CMPUT 350 Project
Team 2B

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Motivating our work

- Learn about Starcraft 2
- Develop a bot using SC2API
- Apply algorithm and C++ knowledge

Prior Work in Our Area

https://ojs.aaai.org/index.php/AIIDE/article/view/12961/12809

- The Current State of StarCraft AI Competitions and Bots
- Discusses various past StarCraft AI and Bot competitions, as well as some of the strategies applied by some of the bots.

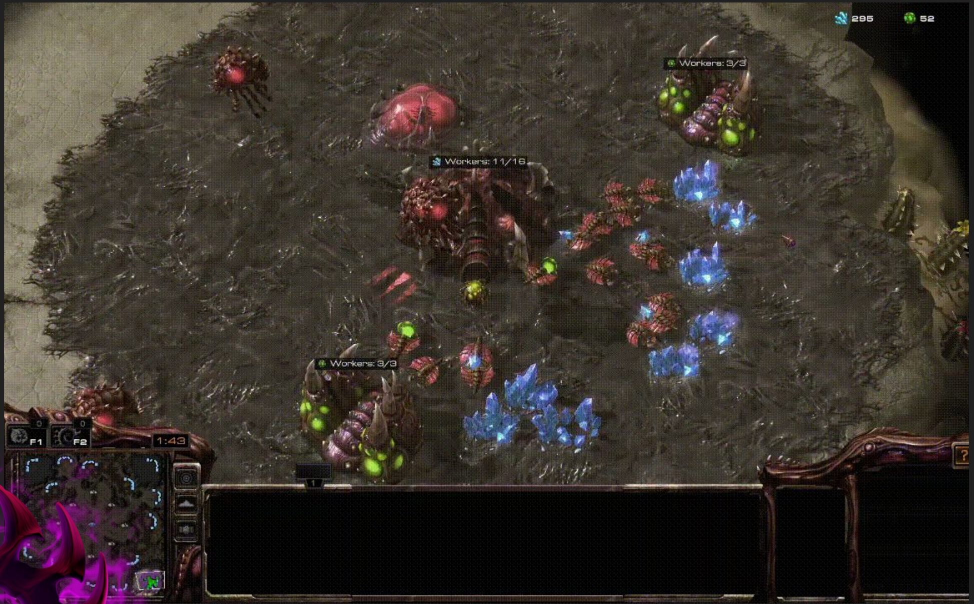
https://www.researchgate.net/publication/319151530_StarCraft_II_A_New_Challenge_for_Reinforcement_Learning

- StarCraft II: A New Challenge for Reinforcement Learning
- Discusses the challenges of using StarCraft II as a reinforcement learning target because of its number of actions, the depth of its state tree, and its status as an incomplete information game.

The Approach

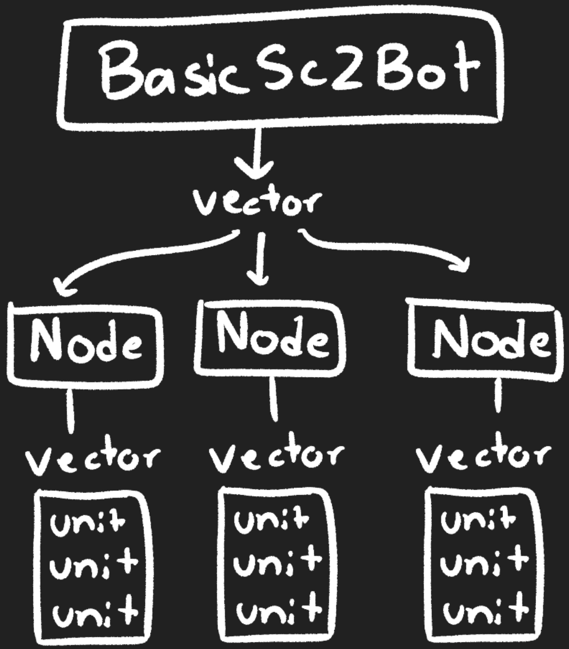
Chose Zerg

- Map Control
  - Distribute units across map
- Low Unit Cost
  - ...but need higher level units too



Bot Structure

- **BasicSc2Bot:** Interfaces with Starcraft2 API. Contains Node vector.
- **Node:** Controls single base of the bot. Contains vector of Units.

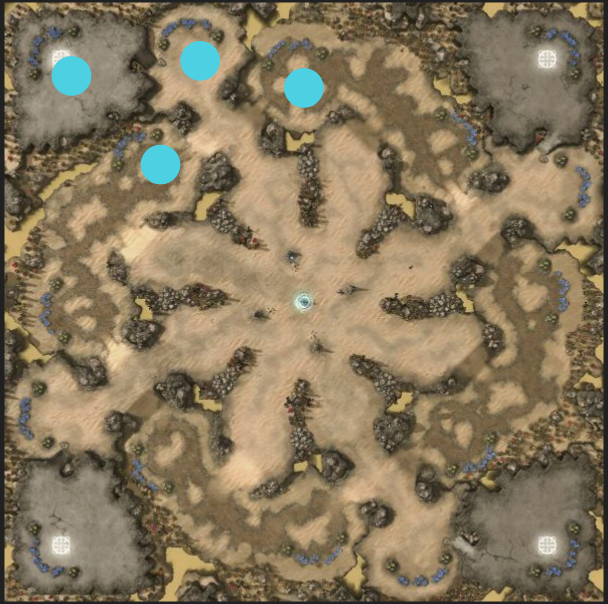


Base Building

- Buildings are constructed once conditions are met.
- Buildings are mainly constructed to help build better units.

