

STARCRAFT 2 AI

Background

Starcraft2 is a real-time, player versus player, strategy game that has two players fighting each other for victory. Real time strategy games are an interesting challenge for AI due to the presence of delayed rewards, high complexity action space, and incomplete game state knowledge (unlike Chess or Go).

Interest in Problem

We wanted to pursue a topic that was related to a hobby we all shared (playing video games). Creating a AI was interesting to us because there are a variety of methods for approaching the problem and each of us had varying domain knowledge about Starcraft2. Furthermore, Blizzard and Deepmind recently released tools to aid in the development of Starcraft2 AI agents.

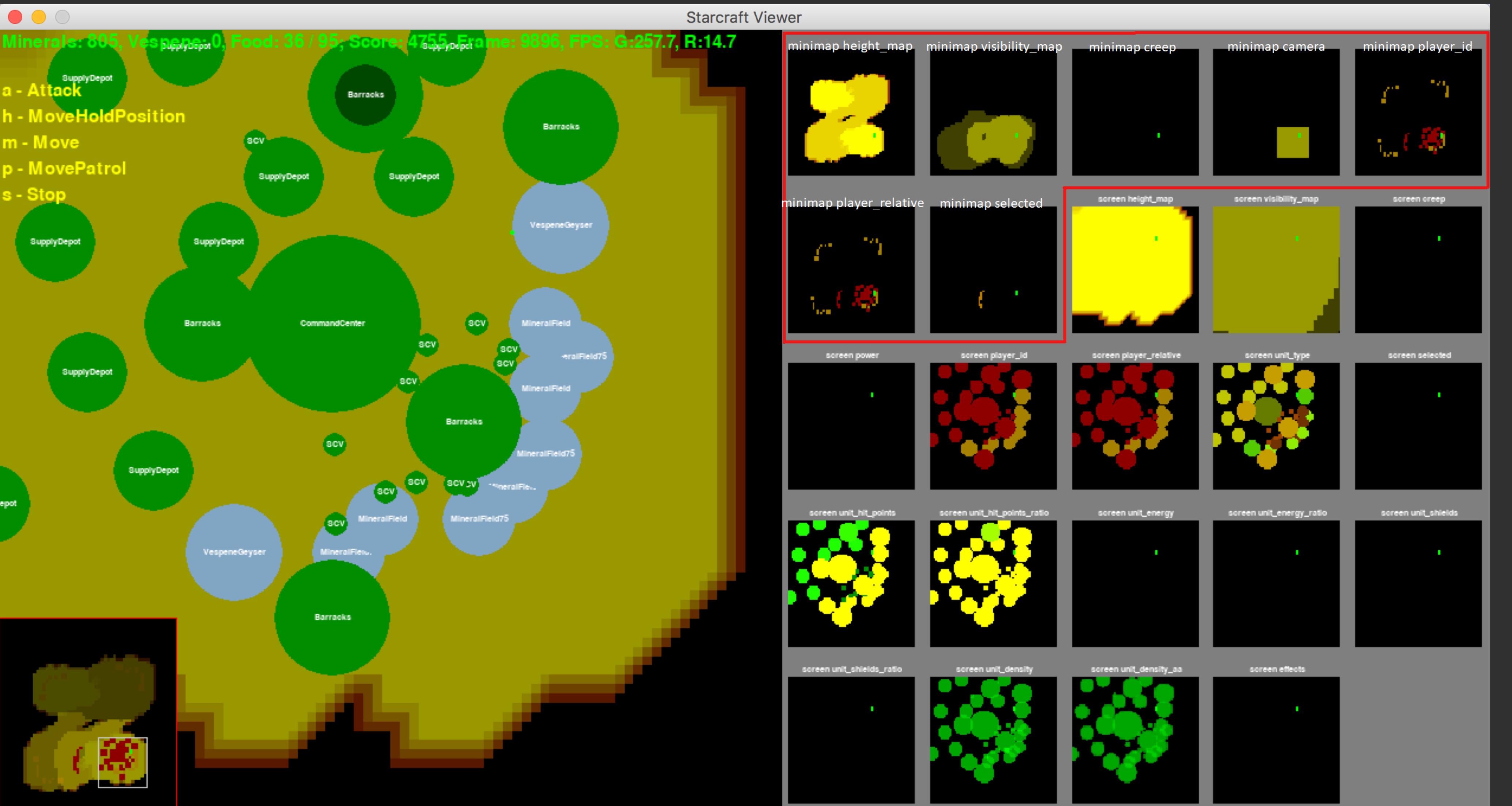
Important Challenges

The challenges related to our project include:

- Long term rewarding
- Long term stochasticity
- Managing Action Input Space
- Training the AI “as a human”

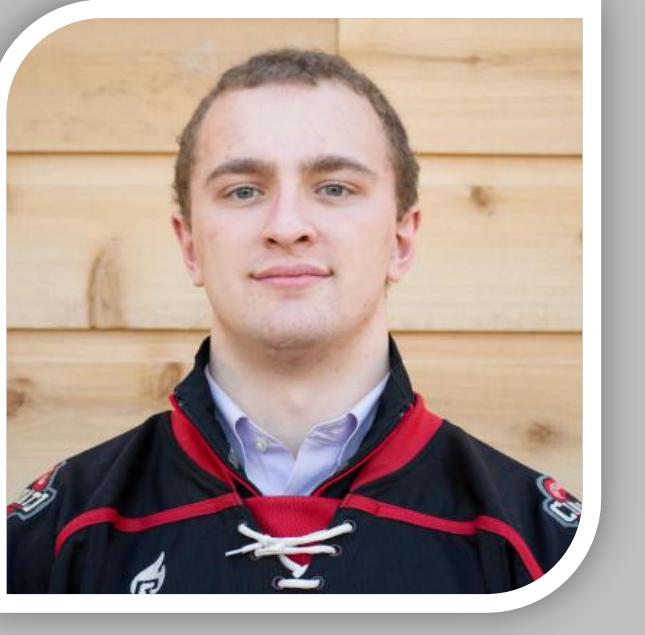
To account for some of these challenges, we developed a deep Q-learning solution.

Design and Input



The seven regions boxed in red above serve as a high-level overview of the first layer of inputs that we feed into our machine learning model. These seven layers are:

- 1) Height Map – observe terrain differences, impacting vision.
- 2) Visibility Map – observe current and past exploration.
- 3) Creep – shows where Zerg has spread “creep”. Race-specific.
- 4) Camera Selection – shows where the camera is currently located.
- 5) Player Id – shows units based on owning-player’s ID.
- 6) Player Relative Team – shows units relative to their respective teams.
- 7) Selected – shows the currently selected unit.



Kyle Arens



Ryan Benner



Jon Deibel



Dr. Ali Minai
Advisor

Results

AI Type

Random Action	0%
Network with No Training	12%
Network with Training	54%

Win Rate vs. Very Easy Random AI

0%

12%

54%

Milestone Achievements

- 10/31 – Develop scripted dumb AI.
- 12/05 – Develop Q-learned model capable of defeating Very Easy AI.
- 1/13 – Update to a deep-learned model with better success than Q-learned.
- 2/5 – Update to sparse and intermittent reward systems.

Future Work

- Expand action space to the full possibility of Terran’s actions.
- Train against multiple maps.
- Train AI to change camera location.
- Utilize Pro-player replay data.
- Expand input space to include all mini-map layers.
- Train AI to play as other races