



Visual Attention for a Real-Time Strategy Game

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Introduction

- RTS Games present lots of information to the player
- Fundamental problem: Which of this information should be selected, and how should it be presented to the Soar agent?

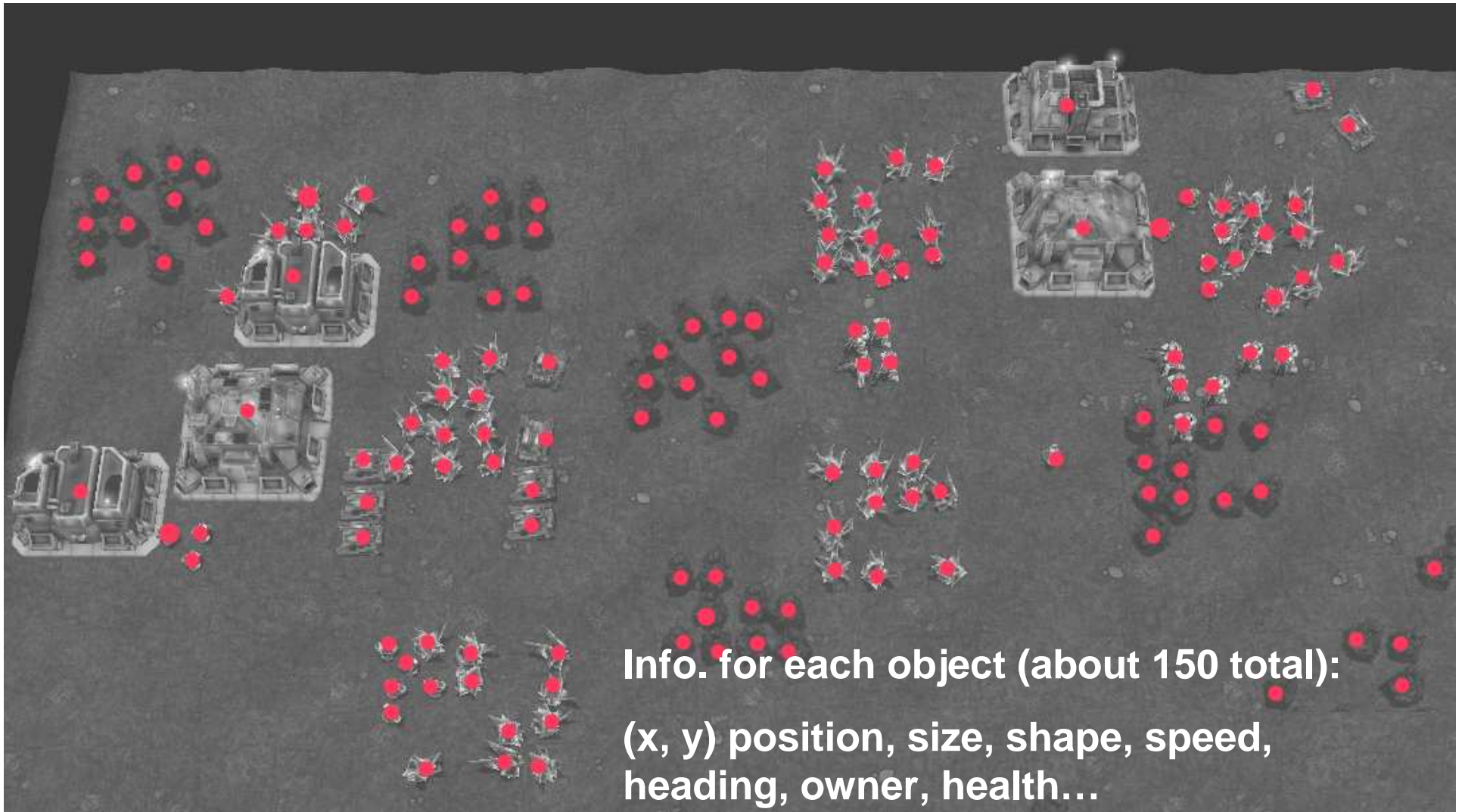


Typical (Small) RTS Game State





Objects Present





Desired Vision System Properties

- Grouping of similar objects
- Levels of abstraction (varying what “similar” means)
- Spatially-local selection
- General information about un-selected regions
- Efficient searching
- “Pop out” effects
- Constant-bounded input size

