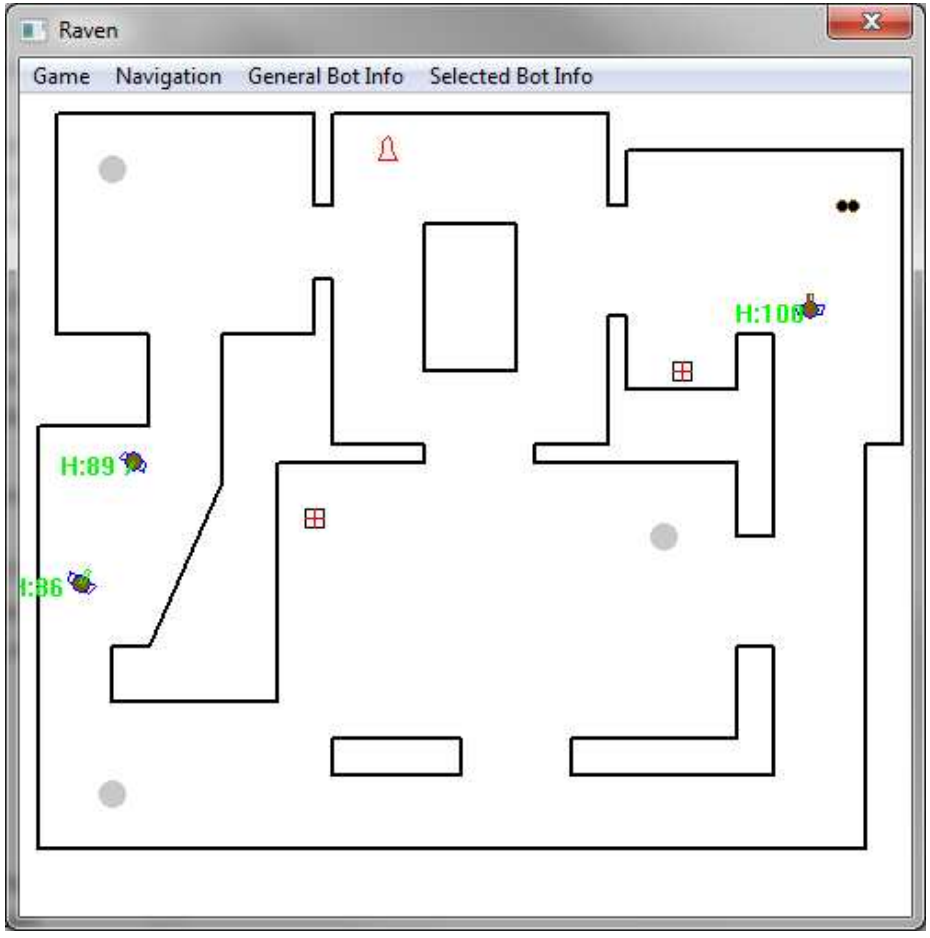
Raven Notes

CSCI 321

Based on *Programming Game AI by Example*, Buckland

June 2, 2014

Raven


Raven
Game
Navigation
General Bot Info
Selected Bot Info
H:89
H:36

Raven Game Class

- Map
- Bots
- Projectiles
- Path manager
- Grave markers

Raven Map Class

- Walls
- Trigger system
- Spawn points
- Doors
- Nav graph
- Space partition

Raven Weapons and Projectiles

- The Blaster
- The Shotgun
- The Rocket Launcher
- The Railgun

Trigger examples in games

- Step on a pressure plate
- Dead guard notifies other guards
- Shooting a gun activates a noise trigger
- Determine if a player has tried something three times
- Wounded enemies leave a trail of blood

Raven Triggers

- Respawning
- Givers
  - Weapon
  - Health
- Limited lifetime
  - Sound

AI design

- Weapon handling and movement independent
- Predict enemy's movement
- Choose appropriate weapon
- Select best weapon
- Aim slow weapons
- Select a single target from a group
- Perception
  - Visible
  - Noisy
- Perception memory
- Planning

Raven AI Overview

- Decision making
  - Attack
  - Find health
  - Chase target
- Movement
  - Steering
- Path planning

