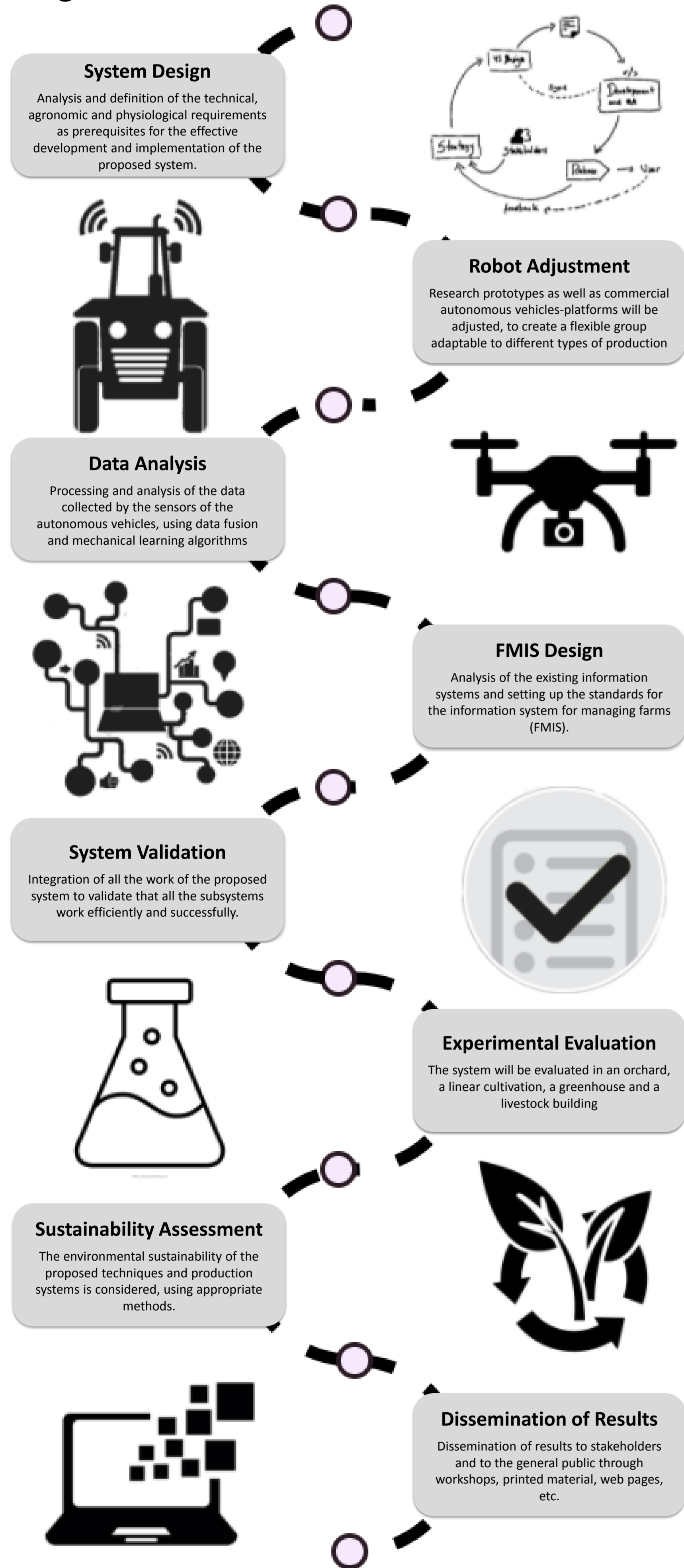


Co-financed by Greece and the European Union

Pr. No. MIS 5002496

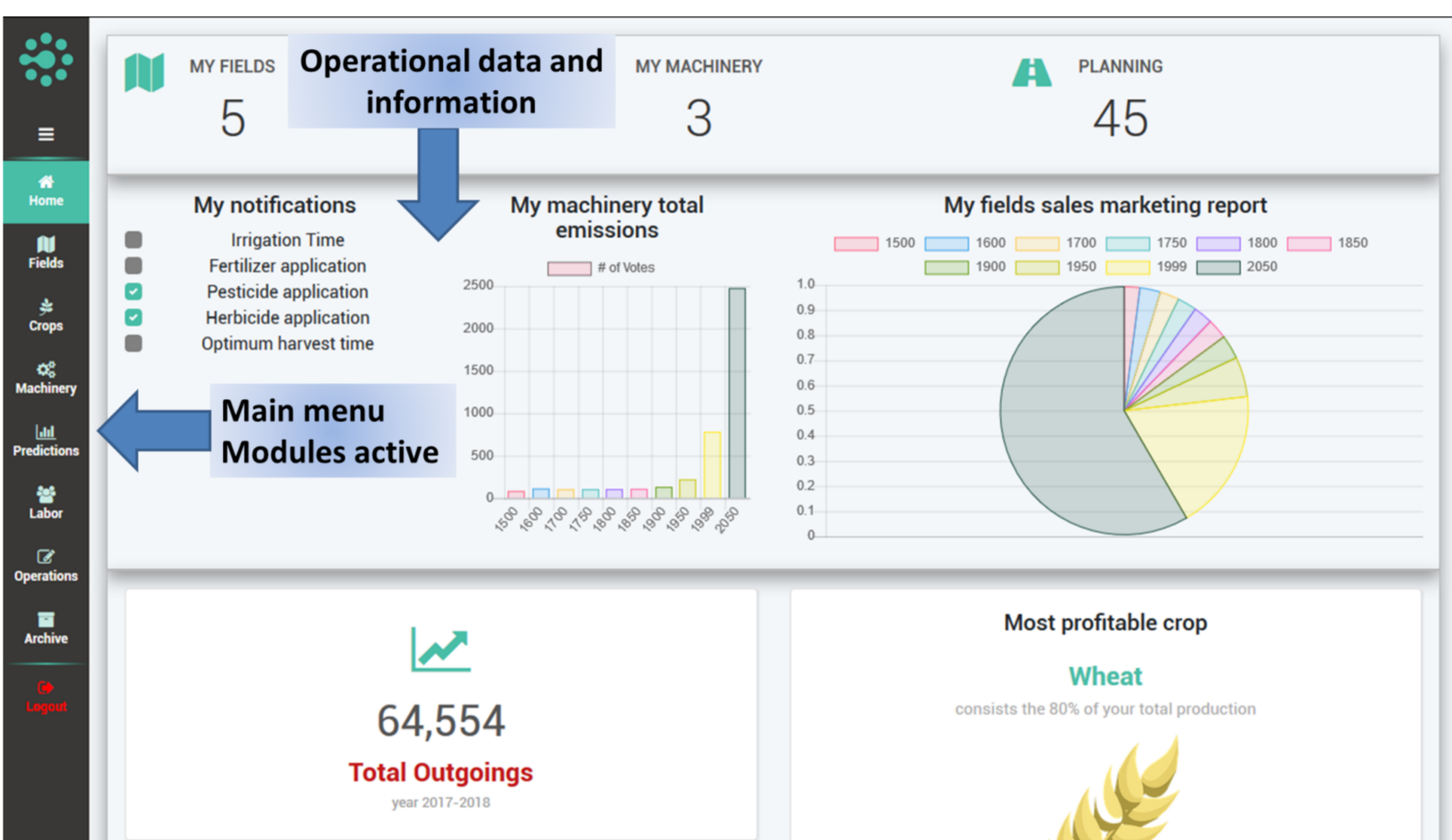
Introduction and Objective

The NEXUS project aims to develop innovative systems linking the Energy, Environment and Agricultural Grid (Water, Food, Materials), creating technological bases for sustainable economic and social development. The goal is a novel integrated and adaptive low input management system for the agricultural sector aiming at producing raw agricultural materials with resource management in an environmentally and economically sustainable way. The system will integrate all existing technologies while using robotic platforms equipped with appropriate sensors for crop, environmental, soil and climate monitoring systems to fully automate data collection, processing, decision making and intervention.



The Information System Architecture

The FMIS developed is a system aimed to serve human users while simultaneously be able to monitor and control various subsystems with varying levels of autonomous functions. The resulting product provides secure data connections and storage for both user and Unmanned Ground or Aerial Vehicles. Finally, the ground for future development and connectivity to other systems of the agri-food supply chain was laid.



