Kuncheng Feng CSC 466 Candidate Research/Programming Project

Heuristic Playing Machines for Go

Introduction

Go is a 2 player abstract strategy game played on a board with gridded lines, each player has a set of stones of uniform color different from the other player. At each turn each player places a stone on an unoccupied intersection, if a set of stones have all of its adjacent intersections occupied by the different colored stone, then this set will be removed from the board. The aim of the game is to surround more territory than the opponent, and usually terminates when neither player wishes to make another move.

Although the game rules are simple, there are many strategies for playing this game. We humans have many many strategies to win the game, some are inherent instincts that are hard to explain, some are very complex and well researched. As a result it is very difficult to implement good heuristic rules for the AI to follow, it is only until recently in 2015 that an AI (AlphaGo) is able to defeat a human professional player on a full-sized board without a handicap.

This project intends to set up a representational world for the game of Go, as well as some infrastructure that allows players to interact and easily see what is going on in that world. Then some heuristic machines will be built to play the game, their win rates will be analyzed to determine their effectiveness. Due to the anticipated difficulties revolving around the deterministic system and the heuristic machine, only 2 machines are planned for development at this time. 1 randomly playing machine to test out the basic game functions as well as future references, and 1 heuristic machine that follows many rules.

Representational World

First part of the project will be modeling the game board; the standard board has a 19x19 grid of lines, but 13x13 and 9x9 boards are also allowed and are recommended for shorter games or for beginners. The project should allow users to choose the desired board size.

Modeling the Stones

By standards only black and white stones are used, and the black stone usually goes first. But since this project is for the purpose of learning, as long as the stones can be distinguished for the player it is fine on how it is represented.

Game Playing Interface

Reading lines of code to figure out the position of stones is not fun, therefore a basic text based interface will be built to help users identify the positions of stones on the board.

Game Rules

The game has a few rules for playing, such as forbidden moves that result in an infinite loop, rules on what determines a set of stones are encircled, rules on how to determine an area is surrounded. These rules are anticipated to be difficult to implement, but it is needed in order for the game to be played normally.

2 Playing Machines

Due to the amount of complex maneuvers available for the game, not all heuristic rules for the playing machine are going to be implemented, the goal is to have 1 that is good enough.

Analyze the Heuristic Machine

The herusic playing machine will be put against the randomly playing machine to see if it is good enough, by good enough it should be able to win most of the matches.

Reflection

Upon the completion of analyzing heuristic machine, some reflection on its development will be recorded in forms of text.