Multi-Agent Robotics (MURO) Lab

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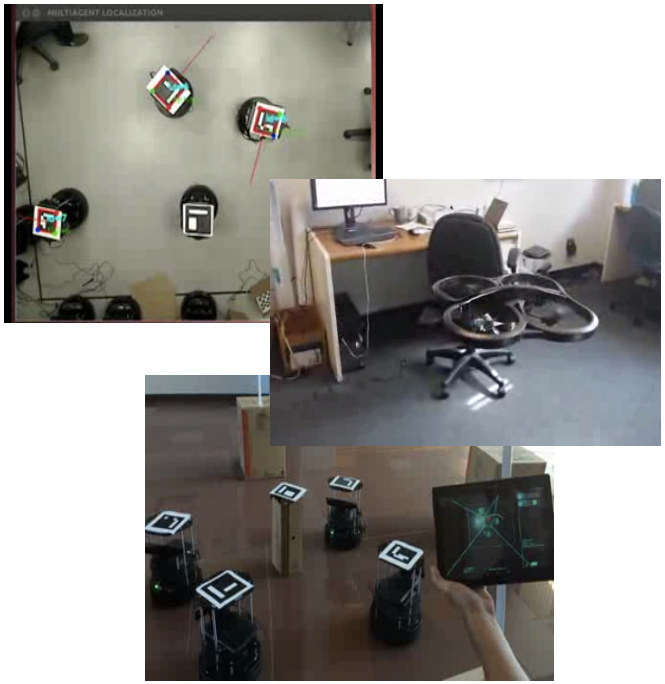
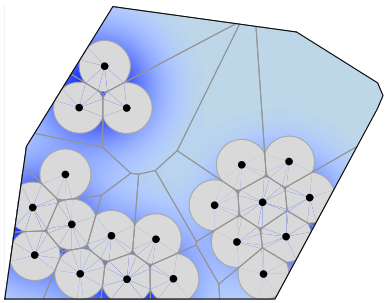
MURO Lab for Swarm Robotics

Analysis and design tools to develop
provably correct algorithms
Demonstrated on simulation
and robotic testbeds

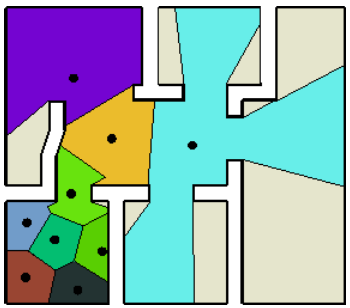
Models to formalize, analyze and
compare coordination algorithms
useful in sensing, estimation, planning

Example problems: formation control, coverage
control, task assignment, distributed estimation

