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NINSAR: New itineraries for agroecology using cooperative robots

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► To cite this version:

Roland Lenain, Marco Medici, Philippe Martinet, Ouiddad Igbida Labbani, Danès Patrick, et al.. NINSAR: New itineraries for agroecology using cooperative robots. WORLD FIRA 2023 - Forum international de la robotique agricole en action, Feb 2023, Toulouse, France. , pp.1-1, 2023. hal-04205666

HAL Id: hal-04205666

<https://hal.science/hal-04205666>

Submitted on 5 Dec 2023

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Background

Several agriculture strategies have been proposed in the last decades to achieve a more environment-friendly food production. The challenge is to increase the efficiency of energy, water, and agricultural inputs use by integrating agroecology practices (e.g., organic farming, regenerative agriculture, bio-control input application, sowing under cover, permaculture, PA).

Technical limitations

Yields may decrease in case agrochemical use is limited, and it is required that technology perform complex tasks (e.g., bio-control applications require enhanced crop monitoring and highly cadenced treatments, permaculture and bio-control require to simultaneously treat different cultures and to extend field surveillance).

Social issues

The refinement of agroecology practices requiring relevant human effort appears difficult to consider due to the limited attractiveness of agricultural works for new generations.

Strategy

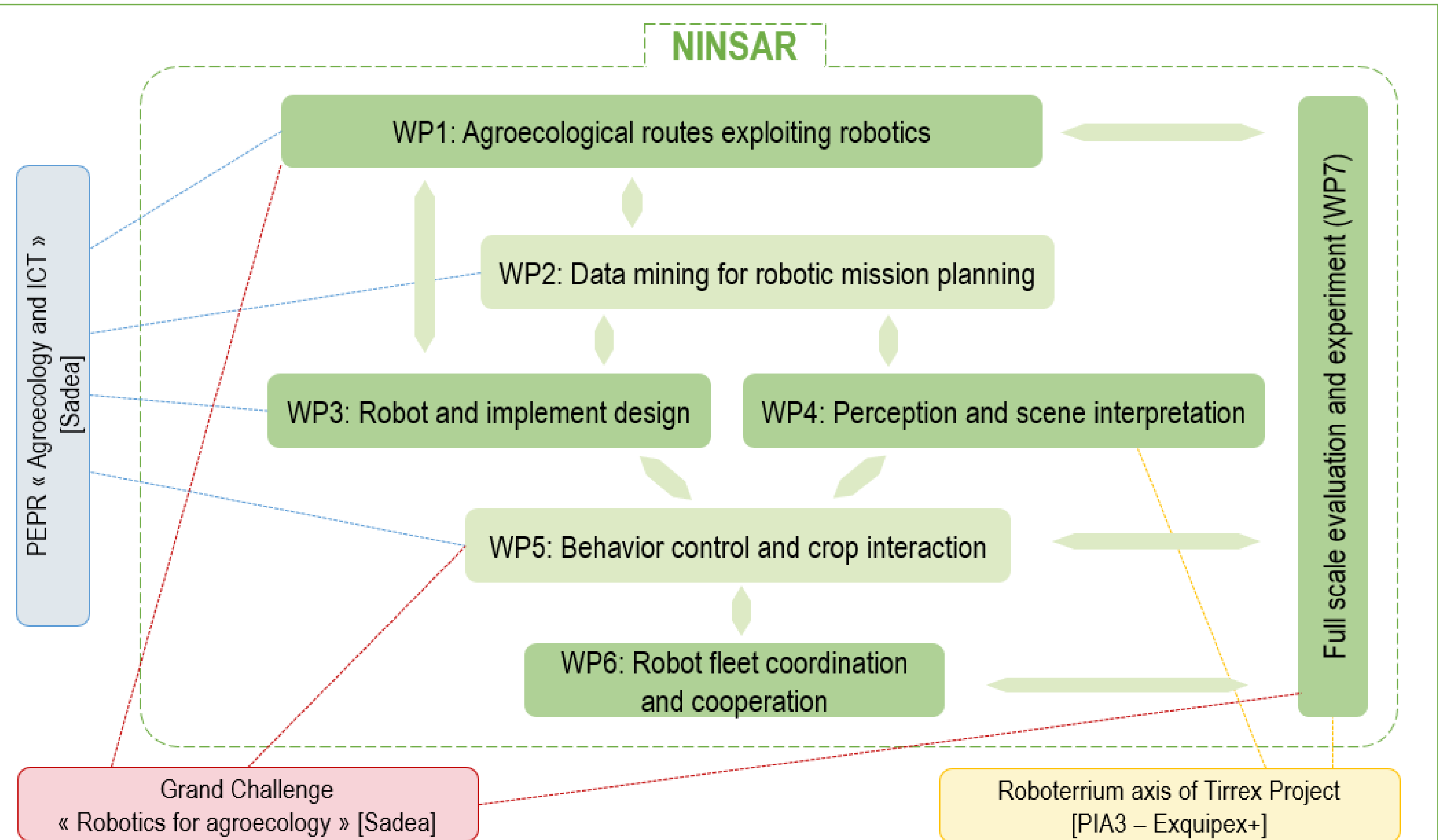
The adoption of agroecology principles at large scale can rely on the **development of multi-purpose tools and machinery sufficiently autonomous**. Albeit promising, robotic capacities need to be developed, particularly focusing on precision, variability of environment and cultures, and productivity. Such approach requires advances both in terms of definition of new farming practices and robotic developments.

Project aim

To develop robotic approaches for the implementation of **agroecological practices**, which ultimately means to design agroecological routes using a fleet of robots capable to cooperate while getting feedback from the surrounding environment. To achieve this objective, new farming practices and multi-robot capacities will be developed.

Methods

Based on an iterative approach, activities will be focused on the experimental evaluation of robotic developments capable of producing new research themes at the interface of engineering and agronomic sciences. Robot performances will be measured in terms of level of **precision**, **frequency**, and **coordination capacity**, which will make it possible to build new routes based on the degree of achievable efficiency in terms of precision, speed, and achievable actions. The project will rely on experimental findings of other national actions (PEPR 'Agroecology and ICT', Grand Challenge 'Robotics for agroecology', Roboterrium axis 'Tirrex').



Project scientific structuration and relationship with other national actions

Expected results

- Innovative agroecological actions autonomously handled by cooperative robot fleets;
- Adaptive strategy for autonomous and discriminate treatments of crops;
- Enhancing a close collaboration between farmers and autonomous tools;
- Advancing in soft objects manipulation to operate accurately on crops and soil;
- Definition of new agronomic processes from intersection between agronomy and robotics.

