
Approximation Models of Combat in StarCraft 2



Ian Helmke
Dan Kreymer
Karl Wiegand

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Outline

- Background and Motivation
 - Problem Statement
 - Approach and Method
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Background: StarCraft 2

- Real-Time Strategy (RTS) computer game



- Gameplay: Gather, build, research, attack, and then destroy all enemy buildings
 - Complex, zero-sum, partial information game
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Problem Statement: One Battle

- Given the composition of two armies, which army will win and which units will remain?

Terran	Zerg
 12 Marines  4 Marauders  4 Hellions	 24 Zerglings  4 Roaches  4 Hydralisks

50%	50%
 2 Marines  2 Marauders  1 Hellions	 3 Hydralisks

Approach: Approximations

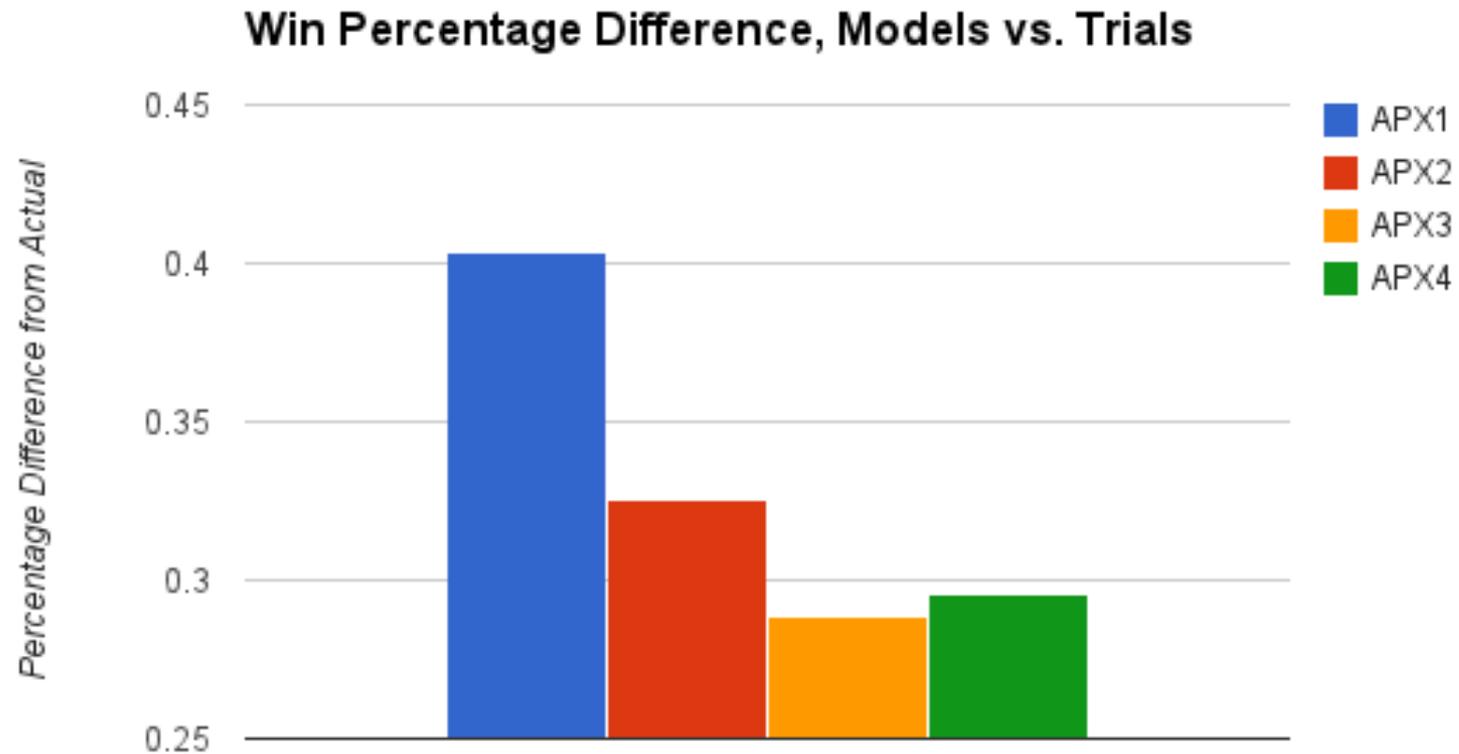
- Units have health, DPS, flags, and basic attributes based on unique type
- APX1: Randomized perfect focus fire
- APX2: Free round of attacks by ranged units
- APX3: Attributes and bonus damage
- APX4: Preferred targeting of melee units