Perception Localization Navigation

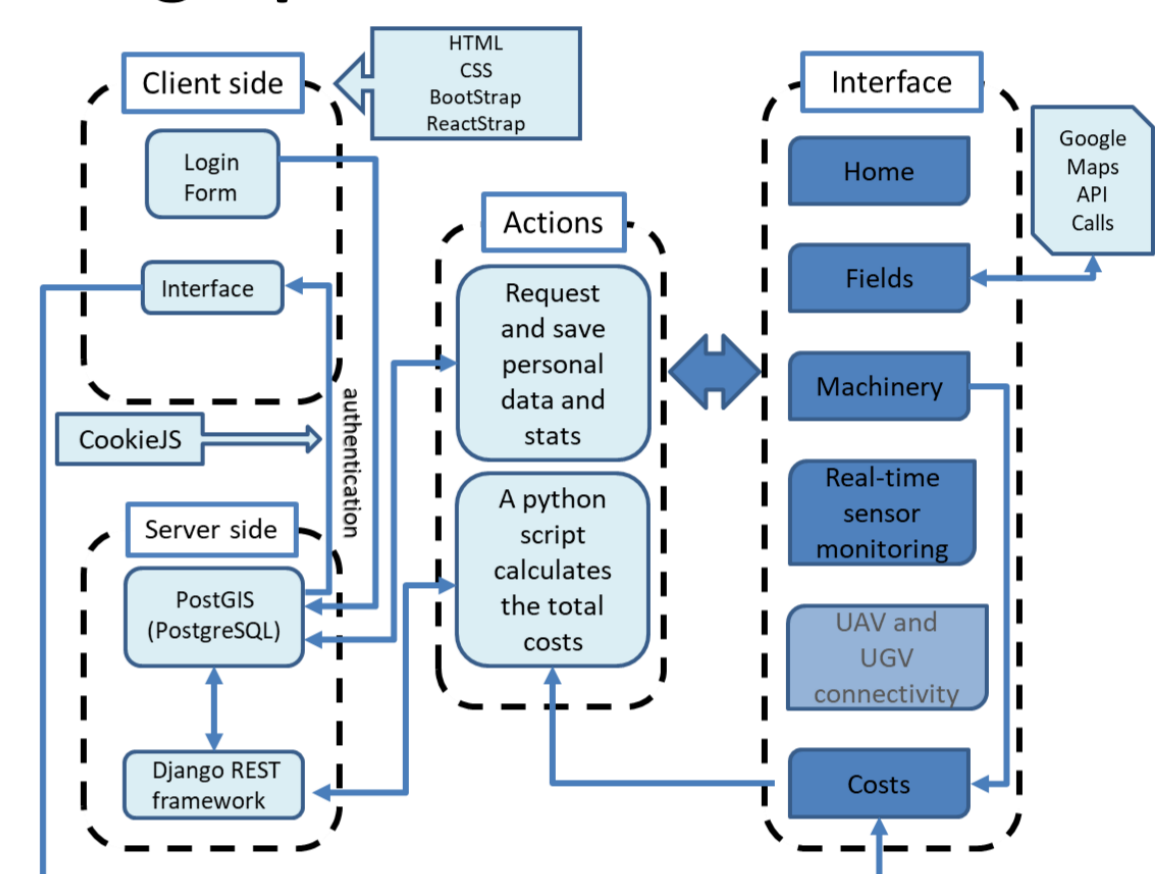
In this module the UAV, executes a survey mission using the user provided coordinates and creates a 2D field representation. Each pixel of the digitized field is geotagged with latitude and longitude coordinates. This information, acts as an input for the UGV mission controller which enables its automated navigation through the field. The overall process is available as an option within the FMIS and can be initiated, monitored and controlled through it.



