**Project Report**

**CS6364: Artificial Intelligence**

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Introduction

This project intends to build a computer program that plays variant of Nine Mens Morris game. Python programming language is utilized for implementation. The first step is to create two programs that can compute the optimum move for White in both the opening and midgame/endgame phases of the game. The second half involves the creation of two programs that use the Alpha-Beta pruning algorithm instead of Minimax, but produce the same estimate values as in Part I. The third step necessitates the use of two programs that compute Black's move rather than White's move. Ultimately, the fourth phase demands the development of an improved static estimate function to replace the original static estimation function.

Part I: MINIMAX

The objective of Part I of the project was to implement the MINIMAX algorithm to determine the best move for the game of Morris-Variant, in both the opening and midgame/endgame phases. The algorithm had to be implemented in two programs, namely MiniMaxOpening and MiniMaxGame, and the programs had to take as input two file names for input and output board positions, and the depth of the tree that needs to be searched.

Program 1: MiniMaxOpening

Program 2: MiniMaxGame

Part II: Alpha-Beta

In this part, we are required to implement the ALPHA-BETA pruning algorithm instead of the MINIMAX algorithm used in Part I. The goal is to write two programs that behave exactly the same as the programs of Part I but return the exact same estimate values while evaluating fewer nodes.

Program 1: ABOpening

Program 2: ABGame

Part III: Play A Game For Black

In this part of the project, we were tasked with writing two programs, MiniMaxOpeningBlack and MiniMaxGameBlack, that are similar to the ones written in Part I, but with the difference that the computed move should be Black’s move instead of White’s move.

Program 1: MiniMaxOpeningBlack

Program 2: MiniMaxGameBlack

Part IV: Play A Game For Black

In this part of the project, we were asked to implement an improved static estimation function for the Morris-Variant game. The goal of this task is to create a more accurate estimation of the game state than the one provided in the handout. This new function will be used in the programs of Part I, replacing the old estimation function.

Program 1: MiniMaxOpeningBlack

Program 2: MiniMaxGameBlack