Perception: Bots too aware

Sensory omnipotence

- Eyes behind heads
- See you in the dark
- See you behind obstacles

Solution: better programming

Perception: Bots too unaware

Selective sensory nescience

- Set off a bomb behind them
- Leave a corpse seen by the next guard
- Forget about you once out of sight
- Forget about you if they turn their head

Solution: short-term memory

Weapon Handling

- Fuzzy logic for selection
- Aim using steering for slow weapons

Weapon Handling Not Perfect

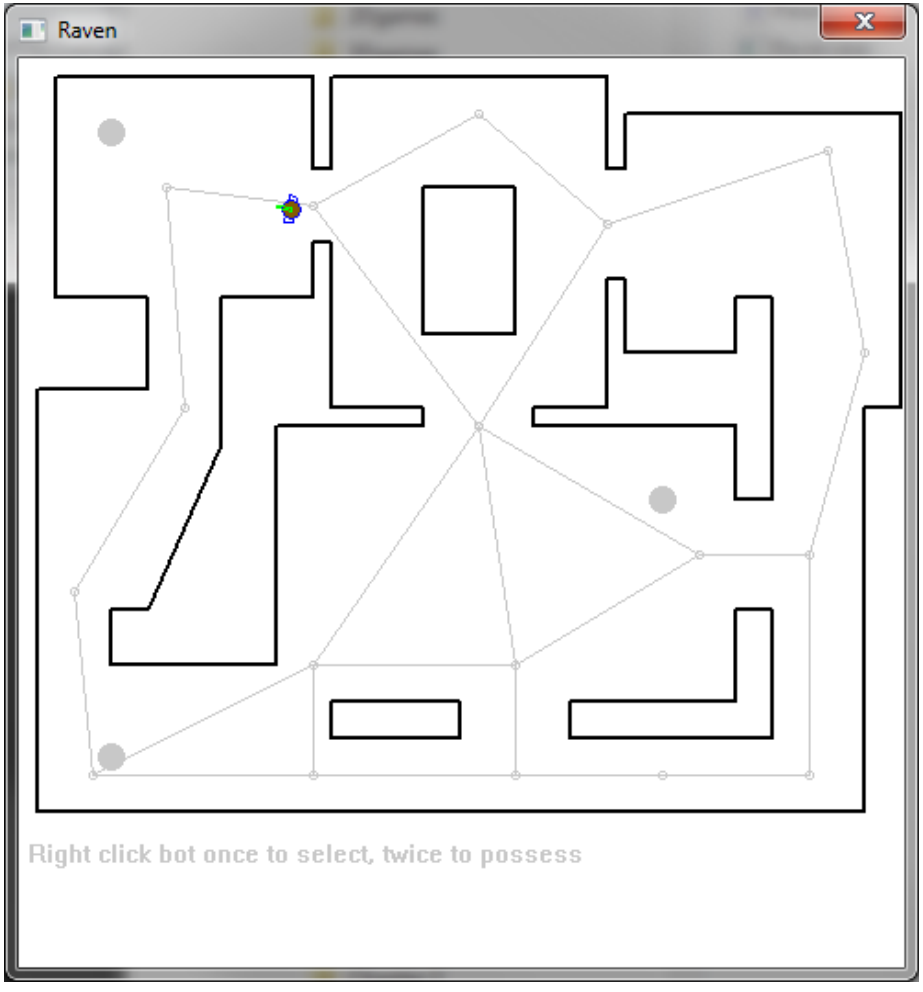
- Selection
- Aiming
- Fire rate
- Some bots *always* miss the first shot
- Lower skill when player's health is low

Updating

- Not everything every cycle:
  - Weapon selection
  - Visible opponent recognition
  - A^* path planning