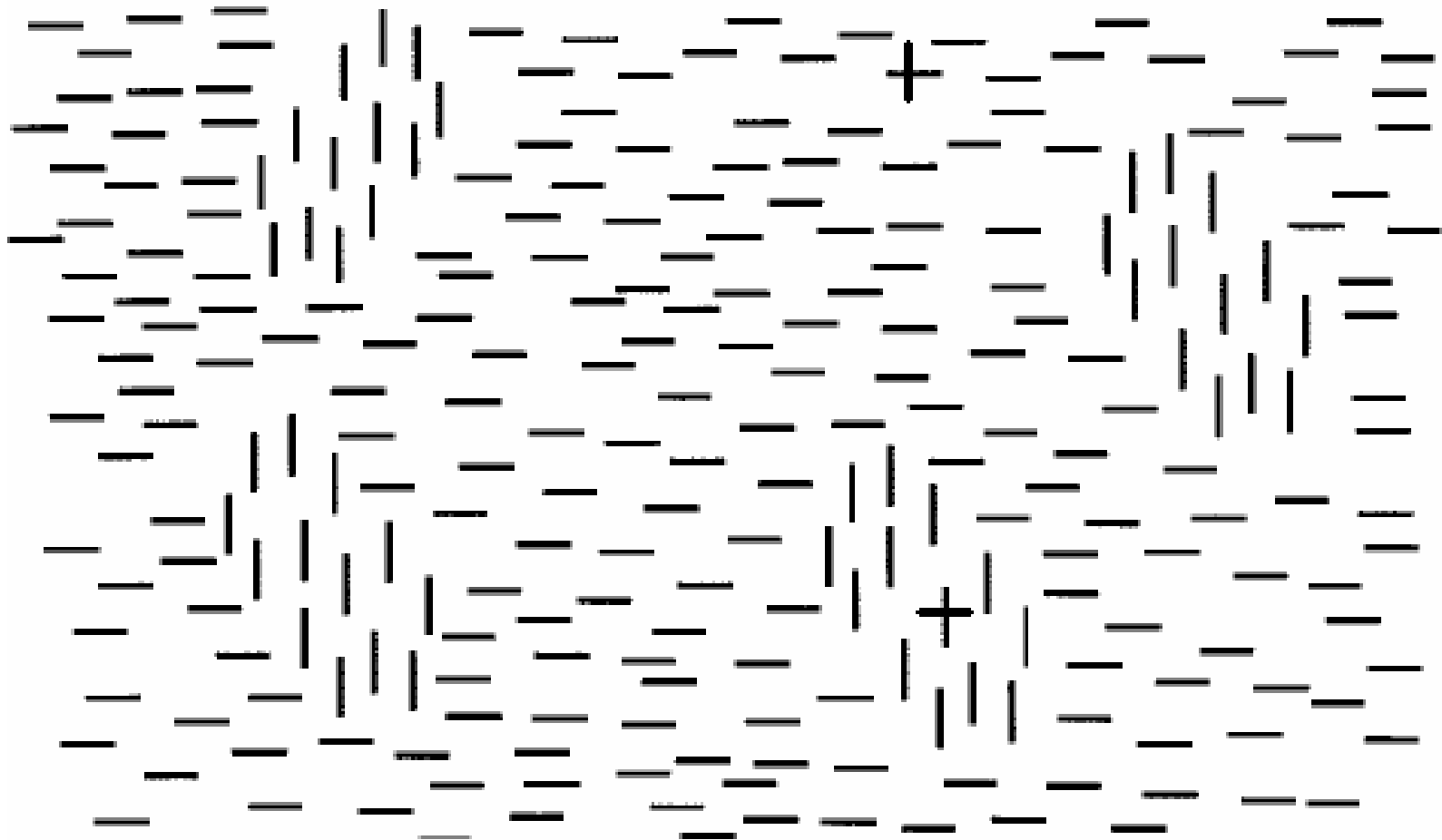


Human Visual Attention

- Gestalt grouping
- Object (group) based selection
- Feature Integration Theory
 - “Feature maps”- information about presence of object features in unattended regions
 - Allow for fast searches for unique features- for example, finding a red object amongst gray objects
- Top-down and bottom-up control



