Synthetic Behavior for Small Unit Infantry: Basic Situational Awareness Infrastructure

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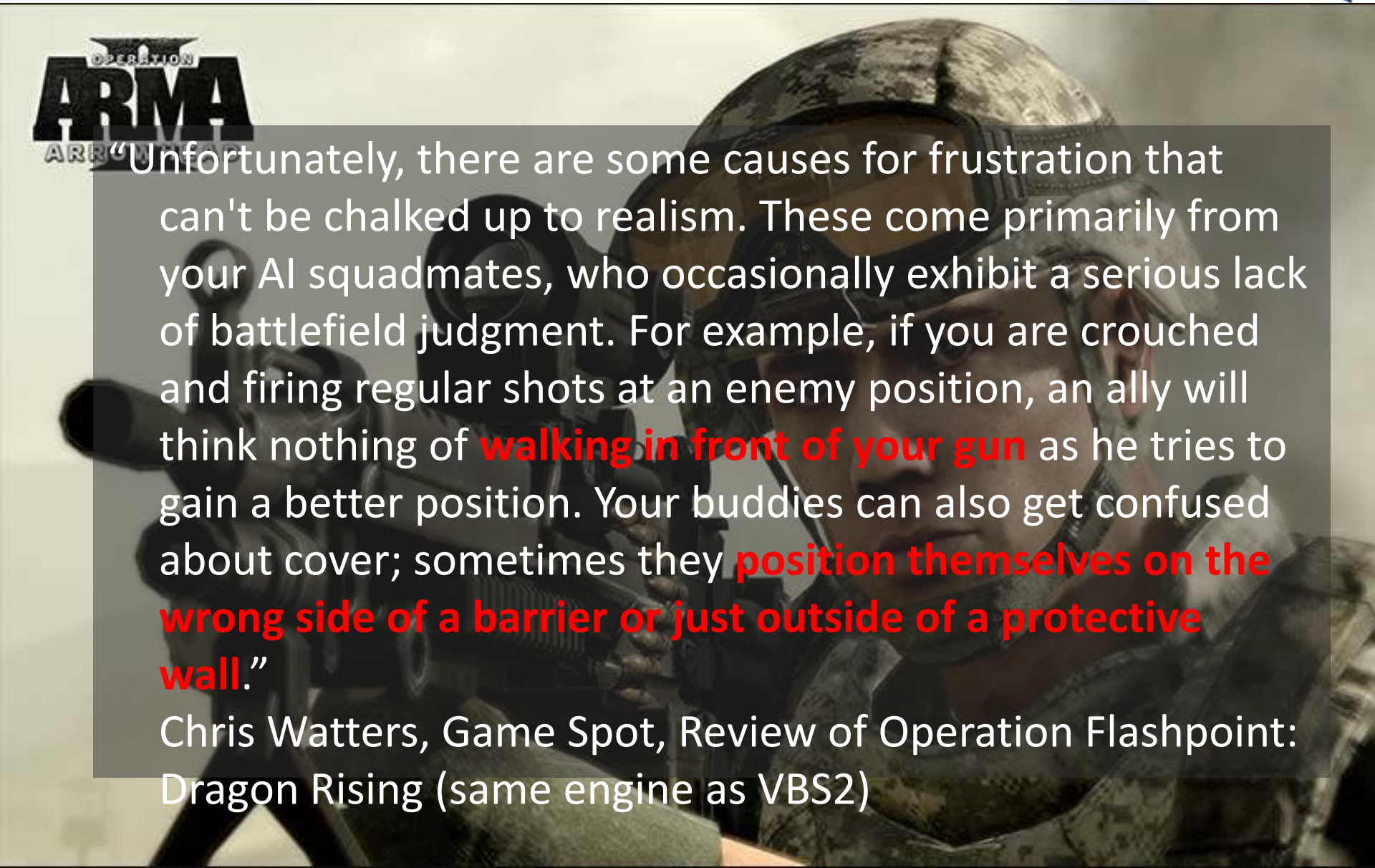
SA for Synthetics: Still an Issue



"Unfortunately, there are some causes for frustration that can't be chalked up to realism. These come primarily from your AI squadmates, who occasionally exhibit a serious lack of battlefield judgment. For example, if you are crouched and firing regular shots at an enemy position, an ally will think nothing of **walking in front of your gun** as he tries to gain a better position. Your buddies can also get confused about cover; sometimes they **position themselves on the wrong side of a barrier or just outside of a protective wall**."

