

15-494/694 Cognitive Robotics Exploration Algorithm

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Exploration Goals

3 Main Considerations:

- How **interesting** is the location?
- How **easy** is the location to access?
- How much **information gain** is expected from the location?

Heuristics

Representations of each considerations:

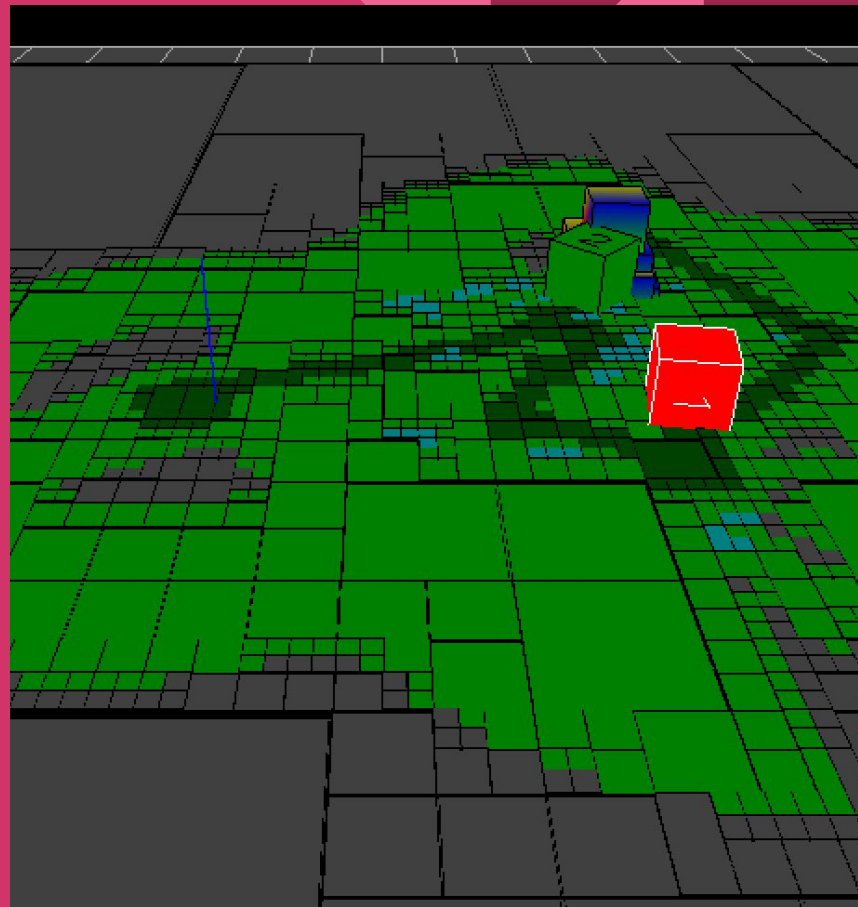
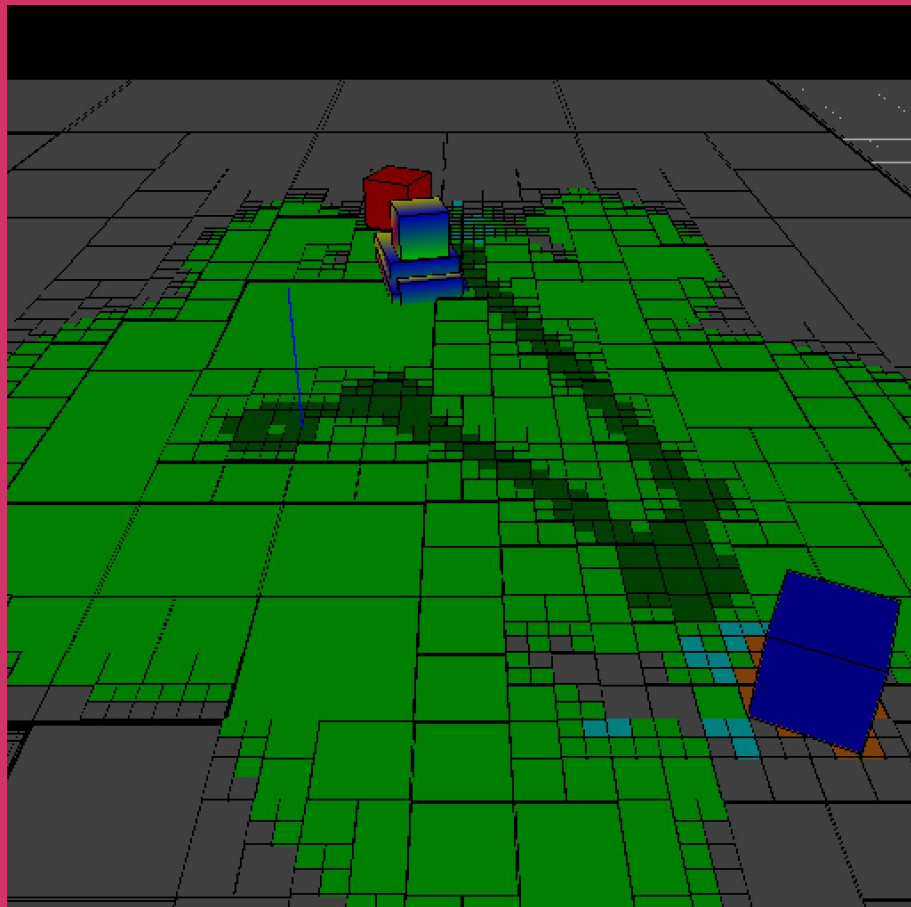
- Interesting: Proximity to known objects
- Easy: Proximity to robot location
- Information Gain: Size of the unknown region

