Simulation of Cooperative Multi-Agent Search in MATLAB

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Abstract

Our project consists of implementing and simulating efficient search algorithms for a coordinated team of autonomous robots in a dynamic mock urban environment in order that they can successfully participate in the Multi Autonomous Ground-robotic International Challenge (MAGIC 2010).

Background of MAGIC 2010

With the use of at least three robots and up to two human operators in a 500m x 500m mock urban environment search area, completing each challenge phase entails:

1. Accurately exploring the entire phase area
2. Locating all Objects Of Interest (OOI)
3. Completing all 3 challenges in 3-5 hours

Real World Applications

Effective use can be applied to dangerous, time-sensitive locations where robots may substitute humans to assist in search and rescue.

Our Approach

Past approaches have focused solely on mapping and exploration of an area and not necessarily on searching for specific objects. Our approach focuses on:

• Simulation of rapid multi-agent communication
• Thorough search of area for static OOI
• Capability for human interaction
• Proper recovery after robot death

Results

Human Interaction Capabilities

(a) User specifies robot ID and selects Region Of Interest (ROI)
(b) Selected robot receives a message with the boundary vertices of the ROI
(c) Robot enters local search mode and searches the ROI before returning to default search state

User Interface

The user represents information that the competition provides dynamically as well as decisions that human operators make during the competition. The GUI receives initial system state information (Ground Truth) and forwards this information to the SIM (World) layer, updating accordingly once the information is processed by the SIM.

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