DEMONSTRATION: INVESTIGATING HUMAN/MULTI-ROBOT TEAM INTERACTION

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Introduction

Our research addresses issues that are well-studied in *virtual* or *simulated multiagent systems (MAS)*, but that present difficulties when implemented in *physical multi-robot systems (MRS)*. Our focus is on tasks that require coordinated exploration, situations that could benefit from shared decision making, and settings that should be robust to dynamic changes in team composition. Our long term goal is to identify MAS approaches that are well-suited to MRS settings, as well as to devise approaches that address particular MRS challenges. Example experimental scenarios considered in our work include *urban search and rescue* (Burke and Murphy 2004; Nourbakhsh et al. 2005; Yanco et al. 2006), *humanitarian de-mining* (Freese et al. 2007; Habib 2007), and ***the treasure hunt game*** (Jones et al. 2006).

Approach

Our **HRTeam project** takes a "rough-and-ready" approach. We deploy a team of low-end robots and distribute exploration tasks across team members. With robotics, practical constraints always present difficulties, and these can be especially prevalent with inexpensive robots (e.g., image quality; network connectivity). Transference of methods from laboratory settings to the "real world" will need solutions to such practical challenges, and we embrace the opportunities to investigate robust approaches.

We have developed a dual simulated/physical environment for our research (Sklar et al. 2011) and are investigating several key challenges, such as coordination across a range of complex task classifications and shared decision-making between human and robot team members. **This Treasure Hunt Game demonstrates our environment for collecting data on how humans interact with a team of robots, under constrained and uncertain conditions—data which can be used to train the team to perform more consistently under varying conditions.**

Play our Treasure Hunt Game!

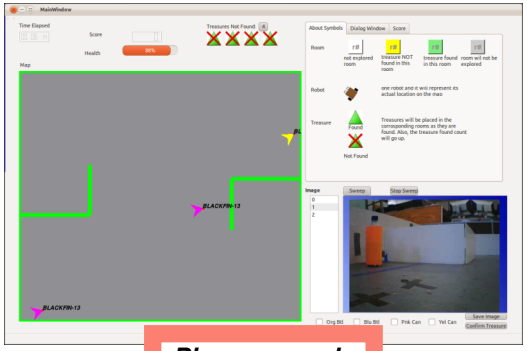
Our version of the Treasure Hunt Game involves one human operator (the "player") and 3 robots (in the simplified demonstration version shown here).
The player collaborates with the robots to find and identify treasures in the arena--before the robots lose all their "health points" ...

PLAYER CONSOLE:

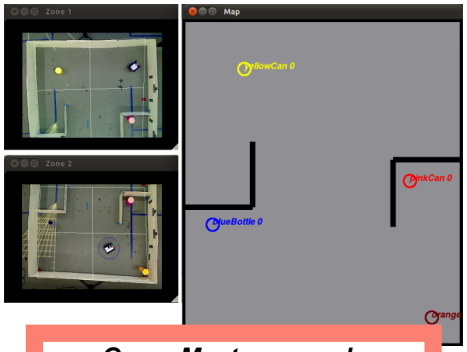
- **Double-click on a robot to select it.**
- **Click on a location** in the arena to request that the "selected" robot move to that location.
- **Click on the Sweep button** to request that the "selected" robot perform a sensor sweep (take panorama of images).
- *Robots lose energy when they move and when they perform a sensor sweep. The health meter shows how long they have before they all die.*
- Players earn points by correctly identifying "treasure" items in robots' images. **Click on Confirm Treasure button** to submit an image to the Game Master for evaluation. Correct identification earns 400 points; incorrect identification loses 150 points

GAME MASTER CONSOLE:

- **Place "treasures" in the physical arena.**
- **Click on treasures** in camera image and enter labels.



Player console



Game Master console

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Funded by the National Science Foundation under
IIS grants #11-17000 and #11-16843 and REU Site grant #08-51901