Chris Watters, Game Spot, Review of Operation Flashpoint: Dragon Rising (same engine as VBS2)

Basic SA?

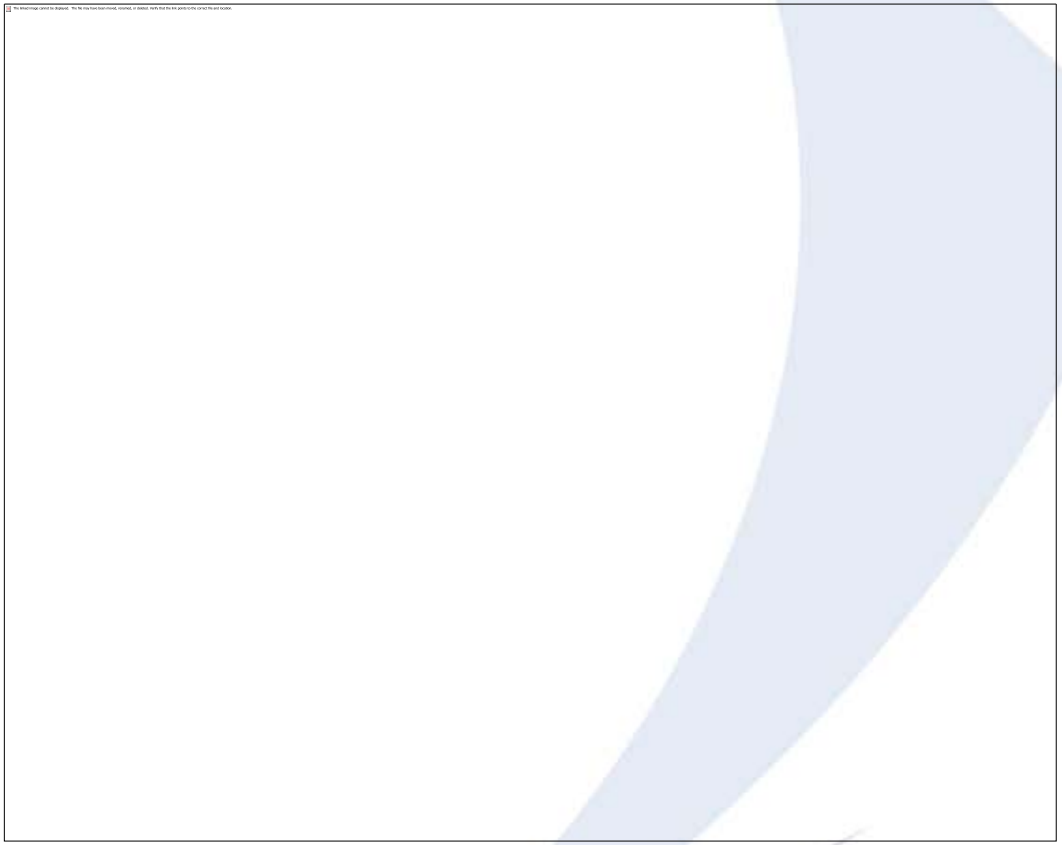
- In human behavior simulation, it is still the case that some necessary phenomena are completely unrepresented
- Then the first task is to provide functionality as quickly as possible, without worrying too much about “how humans actually do it”
- For important phenomena, we will surely have the opportunity to do additional passes for increased realism
- I think we've achieved an infrastructure capable of “basic SA”