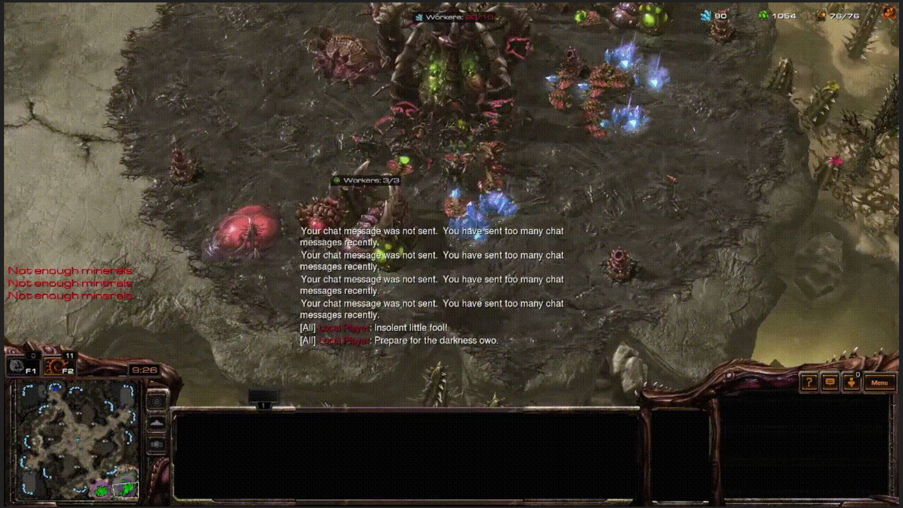
Expanding

- New hatcheries create new nodes
- Node locations are predetermined based on map.
- Uses map rotational symmetry.



Unit Control

- Units of node controlled to do usual tasks
- Special functions change actions for defence, attack, new base, etc.
- Zergling scout finds enemy base early on.
    - Checks each enemy spawn point

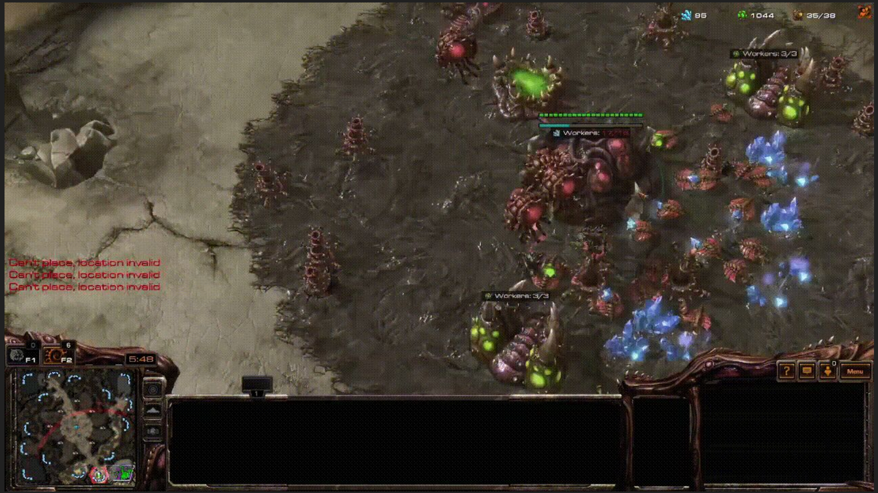


Not enough minerals
Not enough minerals
Not enough minerals

Your chat message was not sent. You have sent too many chat messages recently.
Your chat message was not sent. You have sent too many chat messages recently.
Your chat message was not sent. You have sent too many chat messages recently.
Your chat message was not sent. You have sent too many chat messages recently.
[All] Local Player: Insolent little fool!
[All] Local Player: Prepare for the darkness owo.

