NRI:INT: Ad-hoc collaborative human-robot swarms

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Goal

Design the **autonomy**, **interaction**, and **hardware** that will enable an ad-hoc collaborative swarm of robots and non-expert humans to accomplish a high-level task without central coordination.

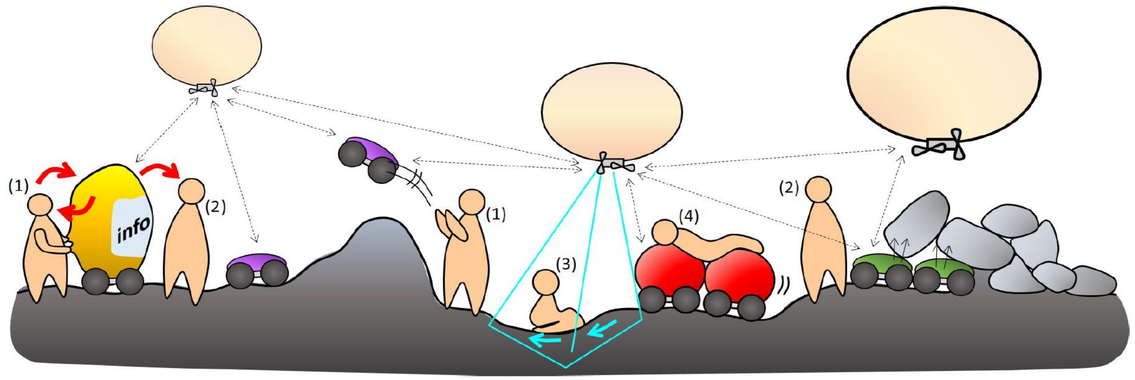
Accomplishments

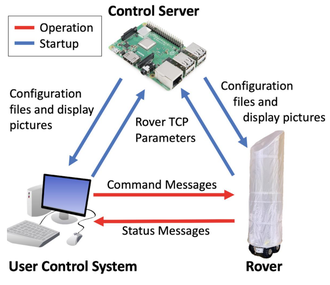
Hardware: We developed robotic platforms including rovers with inflatable bladder, and blimps with broad situational awareness.

Autonomy: We created robot controllers that satisfy the task of finding participants and leading them out of an emergency.

Interaction: We created a shadow image classification method for a detailed, full-body, hardware-light human-rover touch interaction.

Simulation: We created a simulation environment to test robots' strategies for effectively evacuating people in an emergency setting.





Hardware | Autonomy | Interaction | Simulation

Broader Impact

The knowledge created from this project can pave the way to a future where small, robust, low-cost robots are deployed in disaster relief scenarios, in large scale search or evacuation operations, and in safe crowd control. In addition, the project supports joint class projects between the PIs, and broadening participation activities including lectures, lab tours and workshops.

Scientific Impact

This work advances knowledge in swarm design, autonomy, and HRI. For robot design, we incorporate safety and interaction into the design process by exploring inflatable structures. For control, we consider a top-down approach where individual robot control is synthesized from a high-level task. For HRI, we explore multi-modal interaction through distributed projection and haptic interfaces.

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