Outline

- SA Ingredients
  - Navigation graphs
  - Precomputed detectability (exposure plus contrast)
  - Threat densities
  - Shared move plans
- Way Ahead
  - Transfer to sims
  - Better scaling
  - More human-like approaches

Navigation Graph

- Waypoints
  - Characterize continuous space by a finite set of points
- Edges
  - Indicate where it is possible for blue (or red) to move



Precomputed Detectability

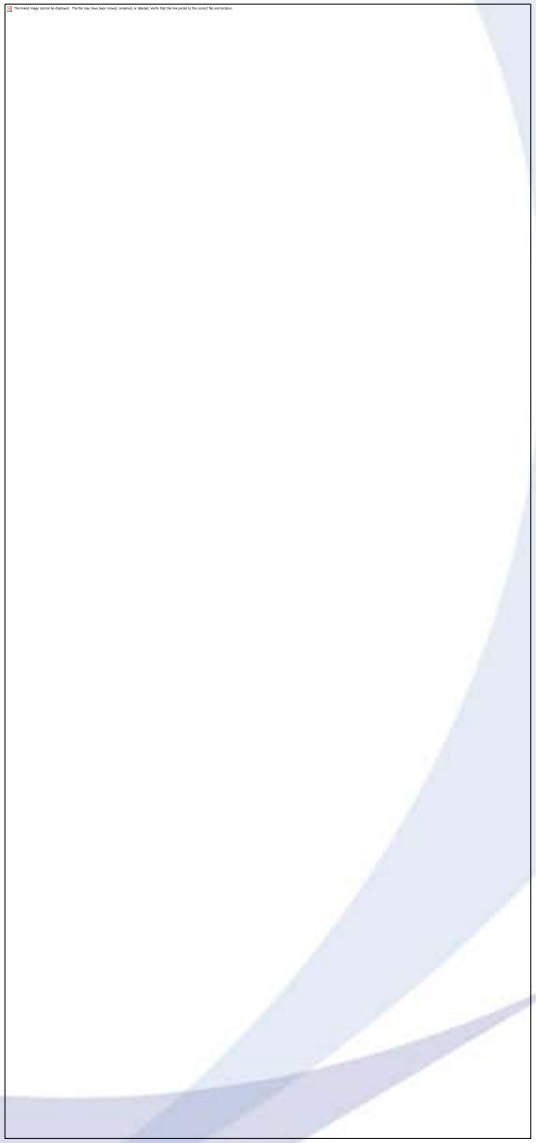
- Contrast and exposed surface area
  - Detection probability (ACQUIRE)
  - Covered positions (including cover from particular threat directions)
  - How exposed each location is to potential shooters

Threat Densities

- Shows where unseen threats may be
- Updated often based on all available information

Shared Move Plans

- Allows individuals and smaller units to plan a move coordinated with the larger unit

