NRI: INT: Balancing Collaboration and Autonomy for Multi-Robot Multi-Human Search and Rescue

Ryan K. Williams, Nicole Abaid, Nathan Lau, and James McClure Virginia Tech, CNS-1830414, Awarded Sept. 2018

Challenge

 Enabling teams of human searchers and unmanned aerial vehicles to collaborate towards improving search outcomes and reducing human effort.

Solution

- Risk-aware human-UAV search planner.
- Agent-based lost person model.
- In-field computational backpack.

Multi-agent models for lost person and search $|-b)\dot{x}_i = \sum_{i=1}^{n} F_{ij}$ for agents $i = 1, 2, \ldots, N$ archer feedback and dynamic robot Human-Robot Task Generatio tasking (for search tasks and computatio Voronoi partitioning constrained by search leader input, communication ds, and human-robot collaboratior Human-Robot Task Assignment Constrained MDP for efficient search ssignments and team compositions ons and collaboration point Regression: Estimated probability map generated from robot neasurements, lost person model: man feedback, and prior map Risk-aware human-robot planning fron chance-constrained ontimization

Project overview.

Scientific Impact

 Planning and control systems that autonomously gather information while adapting to uncertain human plans.

Broader Impact

 Volunteerism is in dramatic decline nationally and across Virginia, and thus UAVs could eventually supplement the lack of trained volunteers.

• Web-based SAR interface.

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Summary of Current Results:

Software Infrastructure



Lost person modeling and human-UAV search planner simulation pipeline.

In-field computational backpack benchmarking.



Search and rescue interface with human factors studies.