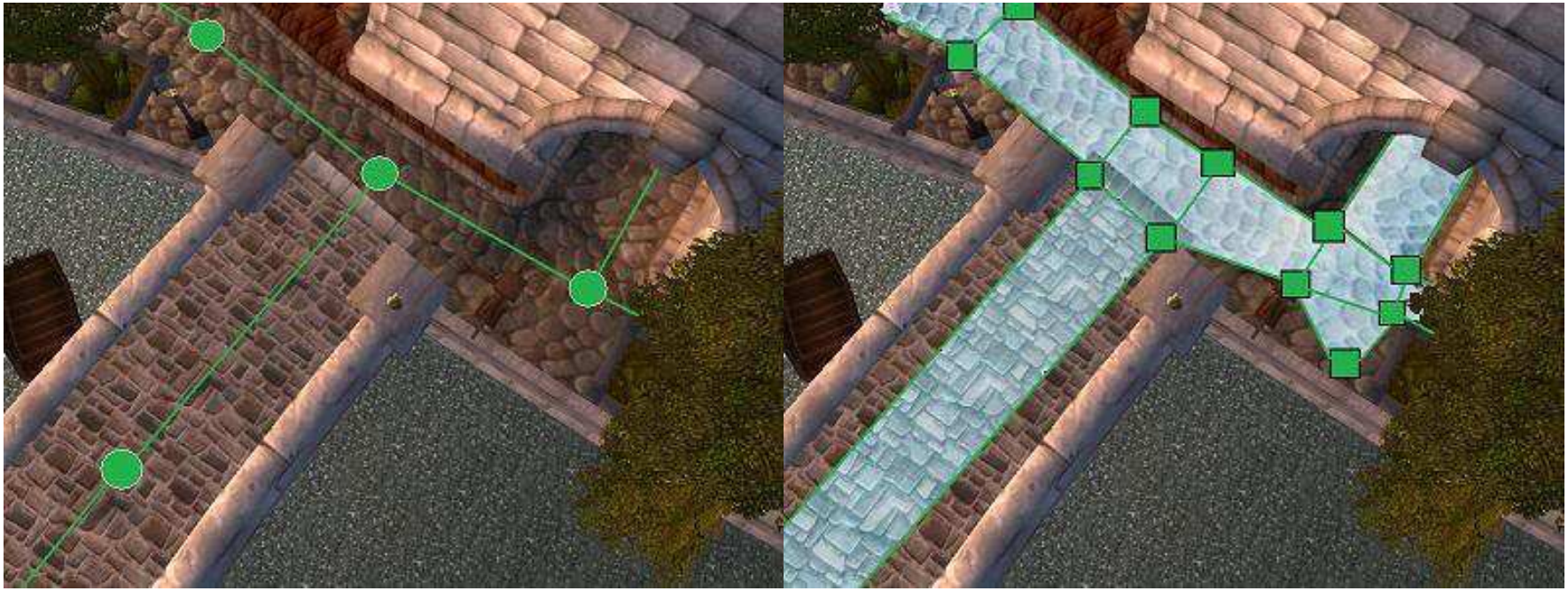
Tile Based Games

Sparse Graphs—Points of Visibility



Use expanded geometry to generate automatically.