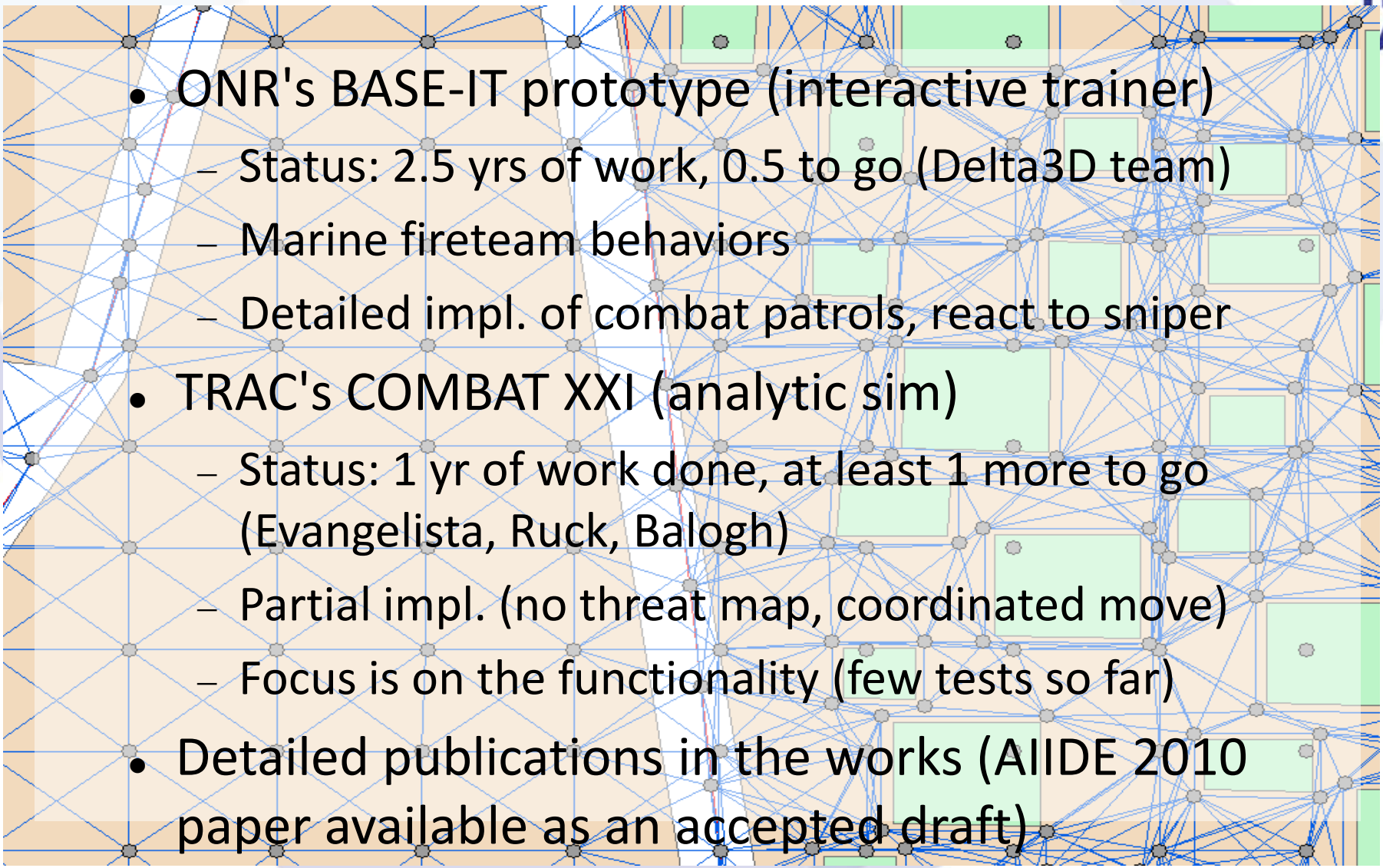


Typical Use Case

- Fireteam is ordered to move to a position and provide overwatch over a given sector
- End positions providing good overwatch and cover are selected (D)
- Fireteam route is planned (G, D)

- Loop
  - Successive individual paths are planned for the next few seconds (G, D, P)
  - Individuals scan for targets and threat density is continuously updated (D,T)

