Interactive Human-Drone Partnerships for Emergency Response

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http://droneresponse.net

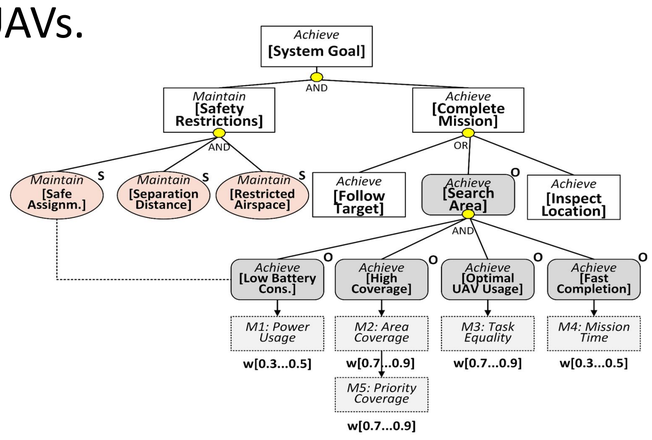
Goal: Deploy semi-autonomous cohorts of UAVs as trusted members of an emergency response team!

1 Scene Recognition:

Develop effective scene recognition algorithms and techniques to provide high-fidelity situational awareness for humans and drones engaging in a shared mission

2 Mission Modeling:

Create goal models that capture mission goals and supports dynamic task allocation and self-adaption of UAVs.



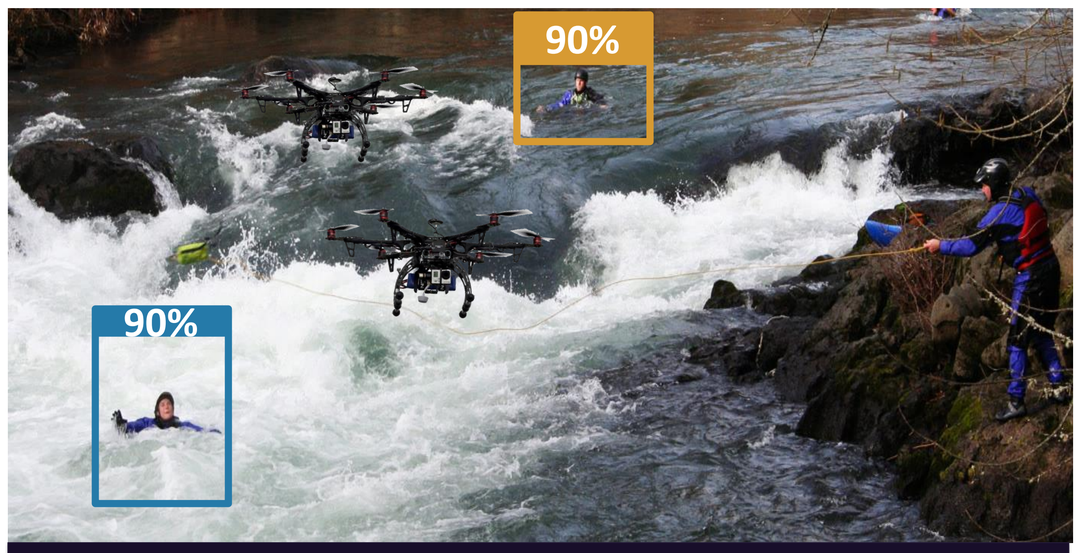
3 Human Drone Interface:

Design a human-CPS interface to provide situational awareness, to support human and drone decision making, and enable meaningful human-drone partnerships.

Develop and evaluate UI prototypes. Explore UAV autonomy and human engagement with situational awareness demons.