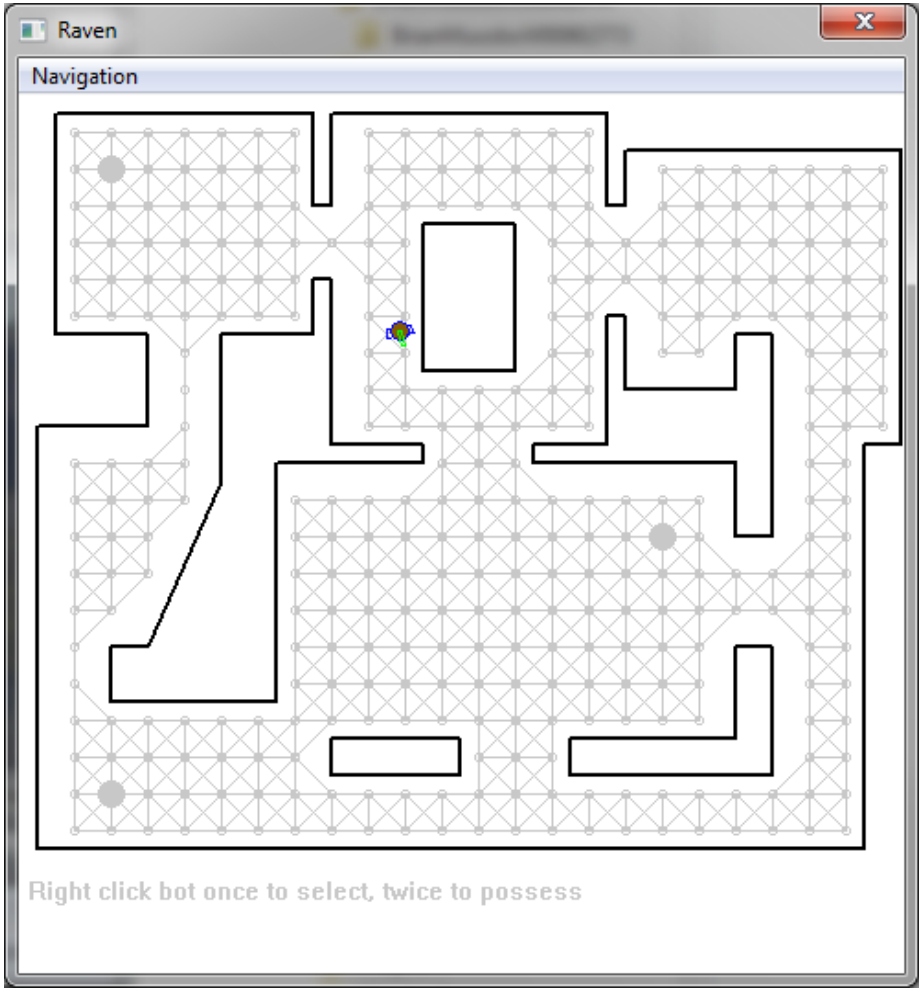
Navigation Meshes



Bot: move from x to y

- Algorithm:
  - Find A: closest graph node to x
  - Find B: closest graph node to y
  - Search for least cost from A to B
  - Move to A
  - Follow path
  - Move to B
- Problems:
  - Can be invisible points in coarse graph.
  - Coarse graph can result in poor paths.
  - Problems getting from A to x

Fine Graph



Can be built automatically with flood fill.

