NRI:INT:COLLAB: High Throughput Multi-Robot Weed Management for Specialty Crops

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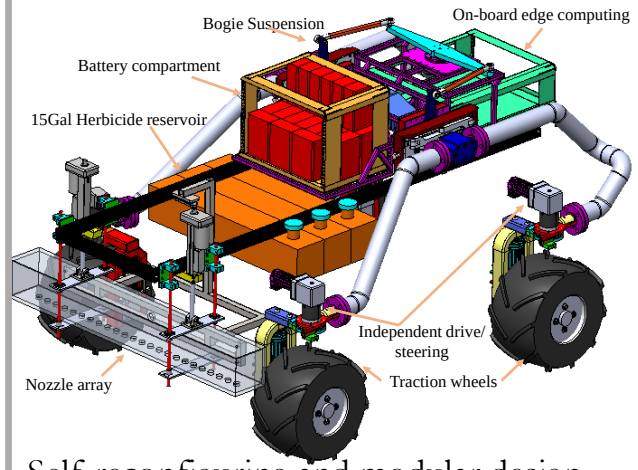
Overview, Motivation and Objectives

Most conventional sprayers apply agrochemicals uniformly, despite the fact that distribution of weeds is typically patchy, resulting in increased costs, crop damage risk, pest resistance to chemicals, environmental pollution and contamination of produce.

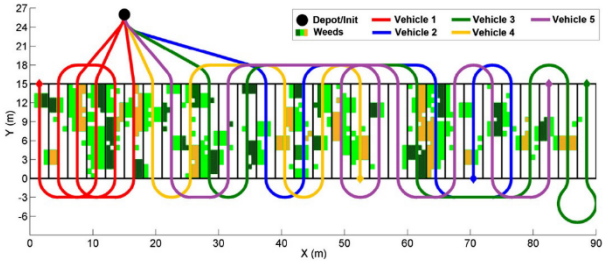
Objectives:

- *Develop a low-cost, high throughput, and smart technology to simultaneously scout and spray a variety of weeds with different herbicides*
- *Develop low-cost and multi-crop autonomous vehicles equipped with the precision spray technology*
- *Design and develop a high-level task planning and control*
- *Conduct comprehensive economic analyses of the proposed multi-robot system.*

Multi-Agent Autonomous Sprayers



Self-reconfiguring and modular design



Task Planning and Control

Project Activities and Collaboration

Task	Activity	Lead PI	Year 1	Year 2	Year 3	Year 4
1	Design vision-based weed detection system Design multi-crop adjustable smart sprayer	Ampatzidis (UF)				
2	Fabricate reconfigurable robots Develop autonomous navigation system	Silwal (CMU)				
3	Develop a multi-agent task allocation and planning system Develop a virtual environment to train the multi-agent system	Pardalos (UF)				
4	Conduct comprehensive economic evaluation	Ampatzidis (UF)				
5	System integration and field evaluation					
6	Education and outreach					

Expected Impact and Intellectual Merit

- Multi-crop, low-cost, autonomous, and precision spraying robots.
- No major changes to way growers currently grow crops.
- Reduces spraying costs, dependence on agrochemicals and labor.
- Increases profit and provide a road map to sustainable multi-robot smart spraying technology.
- Provide robotics research opportunities to undergraduates, underrepresented and minority groups.
- Outreach to K-12 students, through existing programs at UF and CMU.