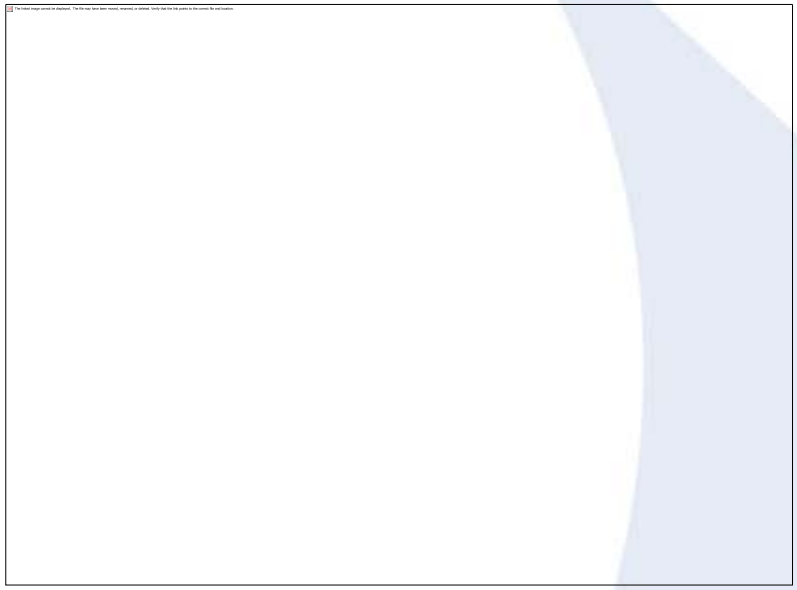
Transfer to Simulations



- ONR's BASE-IT prototype (interactive trainer)
  - Status: 2.5 yrs of work, 0.5 to go (Delta3D team)
  - Marine fireteam behaviors
  - Detailed impl. of combat patrols, react to sniper
- TRAC's COMBAT XXI (analytic sim)
  - Status: 1 yr of work done, at least 1 more to go (Evangelista, Ruck, Balogh)
  - Partial impl. (no threat map, coordinated move)
  - Focus is on the functionality (few tests so far)
- Detailed publications in the works (AIIDE 2010 paper available as an accepted draft)

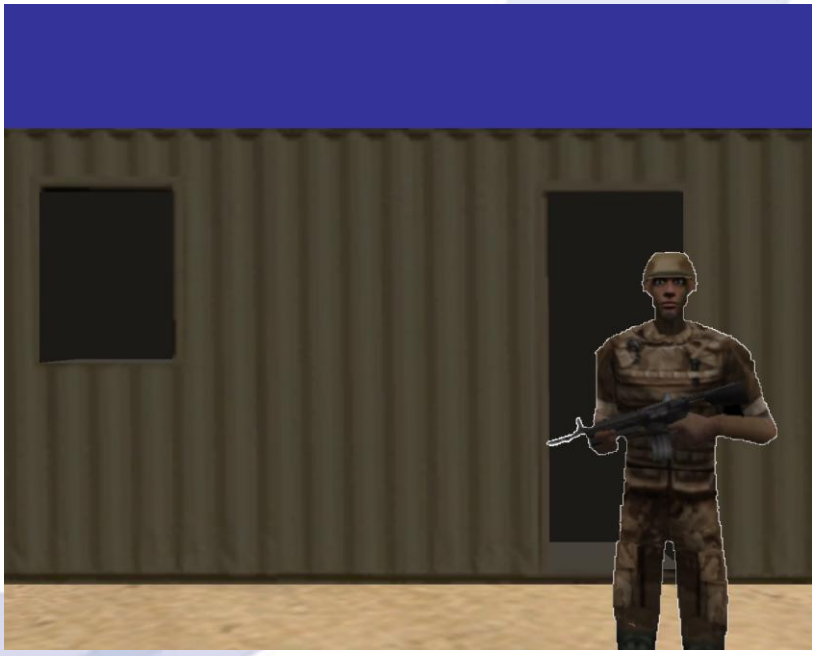
Better Scaling

- Currently implenting a quadtree-based level of detail scheme
- Multiple navigation graphs with of vaying granularity covering the entire terrain
- Coarser graphs can be used far from the action



More Human-Like Approaches

- Image input and computer vision-like approaches instead of navigation graphs
- Already done to a very minor extent in computing detectability parameters
- Agents that use the same inputs as humans should be attempted (video in, mouse and keyboard out)



Summary

- Complete set of basic infrastucture for representing small unit kinetic SA
- Completeness can be “proven” only by developing more behaviors
- Can run at interactive rates for a Marine squad on a small map (half of Range 200 at 29 Palms)
- Should be running on larger terrains (Kilo 2 range at Pendleton) by end of summer
- Relevant to the whole spectrum of ground combat simulations from interactive trainers to analytic sims