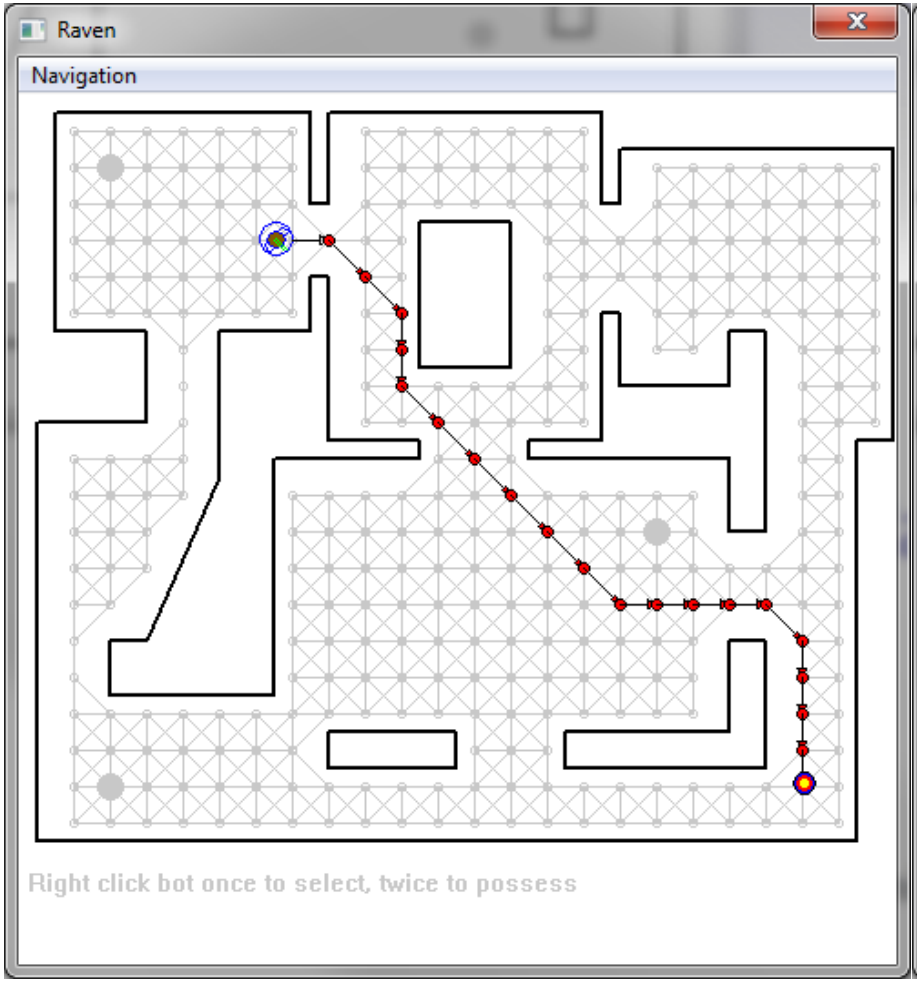
Spatial partitioning

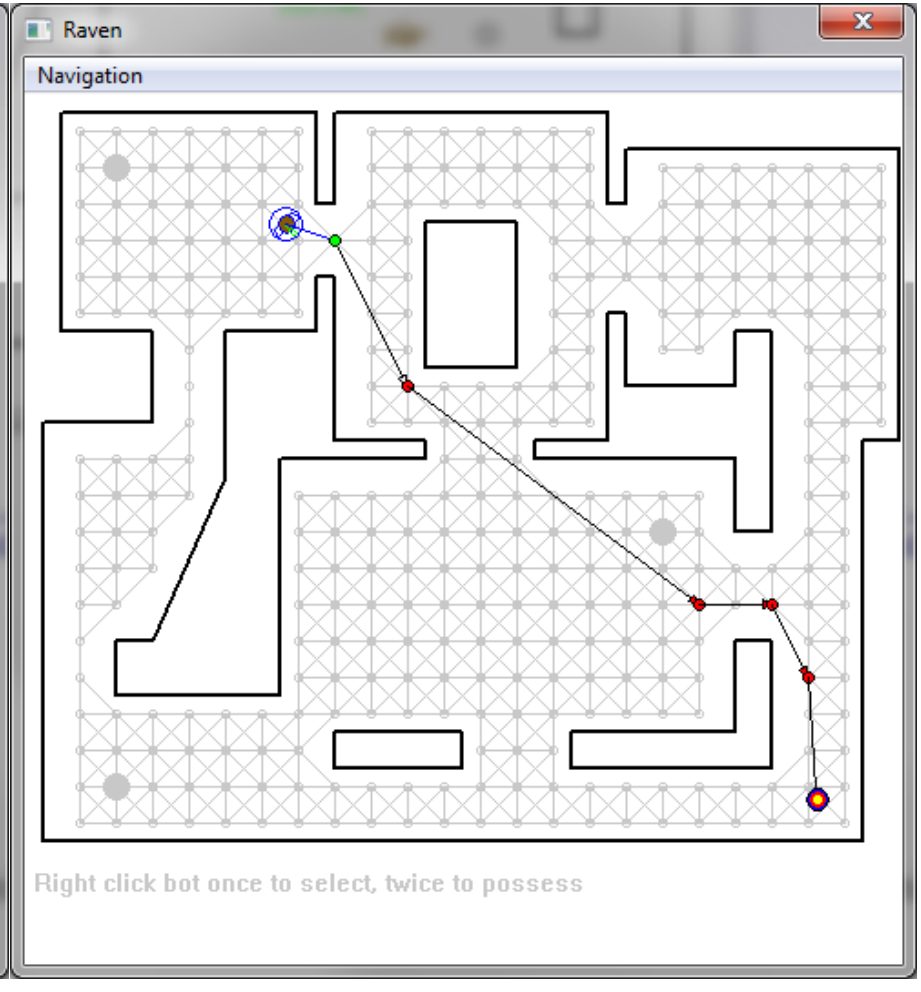
- Need to find closest visible node.
- Partition space.
- Time goes from $O(n^2)$ in number of nodes to $O(d)$ in *density* of nodes, which is usually constant.