Defense

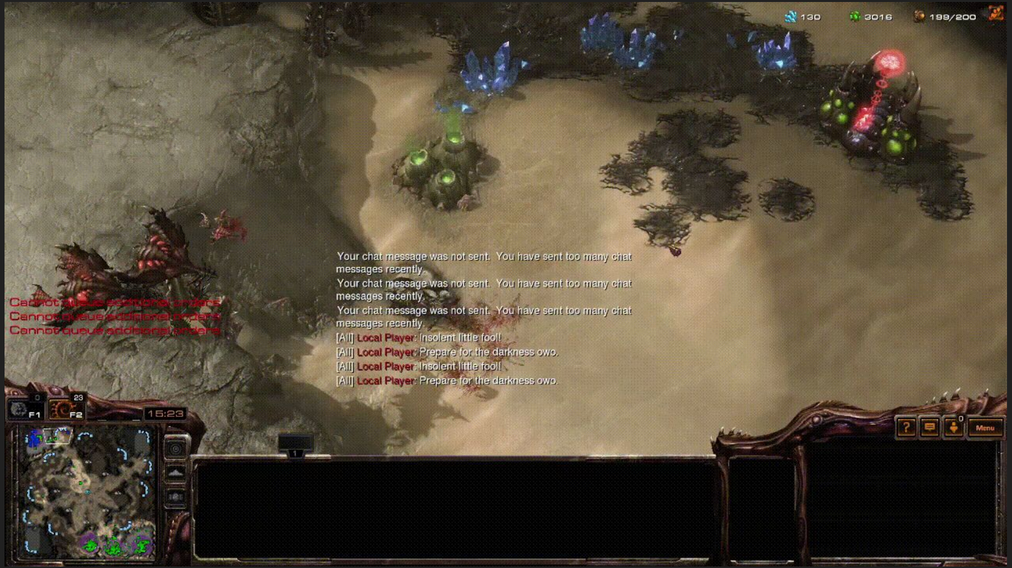
- Keep track of most damaged node (hatchery with lowest health to max health ratio)
- Move defense units to most damaged node
- Also move when making new base



Can't place, location invalid
Can't place, location invalid
Can't place, location invalid

Offense

- Every once in a while, after a certain unit threshold has been reached, we send a set number of units at the enemy.
- Weakens the enemy early on so we don’t have issues later.
- Ambush() and SearchAndAmbush()
- Increases attack size over time



Cannot queue additional orders
Cannot queue additional orders
Cannot queue additional orders

Your chat message was not sent. You have sent too many chat messages recently.
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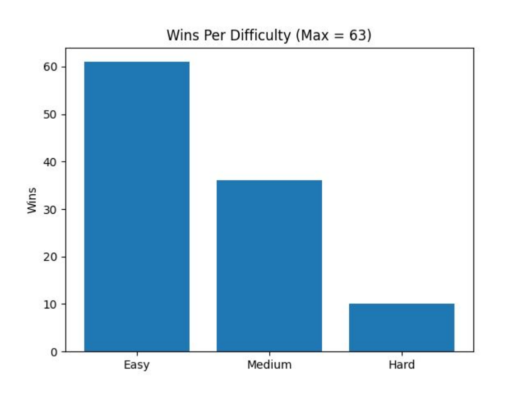
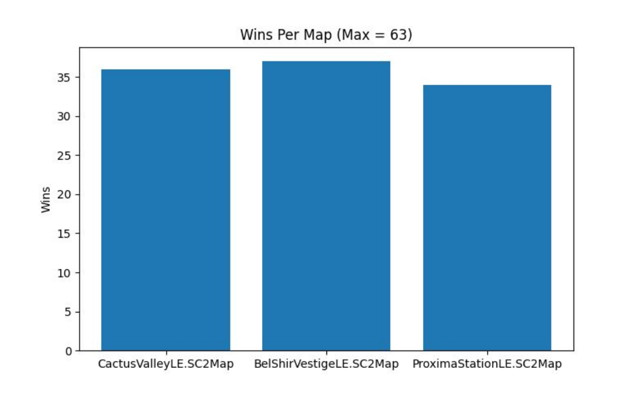
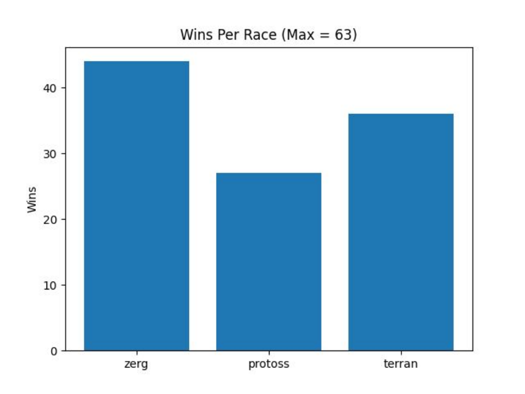
Evaluation


Wins Per Difficulty (Max = 63)
Wins
0
10
20
30
40
50
60
Easy
Medium
Hard


Wins Per Map (Max = 63)
Wins
0
5
10
15
20
25
30
35
CactusValleyLE.SC2Map
BelShirVestigeLE.SC2Map
ProximaStationLE.SC2Map


Wins Per Race (Max = 63)
Wins
0
10
20
30
40
zerg
protoss
terran

Average Time

Average Time per Win: 781 seconds (~13 minutes)

Average Time per Easy win: 744 seconds

Average Time per Medium win: 843 seconds

Average Time per Hard win: 782 seconds

Average Time per Lose: 957 seconds (~16 minutes)

Average Time per Easy lose: 1229 seconds

Average Time per Medium lose: 1216 seconds

Average Time per Hard lose: 814 seconds

Advantages + Disadvantages

Advantages:

- Early ambushes are effective
- Our bases can live for a long time

Disadvantages:

- Hard-coded Hatchery locations, limited to certain maps
- Defense movement time

Future Work + Conclusion

Future work:

- develop a more solid build order
- Improve defensive capabilities

Conclusion:

- Satisfied with our progress

Questions?

Thank you!