BWAPI / UAlbertaBot
CMPUT 350

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Computing Science
StarCraft Introduction

► Two Player War Simulation
► RTS Game Breakdown
   Economy (Macro)
   Combat (Micro)
► Typical Game:
   Few starting units
   Gather resources
   Build up a town / army
   Battles take place
► Played Professionally
► Humans are VERY good
Motivation

► Solving hard AI problems
  ▪ Applicable to other fields

► Game design
  ▪ Better single player experience
  ▪ Training for professionals
  ▪ Game balance

► Creating quality AI agents
  ▪ Beat the best AI bots
  ▪ Beat the humans!
Human Micro – 400apm

Marine Micro

Jaedong

Nada + Moon
STARCRAFT AI COMPETITION

Hosted By: University of Alberta
Edmonton, Alberta  Canada
Tournament Details

► Format
  ▪ 1v1 StarCraft Broodwar – full game
  ▪ Round robin format – 200 rounds
  ▪ Highest win % wins the tournament

► Game Rules
  ▪ 60min time limit – tiebreak with score
  ▪ No ‘cheating’ or game glitches
  ▪ Bots penalized for slow computations. Game loss for those who go over time limits
Participants

► Past Entries

- University of Alberta
- University of Central Florida
- University of Tokyo
- INRIA / Collège de France / LIG
- Blekinge Institute of Technology
- Drexel University
- University of Birmingham
- Université de Sherbrooke
- Sejong University
- Some Independent
BWAPI

- BroodWar Programming Interface
- https://code.google.com/p/bwapi/
- Using Version 3.7.4
- Many Commands to Control BroodWar
  - Get Unit Properties: HP, Position, Energy
  - Give Commands: Gather, Attack, Train
  - Map Info: Tile Walkable, Resources
  - BWTA: Chokepoints, Regions
UAlbertaBot - Overview

- Uses BWAPI, C++
- Uses Protoss Race
- Rushes Opponents
  - Zealot Rush
  - DT Rush
  - (2012) Dragoons
UAlbertaBot Previous Results

► **AIIDE**
  - 2011 – 2\textsuperscript{nd}
  - 2012 – 3\textsuperscript{rd}
  - 2013 – 1\textsuperscript{st}

► **CIG**
  - 2011 – 2\textsuperscript{nd}
  - 2012 – 2\textsuperscript{nd}
  - 2013 – 2\textsuperscript{nd}

► **SSCAI**
  - 2012 – 2\textsuperscript{nd}
UAlbertaBot Design
StarCraft
(huge)
High-Level Strategy

Combat Policies

Resource Gathering

Multi-Agent Pathfinding

Build-Order Planning

Unit Placement

StarCraft
UAlbertaBot - Solutions

- **High-Level Strategy**
  - 2 Strategies
  - Hand-coded from expert play
  - Focus on rushing
  - 2012 used UCB with 3 strategies

- **Resource Gathering**
  - Copy professional heuristics for worker allocation
  - Expand based on in-game timing
UAlbertaBot - Solutions

Unit Placement

- Scripted Rules
- Spiral search for closest placement
- Combat units can 'regroup' when separated

Multi-Agent Pathfinding

- Flood-fill approach
- Finds all paths to single goal
- Runs < 2ms
- In-game path-finding takes over
UAlbertaBot - Solutions

Build-Order Planning

► All planned online
► Depth-first branch and bound
► Goals for build order still scripted

► Enhancements:
  ▪ Macro actions
  ▪ Landmark heuristic
  ▪ Resource heuristics
  ▪ Expert action pruning
UAlbertaBot - Solutions

Attacks Policies

► Attack Policy
  ▪ Always Attack
  ▪ Use simulation to retreat or continue
  ▪ Defend if enemy is near our base

► Unit Control
  ▪ Scripted control
  ▪ Attack biggest threat

► SparCraft
SparCraft

http://code.google.com/p/sparcraft
UAlbertaBot Design
Project Ideas

► Change building placer
► Change race played
► Add drop ships
► Add spell casters
► Make late-game strategy
► Adjust expansion timings
► Modify SparCraft
Relevant Links

► BWAPI
  ▪ https://code.google.com/p/bwapi/

► UAlbertaBot
  ▪ https://code.google.com/p/ualbertabot/

► SparCraft
  ▪ https://code.google.com/p/sparcraft/

► 2013 AIIDE StarCraft AI Competition
  ▪ http://www.StarCraftAICompetition.com

► My Website
  ▪ http://webdocs.cs.ualberta.ca/~cdavid/
Help With BWAPI

► CMPUT 350 Forum

► Email Me
  ▪ dave.churchill@gmail.com

► BWAPI Facebook Group
  ▪ https://www.facebook.com/groups/bwapi/

► BWAPI on IRC
  ▪ #BWAPI on freenode
  ▪ http://webchat.freenode.net/?channels=BWAPI