

Jafar — Intelligent Othello Agent

Joshua Nelson, Tim Cosgrove, Andrew Haigh

COMP3130 Research Project

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Jafar —
Intelligent
Othello Agent

Joshua Nelson,
Tim Cosgrove,
Andrew Haigh

Outline

Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

Future
Improvements

Design
Methodology

- 1 Problem Overview
- 2 Solution Structure
- 3 Static Evaluation
- 4 Learning Algorithms
 - TD- λ
 - Feature Weight Graphs
 - The EloArena
- 5 Future Improvements
- 6 Design Methodology



Problem Overview

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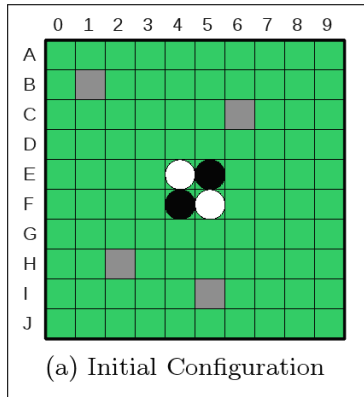
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Algorithms

TD- λ
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Graphs
The EloArena

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Methodology

- The Game — 10x10 Modified Othello



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Overview

Solution
Structure

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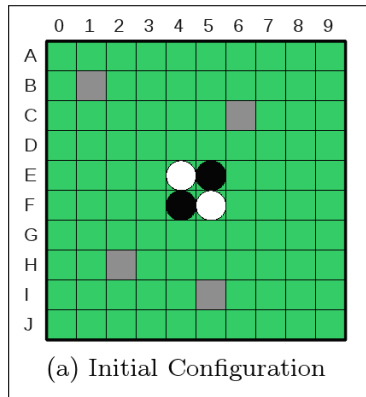
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Algorithms

TD- λ
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Graphs
The EloArena

Future
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- The Game — 10x10 Modified Othello
- The Problem — Intelligent AI player



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Overview

Solution
Structure

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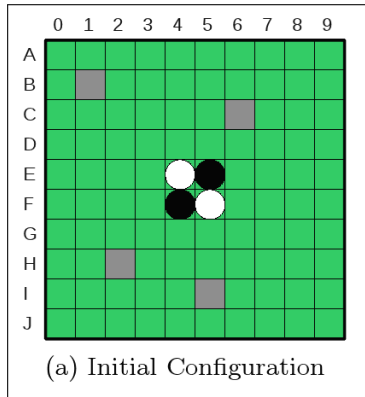
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Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

Future
Improvements

Design
Methodology

- The Game — 10x10 Modified Othello
- The Problem — Intelligent AI player
- Solution basis



Solution Structure

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Problem
Overview

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Structure**

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

Future
Improvements

Design
Methodology

- The MetaPlayer class — Utilises knowledge of the game state and creates instances of other players accordingly

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

Future
Improvements

Design
Methodology

- The MetaPlayer class — Utilises knowledge of the game state and creates instances of other players accordingly
- NegamaxPlayer (varying depth argument)
- OpeningPlayer
- GreedyPlayer

Static Evaluation

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

Future
Improvements

Design
Methodology

- The FeatureSet class — Maintains a list of *features*; functions which evaluate a game state based on some criteria of strength

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Overview

Solution
Structure

Static Evaluation

Learning
Algorithms
TD- λ
Feature Weight
Graphs
The EloArena

Future
Improvements

Design
Methodology

- The FeatureSet class — Maintains a list of *features*; functions which evaluate a game state based on some criteria of strength
- LegalMoves
- Visibility
- StoneCount
- BlockedAdjacent, CornerPieces, SidePieces

TD- λ

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Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ

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- Remaining challenge: decide how important each feature is (the feature 'weights')
- Negative weights not considered (for simplicity)

Feature Weight Graphs

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ

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Graphs**

The EloArena

Future
Improvements

Design
Methodology

The Elo Rankings Arena

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Outline

Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs

The EloArena

Future
Improvements

Design
Methodology

- Custom made genetic algorithm
- Pits a group of randomly generated agents against each other for Elo style ranking points
- Creates new agents from those who perform best

The Elo Rankings Arena

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
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The EloArena

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- Used more as a demonstration of the learning process
- Interesting to see it come to the same conclusions as TD- λ

Future Improvements

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Structure

Static Evaluation

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Algorithms

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Graphs
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- More attention to blocked squares

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

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Design
Methodology

- More attention to blocked squares
- Negamax optimisations (better transposition tables, ... etc.)

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

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- Better use of pre-computed data

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

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Improvements

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- More attention to blocked squares
- Negamax optimisations (better transposition tables, ... etc.)
- Better use of pre-computed data
- More board features (locked squares, open squares, etc.)

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Problem
Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
The EloArena

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Improvements

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- C with a python interface
 - Used this for tic-tac-toe warm up problem, decided against due to development overhead

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Overview

Solution
Structure

Static Evaluation

Learning
Algorithms

TD- λ
Feature Weight
Graphs
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Java

- Sacrifice low level speed improvements for high level language features and built in data structures.

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TD- λ
Feature Weight
Graphs
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Future
Improvements

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Methodology

