EvoGame:
Evolving Game Strategies Using GE (Grammatical Evolution)

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Project Overview

EvoGame is a system where game strategies for draughts, a simple turn-based game are evolved using GE. The project will involve defining a grammar that specifies possible moves and tactics and then using grammatical evolution to iteratively improve these strategies. By simulating thousands of games, the evolved strategies can be tested and refined to find the optimal approach.

- Using the GRAPE engine developed here in UL which implements GE in DEAP
- Several phases of game complexity scaled up as the project progresses. Starting with a smaller board and less complex rule set
- Human prototype testing gauging real world success
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Objectives

1. Develop a system that evolves strategies for draughts using grammatical evolution

2. Implement and optimize a grammar that defines possible game strategies
3. Analyse and visualize the evolution of strategies over multiple generations
4. Iterate these objectives over multiple phases of scaling game complexity
5. Measure the success of the developed strategies for each phase and for the final phase use human competitors to gauge the real-world success

Motivation

Project

Traditional game AI relies on hand-coded logic that is predictable

GE can evolve adaptive solutions, this project will explore the benefit of that and measure its real-world performance

This is a worthy research area as it's not been explored nearly as much traditional AI solutions using minmax etc.

I chose Draughts because of its turn-based nature, clear rules and easily scalable complexity, this makes it an ideal choice for a phased GE project

I chose GRAPE as it is more user friendly and better suited for this project than the alternative

Personal

I've applied for an MSc in Artificial Intelligence and Machine Learning for next year and am interested in working with machine learning in the future

As such I wanted to make sure my FYP had some relation to this to give me more experience going into next year

GRAPE and Grammatical Evolution itself were developed in UL and working with them is an exciting prospect to me

Existing Draughts Bots – WHY GE is still worth it

Draughts is solved?

Chinook – University of Alberta
When this program plays two perfect solutions against each other it will always be a draw

Uses brute force search + endgame databases

Then why bother using GE?

- Chinook has actually still been beaten by humans using different sneaky techniques, adaptive solutions from GE would learn to fight these
- GE could prove better at playing timed modes for real world play

- GE could provide solutions much quicker, without a need for as much expert knowledge or computational power

Most popular methods behind current Draughts Bots

- Traditional AI(minmax) – only becomes nearly unbeatable at high search depth
- Online games mostly use shallow minmax with some heuristics but can be beaten by experienced players (247Checkers, PlayOK, AI Factory)