Method: In-Game Testing

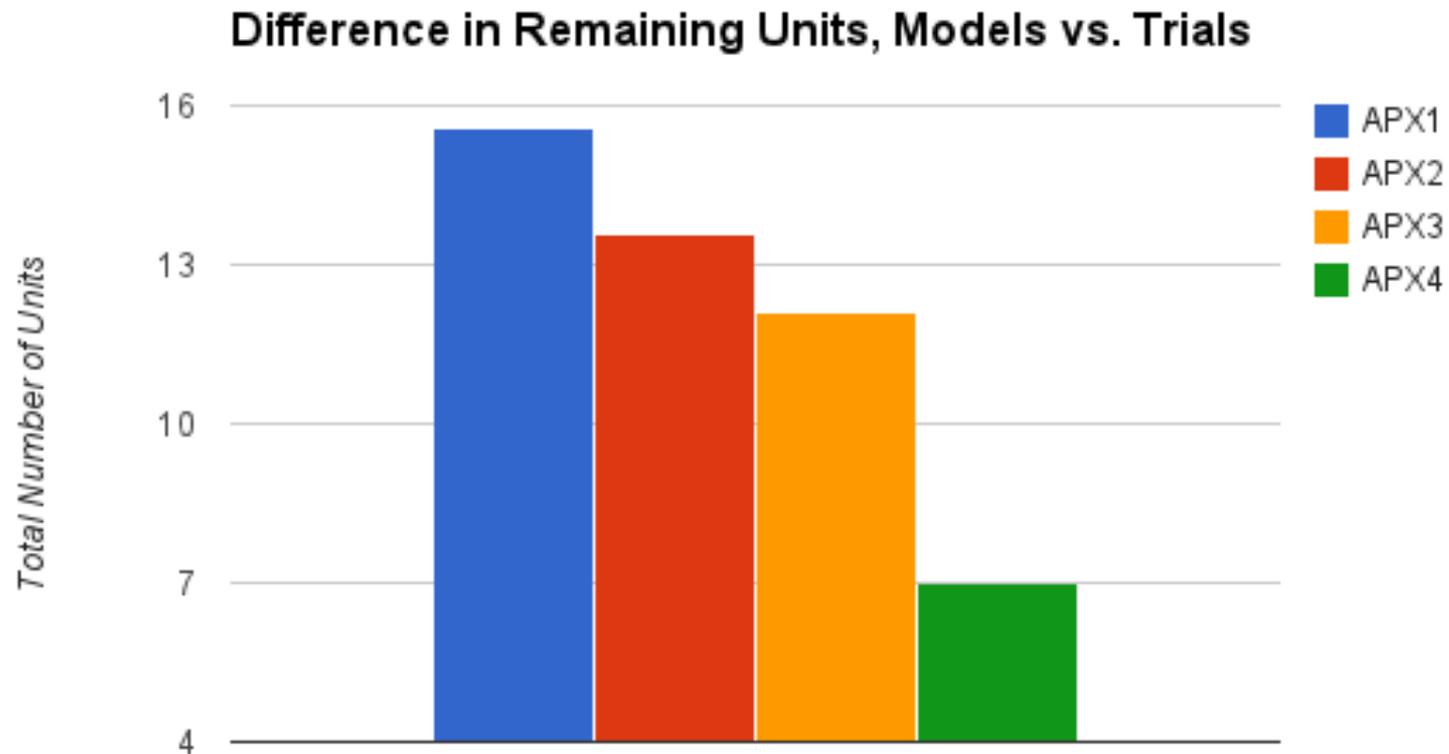
- 12 matches: 4 rounds of 3 different combinations (PvT, TvZ, PvZ)
- Each round increased complexity and size
- 12 custom maps with 10 battles per match
- Tracked compositions and win percentages
- *APX_n*: 12 simulations based on 1,000

