

Research Synergy to address major challenges in the nexus: energyenvironment-agricultural production (Food, Water, Materials)

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. Specifically, development of smart farming systems, technologies for smart materials manufacturing and innovative systems for sustainable energy production and energy carriers. The goal is a novel integrated and adaptive low input management system for the agricultural sector aiming at producing raw agricultural materials with i resource management in an environmentally and i economically sustainable way. The system will integrate all existing technologies while using robotic platforms equipped with appropriate sensors and animal monitoring systems to fully ! crop and data collection, processing, decision : automate making and intervention.



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 : 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







Research supporting Perception, Navigation Satellite software, equipment **Localisation Algorithms** geo-spatial and services services

System architecture

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 specifications led to the planning of an architecture that incorporates elements of data safety for both user data and Unmanned Ground or Aerial Vehicles connections. The system also employs free and/or open sourced used technologies and libraries laying the ground for future development and connectivity to other systems of the agri-food supply chain.





FMIS architecture

The Interface

To strengthen the adoptability, favorable factors were taken into account to form the user interface.





System Validation

Integration of all the work of the proposed system to validate that all the subsystems work efficiently and successfully.



Sustainability Assessment

The environmental sustainability of the proposed techniques and production systems is considered, using appropriate methods.





FMIS Design

Analysis of the existing information systems and setting up the standards for the information system for managing farms (FMIS).



Experimental Evaluation

The system will be evaluated in an orchard, a linear cultivation, a greenhouse and a livestock building



Dissemination of results

Dissemination of results to stakeholders and to the general public through workshops, printed material, web pages,

FMIS interface

Perception Localization Navigation The initial input data of the process, is the orchard's user's-provided delimitation coordinates. Subsequently the UAV, executes a survey mission using the above-mentioned coordinates in order to create 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

The figure displays the dashboard of the system. This 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. The system shares aesthetic and functional elements in all its modules. Implementing services provided by Google Maps increases significantly familiarity.





Project Partners



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