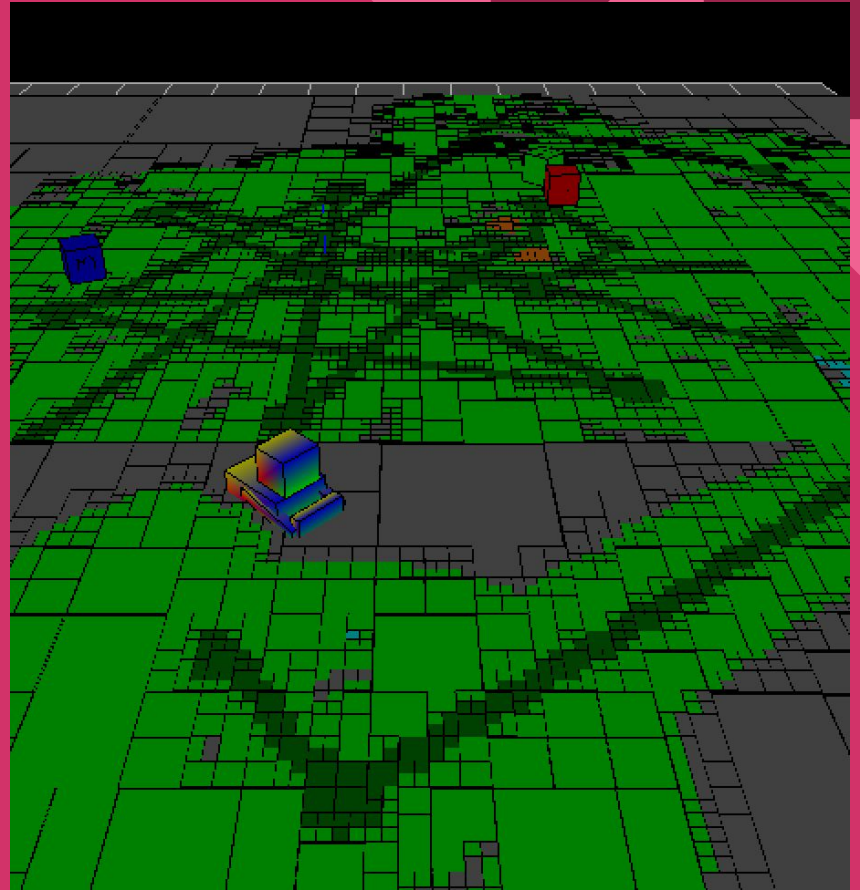
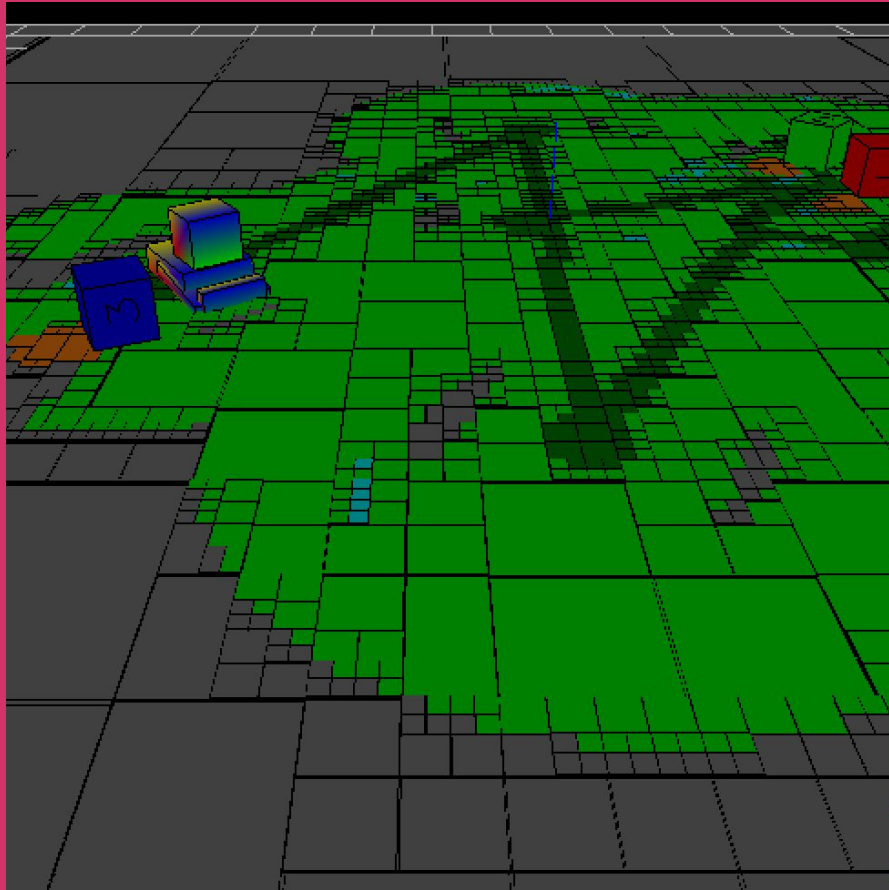
All three of these were combined in various relative importances to create several heuristics to choose from when running the algorithm

Practicalities

Used `nav_memory_map` from `cozmo` to assist in keeping track of the occupancy grid information

- Traversed map tree to find leaves
- Kept track of all unknown leaves
- Weighed the unknown locations based upon the heuristic
- Used path planner to go to the chosen location
- Performed a sweep to gain more location before repeating





Results

Positives:

- Quickly identified and searched around nearby objects of interest
- Covers large unexplored squares after exploring objects

Negatives:

- Not incredibly efficient in mapping time since it is greedy about picking goals
- Some heuristics have trouble avoiding small unknown areas (which can cause path planning failures)
- Has trouble with path planning failures