UAV and UGV operations in real field conditions

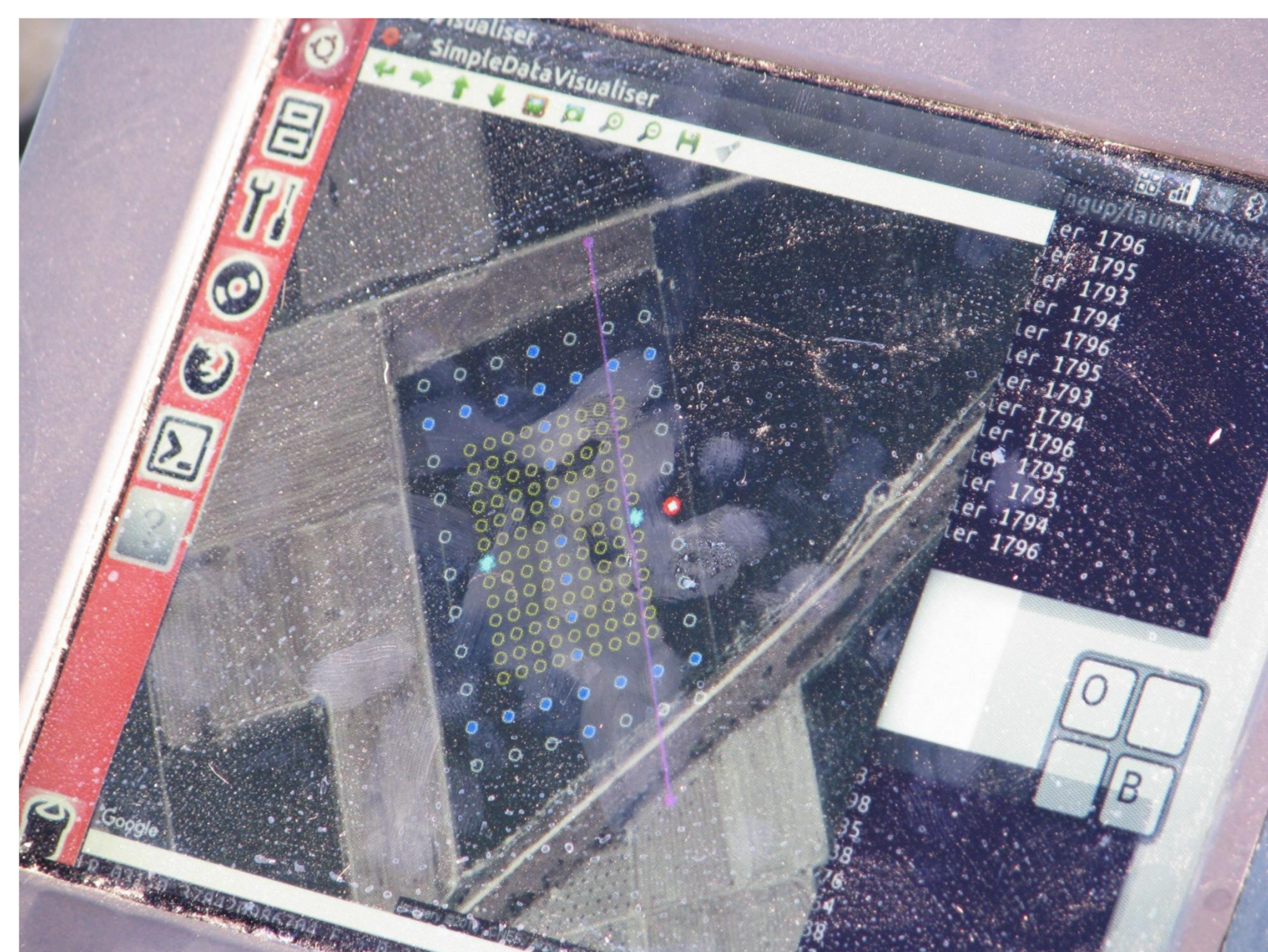
System's Architecture

The proposed architecture serves the needs of the program while ensuring that data and processing is available in every stage of the implementation. In more detail, the information system is hosted on a server and acts as the central node of the system to which all subsystems connect to upload or download data. The Farm Management Information System (FMIS) accesses the algorithms that can compile datasets to secondary data and feed through a bidirectional connection the autonomous vehicles and enhance information received from mounted sensors. These feedback loop enables the system to operate efficiently in the complex agri-production environment



The Interface

To strengthen adoptability, favorable factors were taken into account to form the user interface. The central point allows a one-look estimation of the current situation by providing a mixture of dense graphical information and textual elements only where the information is best conveyed so.



Algorithmic Perception, Localization and Navigation



Project Partners



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