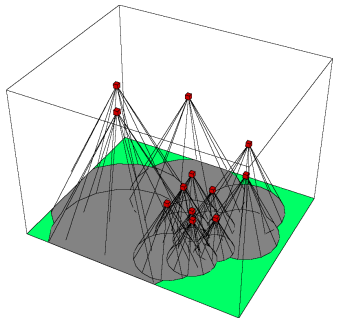




Limited-range



Distributed art gallery

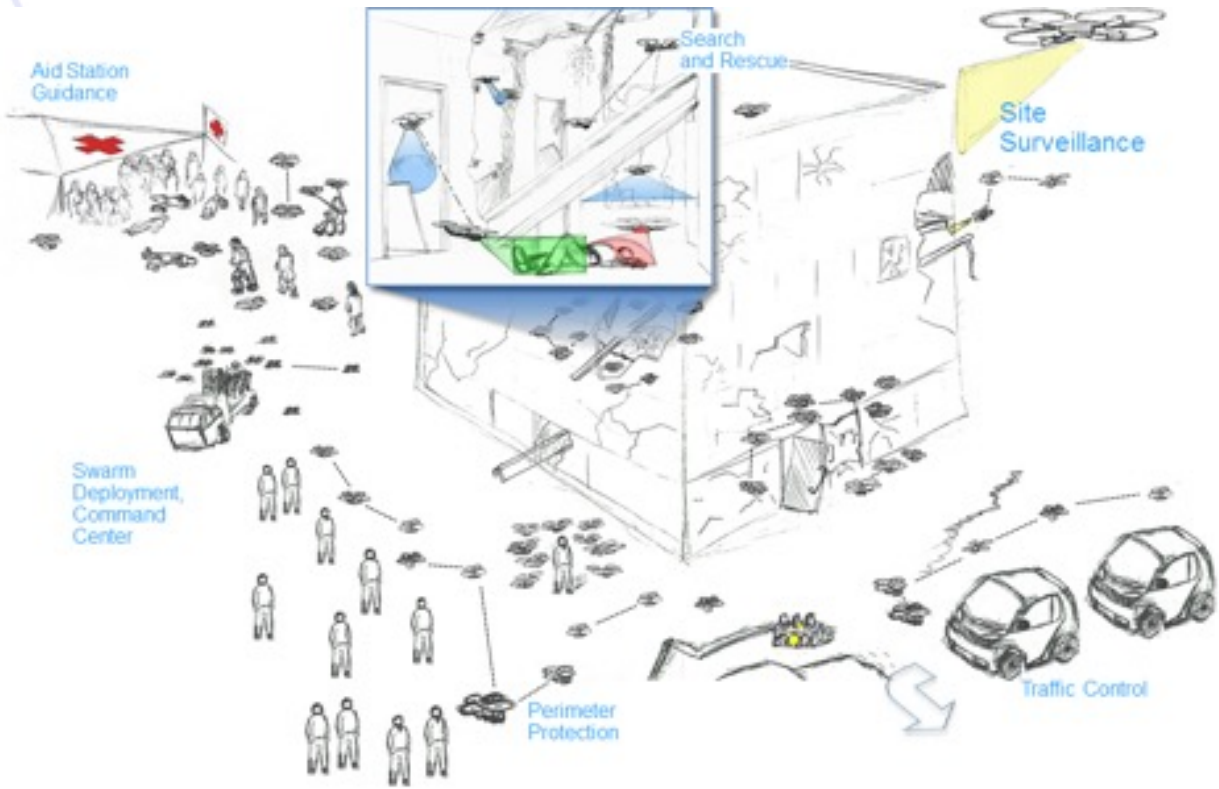


Human-swarm interaction

3D deployment

Disaster Response and Recovery

Northrop Grumman (M. Milam, R. Chen)–UCSD (K. Lee, S. Martinez, JC) collaboration