Example: Replay of Test Battle

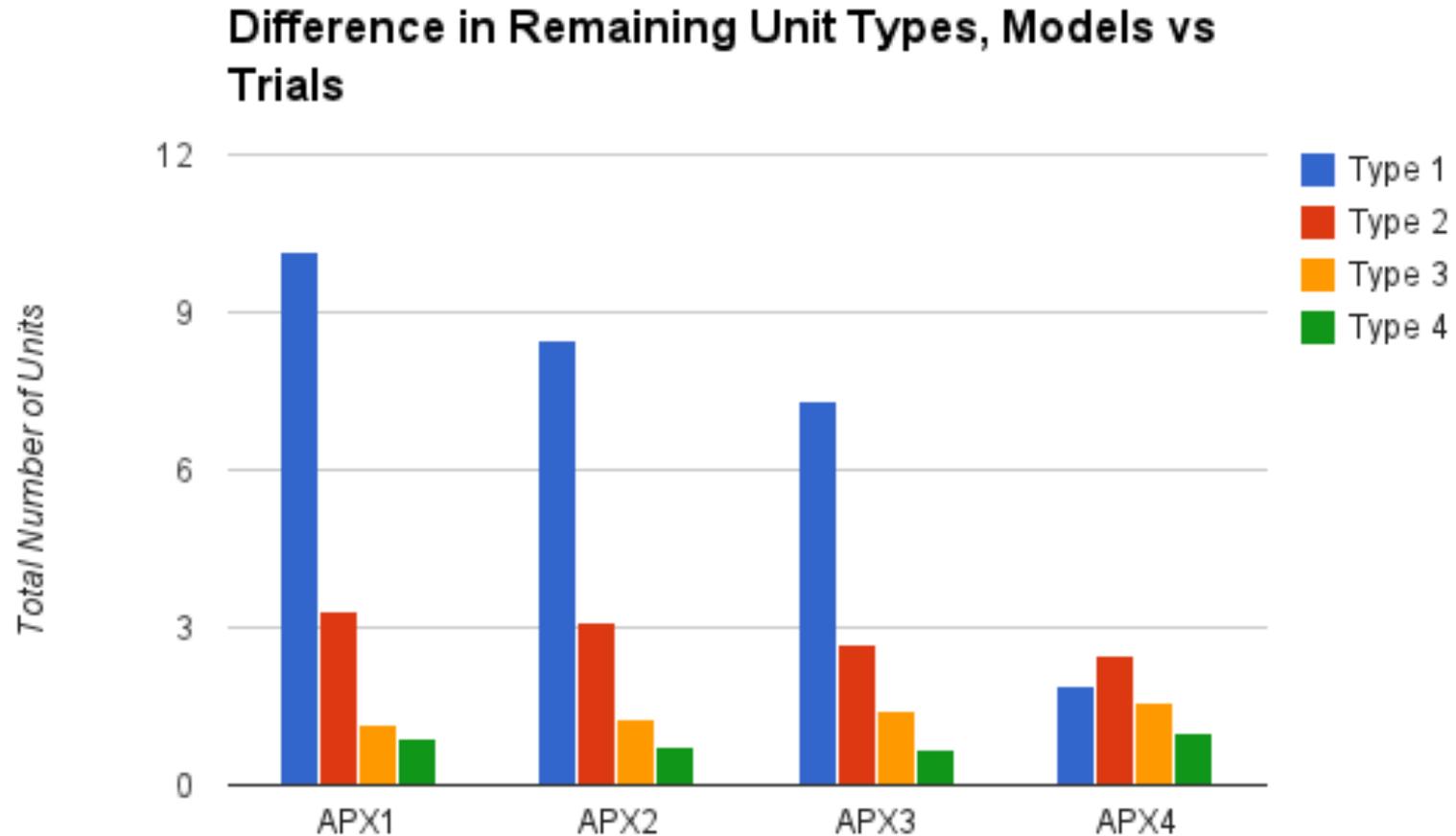
Results: Predicting Victory



Results: Predicting Remaining Units



Results: Predicting Remaining Units



Applications and Limitations

Good:

- Victory determination in decision trees
- Heuristic for many planning algorithms
- Selectively use/combine this model

Bad:

- No micromanagement or formations

Okay:

- No technology or spells
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Future Work

- Technology as a set of rules and effects
 - Spellcasters assumed to be fully effective
 - More testing or creation of a test corpus
 - POMDP for victory prediction
 - Combine with player-specific models to account for micromanagement
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Full report, code, maps, replays, and all results are available at: [<https://bitbucket.org/karlwiegand/sc2apx>].
