Final Project: Parallel Hex Agent

Eric Feng: ef2648
Cesar Ramos Medina: cer2178

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1 Introduction

Hex is a board game invented by Piet Hein in 1942 and independently by John Nash in 1948. The game consists of two players, and is typically played on a 11 x 11 rhombus board, with tiles made of hexagons. Players are assigned a pair of opposite sides on the board and take turns placing their pieces on their board. Once a piece is placed, it cannot be moved or removed. An exception to this rule is on the second turn, whereby the second player may choose to switch positions with the first player. This rule is commonly known as the pie rule, and is used because the first player to move typically has a distinct advantage. The first player to connect their assigned sides with a path made of their pieces wins. Interestingly, Hex cannot end in a draw due to the topology of the board. In other words, a clear winner always emerges. A proof of this phenomenon may be found here.

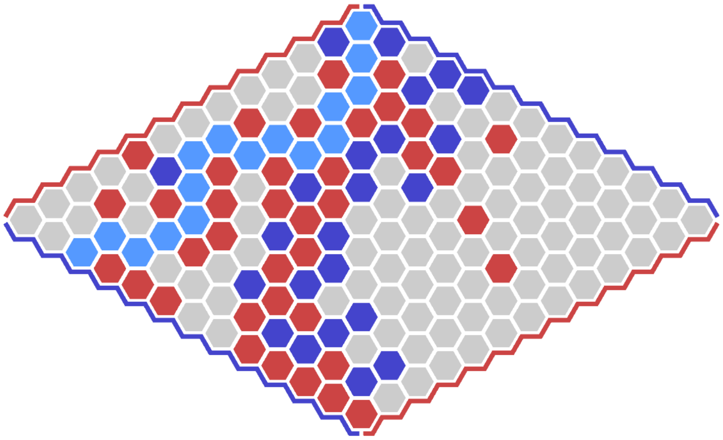

Figure 1: A game of Hex in its finished state. The light blue path indicates the winning path by the blue player.

2 Implementation

We plan to place Hex in the context of an adversarial search problem and create an agent which leverages parallelism to make informed moves. We will consider Hex as zero sum game and formulate a parallel implementation of minimax with $\alpha - \beta$ pruning. Depending on how things go, we will incorporate further optimizations such as heuristics of varying complexities, iterative deepening depth first search, and expectiminimax etc. As strategy in Hex can be quite complicated, there are a lot of resources for us to explore in improving our agent. Furthermore, since there is not just one size of hex board, it will be interesting to see how parallelism scales the bigger a board gets.