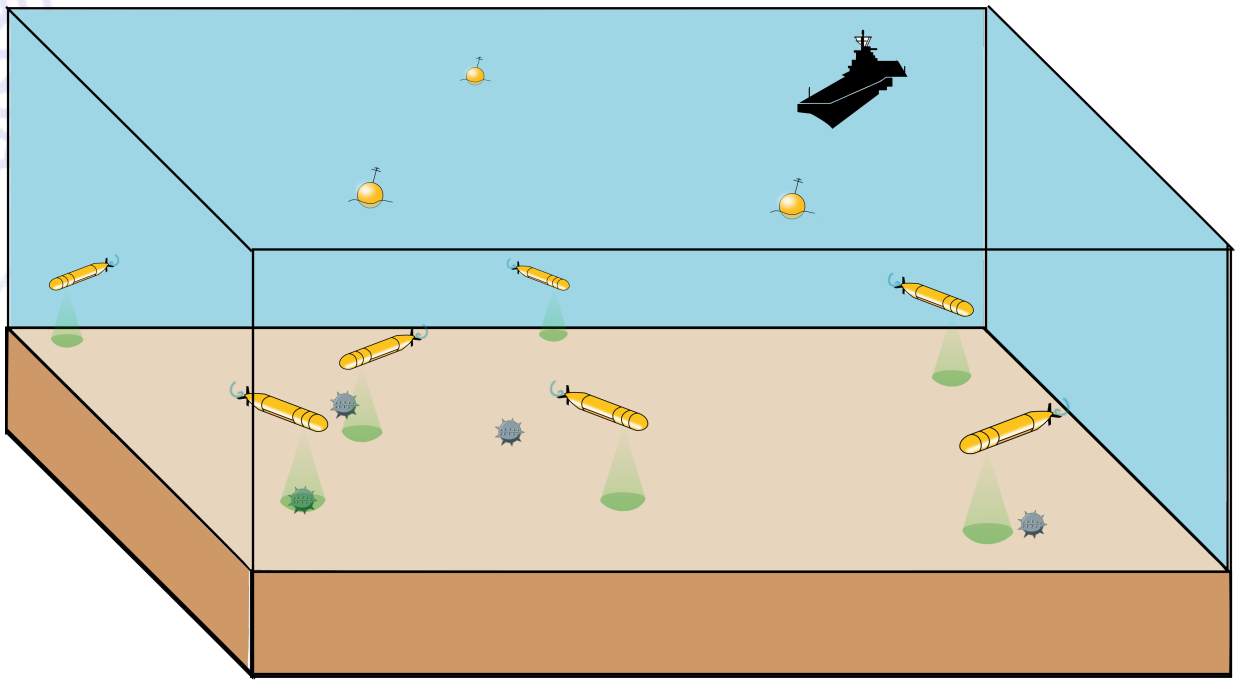


Multi-robot control for

- assess scope and severity of disaster
- maintain safety perimeter
- provide situational awareness
- search and rescue
- reroute traffic
- suggest paths for emergency responders

Underwater Mine Detection

Spawar (M. Ouimet, V. Djapic)–UCSD (A. Ma, S. Martinez, JC) collaboration



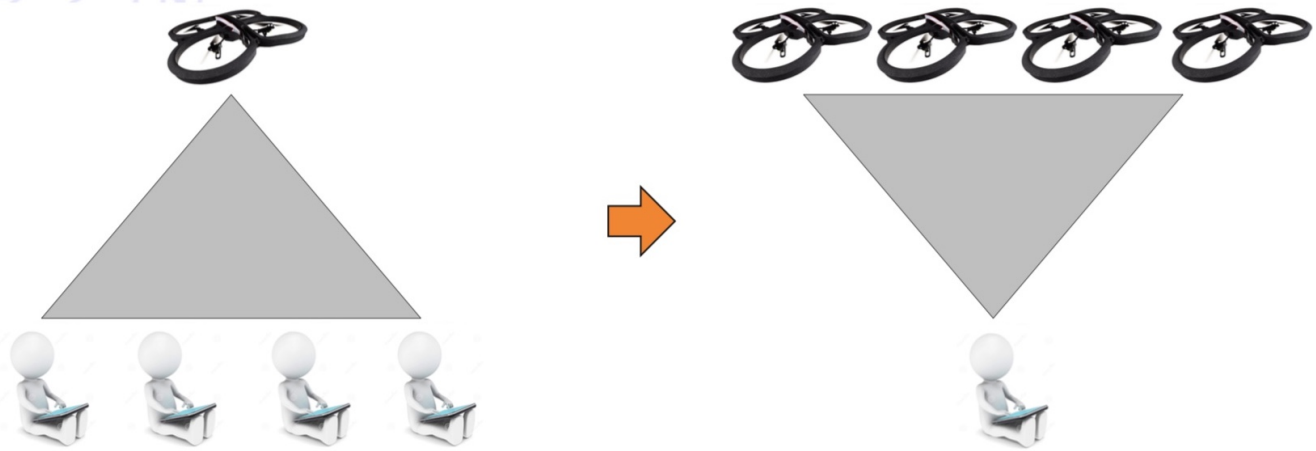
Multi-robot control for

- detect mines
- re-charge
- provide situational awareness
- service mines
- act as relays for inter-robot communication
- support for localization

Shared Autonomy: Human-Swarm Coordination

Abstractions enabling swarm control by human operator with guaranteed behavior

- how to relay human intent to swarm?
- how can swarm recognize human intent?