Path finding to an item type

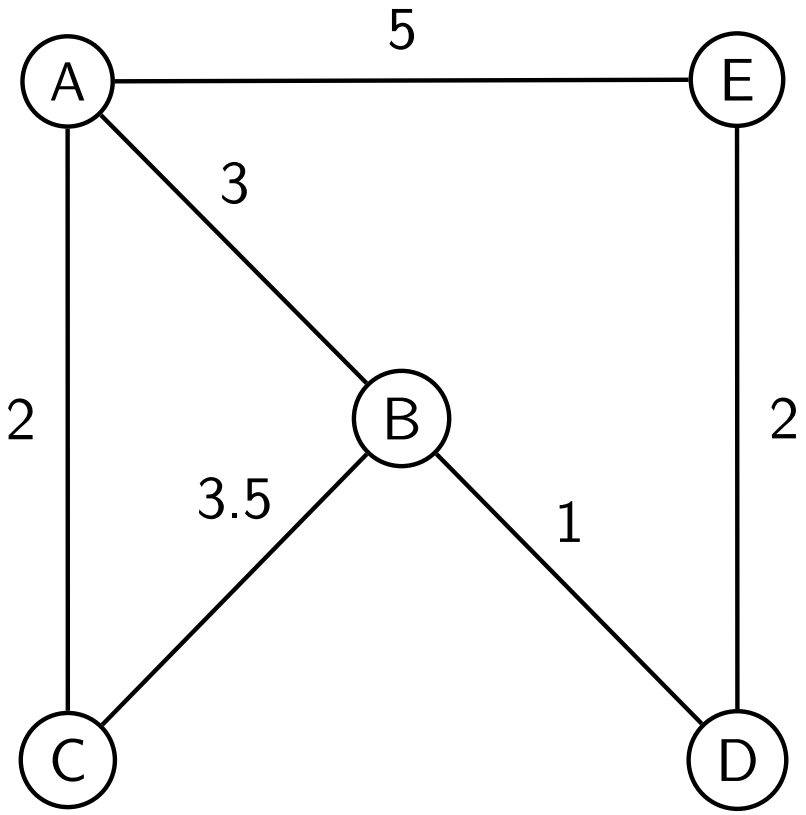
- A^* good if we know the destination.
- Finding the shortest path to the nearest ammo (on shortest path)?
- Can use Euclidean distance and then A^*.
- Dijkstra's algorithm better if there are *many* items.

Path smoothing





Precompute all shortest paths



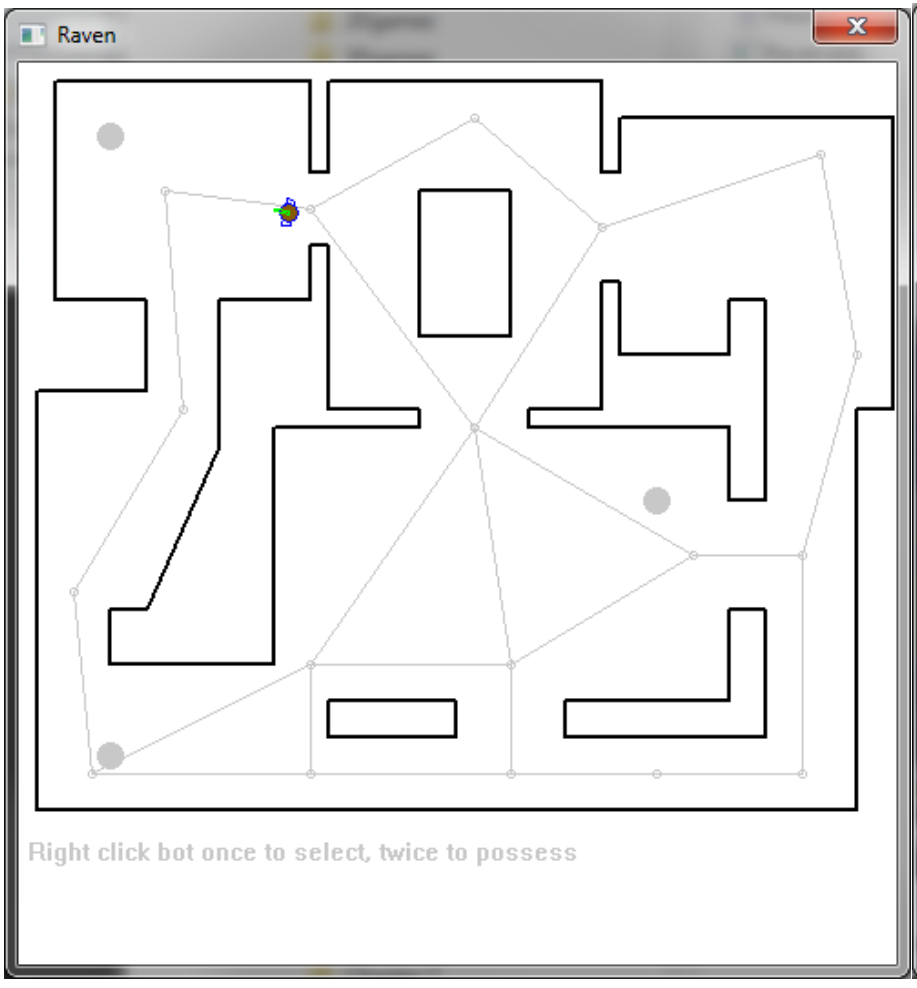
	A	B	C	D	E
A	A	B	C	B	E
B	A	B	C	D	D
C	A	B	C	B	B
D	B	B	B	D	E
E	A	D	D	D	E