4 Next Steps:

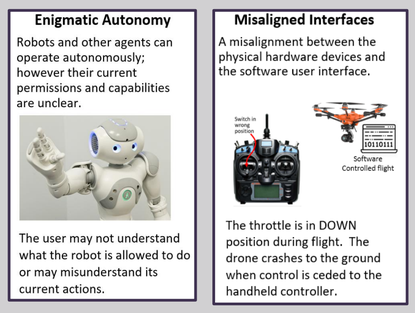
- Collect diverse imagery and training image recognition.
- Create and use a product line of mission-focused goal models.
- Implement a robust working version of DroneResponse with onboard image recognition, follow-me mode, and basic autonomy features.



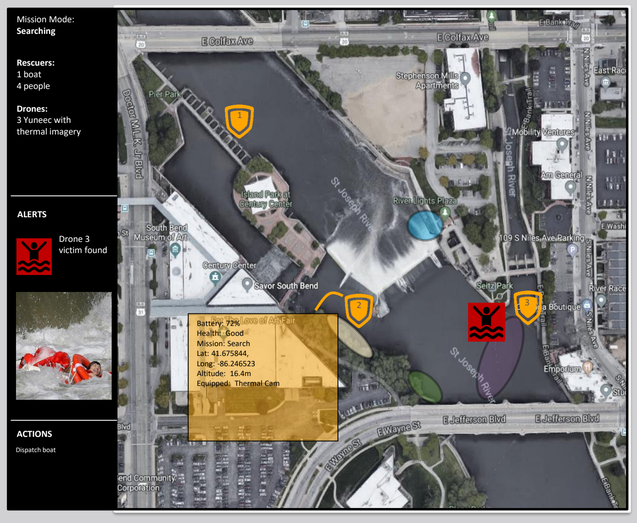
River Search and Rescue

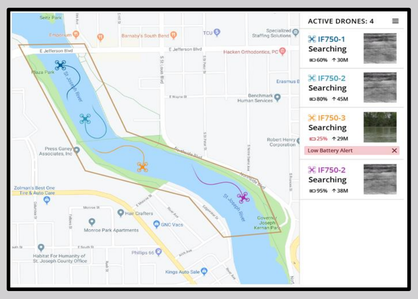
Fire Surveillance

Date	Participants	Meeting Purpose
04/03/19	FireChief, Drone ops Coord., Asst. Chief of Operations, 2 Researchers	Project Planning: Vision setting
05/23/19	FireChief, Drone ops Coord., Asst. Chief of Operations, 2 Researchers	Project Planning: Scenario exploration
06/27/19	Fire Chief, Drone Ops Coord., 6 reg firefighters, 1 fire inspector, 9 Researchers	Requirements Discovery: Brainstorming
July 2019	6 Researchers and Firefighter shift supervisors	Ethnography: Ride-alongs
07/12/19	Drone ops Coord., 1 reg firefighter, 5 Researchers	Participatory design (paper prototypes)
08/28/19	Fire Chief, Drone Ops Coord., 3 researchers, 1 note-taker	Participatory design (exec. prototype)
09/02/19	Fire Chief, Drone Ops Coord., 6 Drone operators, 3 researchers, 1 note-taker	Participatory design (exec. prototype)



10 Situational awareness (SA) demons prevent humans from understanding and interacting with the scene. We evaluate the UI for SA through scenarios with UAV autonomous behavior.

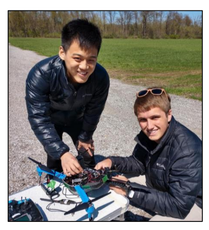




Summer 2019: Co-Design for Situational Awareness

Undergraduate Research

Undergraduate students worked with South Bend firefighters to co-design and prototype the DroneResponse UI.



Community Outreach

A 2018 demonstration of UAVs for emergency response, created foundations for our collaboration with the South Bend Fire Department.

Scenario Brainstorming

1. Search and rescue
2. Hotspot detection for structural fires
3. Traffic accident surveillance
4. Chemical/radioactive sensing and mapping following accident.

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2019 NSF Cyber-Physical Systems Principal Investigators' Meeting

November 21-22, 2019 | Crystal City, Virginia

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