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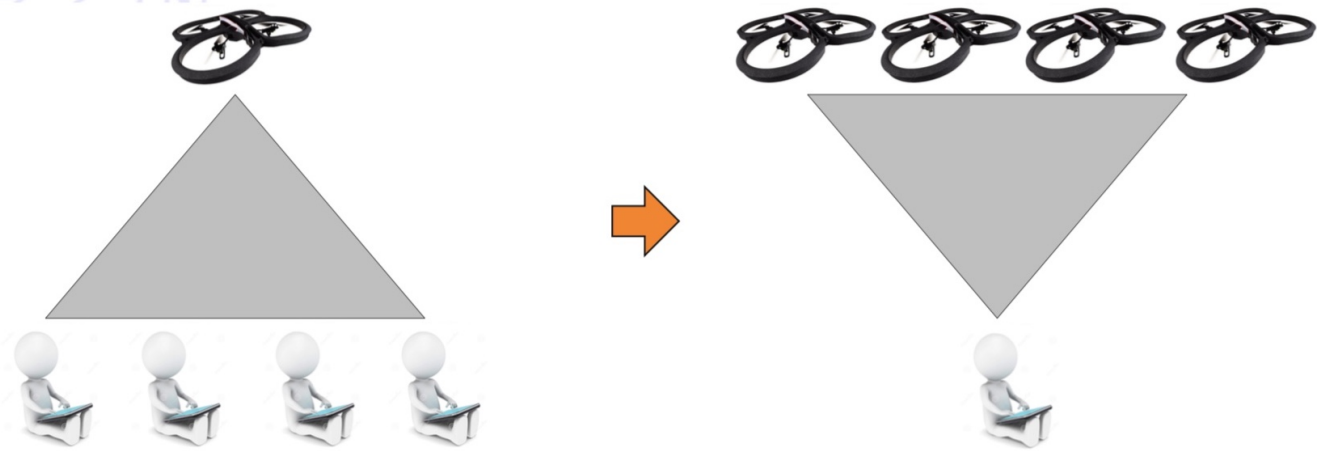


Focus on 'systems' questions

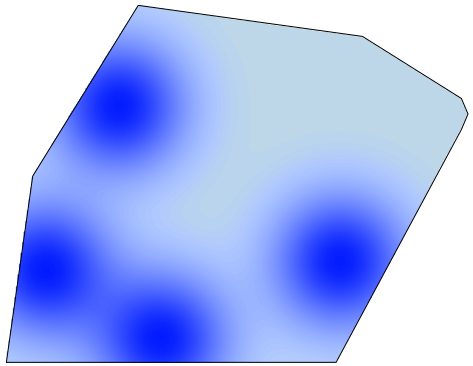
- predictability of swarm behavior disturbed by human input?
- how to make swarm easy/difficult to control?
- robustness, speed of convergence, interconnection