Example- Grouping, Features, Features of Groups





Implementation for Soar/ORTS

- Middleware -> Soar
 - Groups
 - Feature maps
- Soar -> Middleware
 - (x,y) position of focus center
 - Grouping parameters
 - “look at feature” commands
 - Visual range parameters



Grouping of Game Objects, by Type



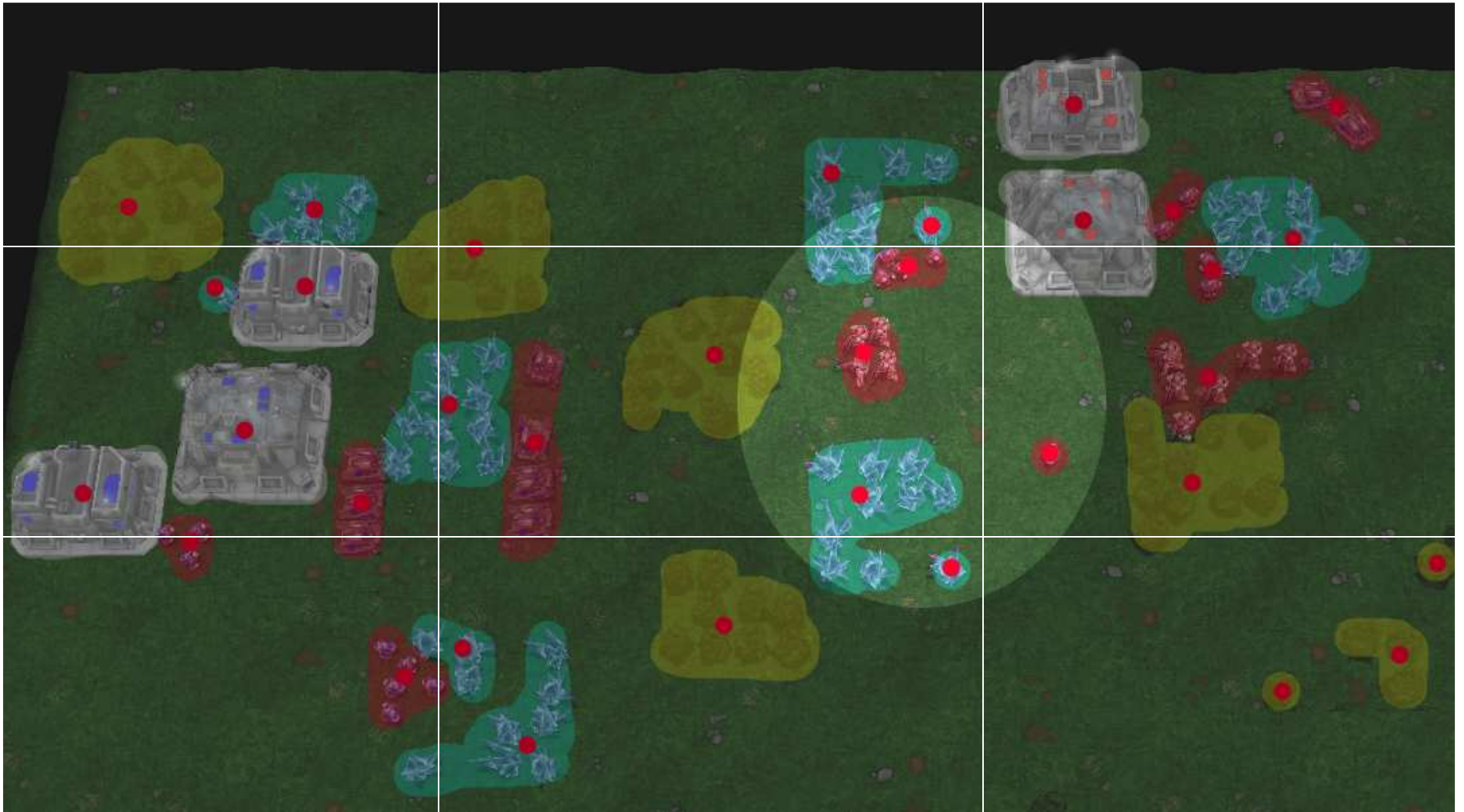


Grouping of Game Objects, by Owner



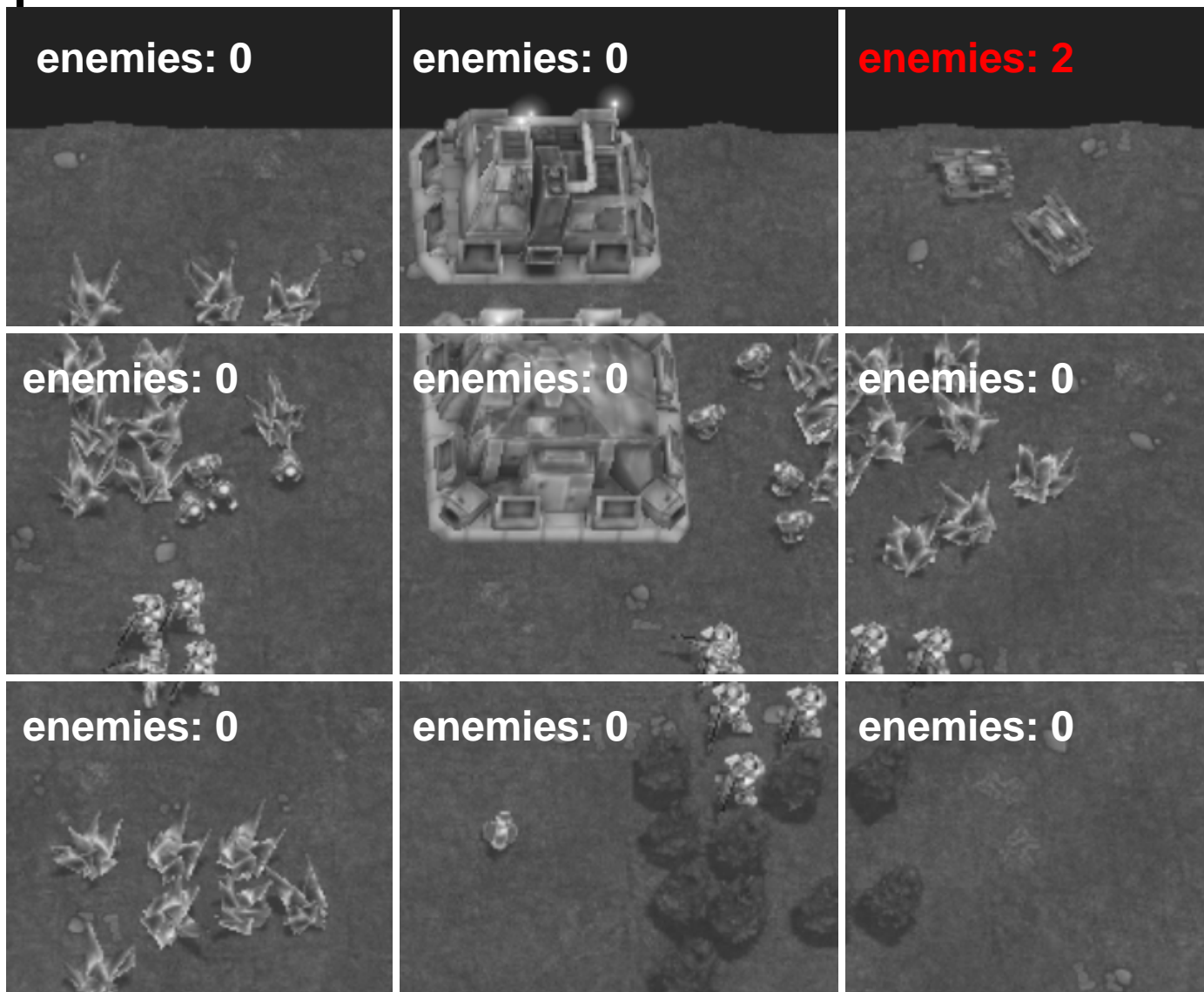


Spotlight of Attention





Feature Map Example





Realism vs. Optimality tradeoffs

- Soar can choose how many groups it sees
- Feature maps based solely on usefulness
- Manual / task-based grouping possible
- Split attention may be added
- Uniform resolution



Progress

- All vision commands have been implemented in the middleware
- Basic usage of commands has been tested
- Soar agent to do more complicated visual tasks under development



Nuggets and Coal

- Nuggets
 - Feature maps have proven straightforward and efficient for finding objects
 - RTS game domain seems a good fit for the system
 - Most of the non-Soar development is done
- Coal
 - Are we overly constraining our system?
 - AIIDE competition..
 - Non-simplistic agent development still has a long way to go