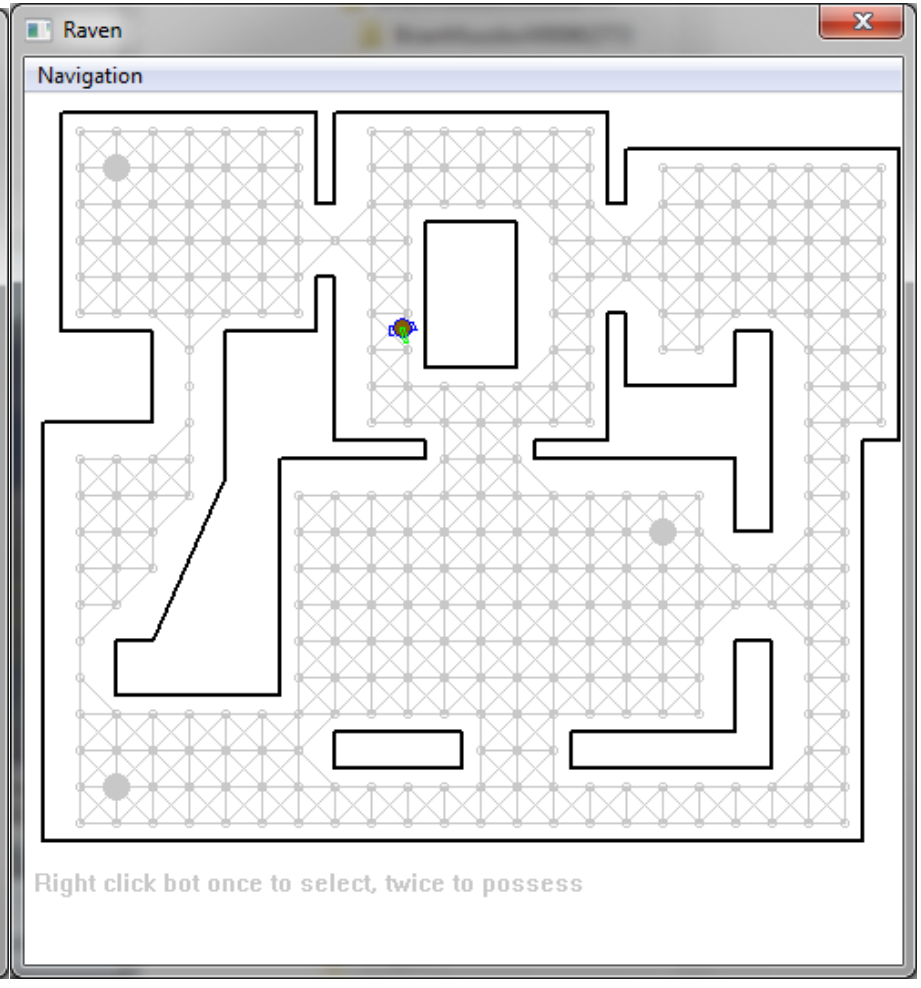
Can be augmented with total path costs.

Time Sliced Path Search

- Don't do searches all at once.
- Break them up into slices.
- Bots must avoid twiddling thumbs:
  - **Seek** in meantime.
    - Must use path smoothing.
  - Use modified A^* to return partial results.

Hierarchical path finding





Bots getting stuck