Human-Swarm Optimal Deployment

Human specifies importance function

Robot swarm deploys according to specification

Changes in function induce swarm reconfiguration

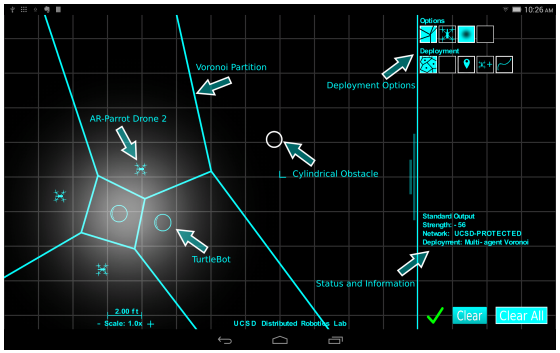
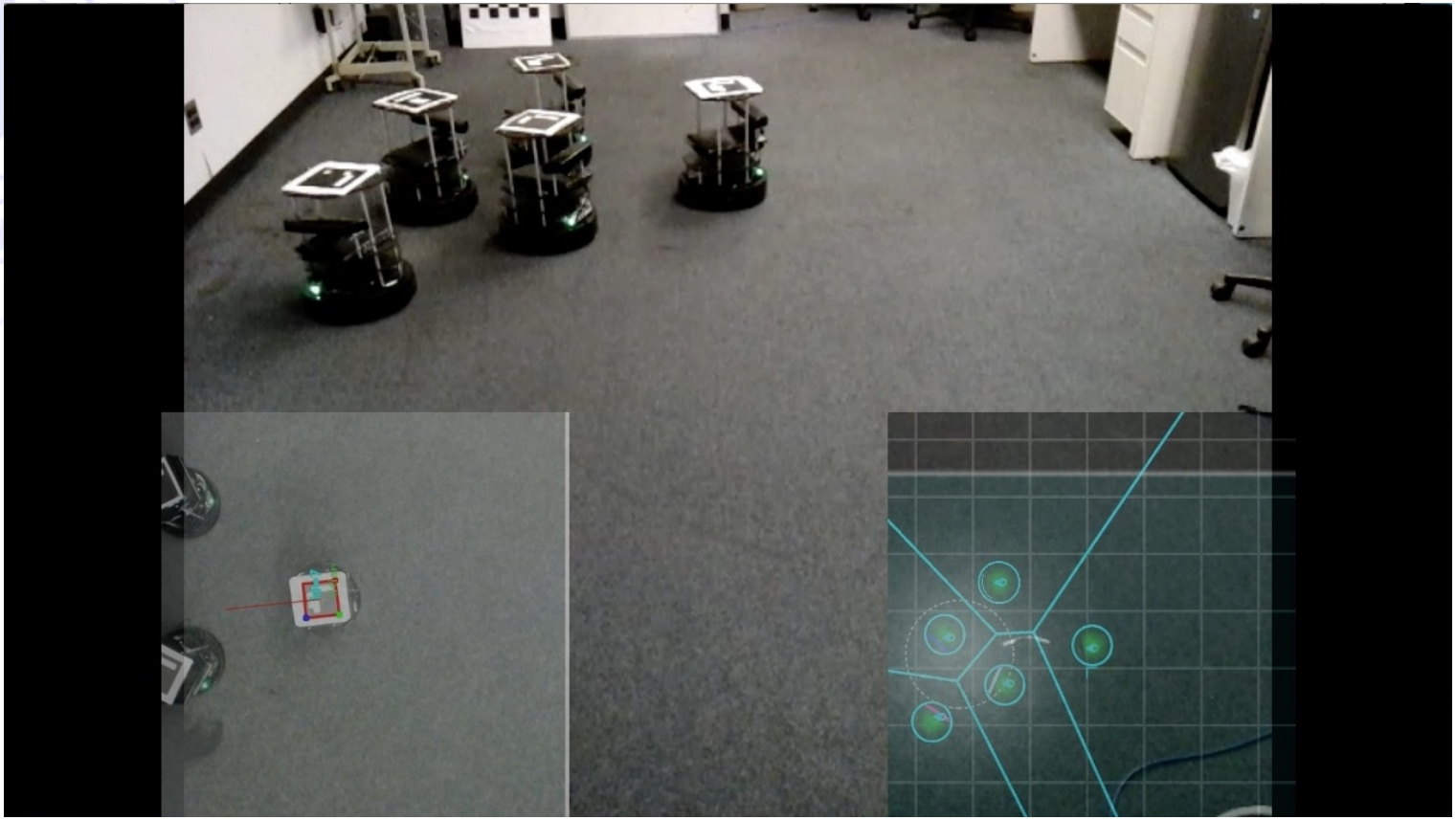


Human-Swarm Optimal Deployment

Human specifies importance function
– through tablet app

Robot swarm deploys according to specification

Changes in function induce swarm reconfiguration



Human-Swarm Optimal Deployment