

BATTLE REVERSI

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PROJECT DESCRIPTION AND GOAL

This project consists of designing and implementing a program that plays Othello. To some this game is also known as Reversi. It will exemplify the minimax algorithm and alpha-beta pruning.

GAME DESCRIPTION

Othello is a two player game . The classical game board is an 8 by 8 grid. At the start of the game there are four pieces in the center of the grid. White in the top-left and bottom-right. Black in the top-right and bottom-left. Players take turns placing pieces on the board until the board is full. The object is to catch opponent's pieces between two of your pieces to flip them to your color. At the end of the game, whoever has the most pieces on the board wins.

- **Pieces**

One of the players uses **white** pieces and the other one uses **black** pieces.

- **Board**

We will use an 8x8 board. We will label the the board columns A through H (left to right), and the rows 1 through 8 (bottom to top).

- **Moves**

- The player with the white piece moves first.
- There are two types of legal moves. First are those which trap at least one opponent piece between pre-existing pieces of your color on the board and the currently placed piece. This trapping could be horizontal, vertical, or diagonal. The other legal move is

a **PASS**. This move can only be taken when there are no trapping legal moves available for the player to take. See links at the bottom for game downloads and online play.

- It is true that moves alternate between black and white, but to be explicit, we will describe a move as a triple: (*color column row*) where:
 - *color* is either B for black or W for white,
 - *column* is a letter from A to H, or P for passing
 - *row* is a number from 1 to 8, (doesn't matter which number if column=P)
 - the parentheses are required.
- NOTE: Executing a PASS when there are other moves is considered an illegal move. In the tournament, this would automatically cause a loss.
- For example, a possible first move of the game is (W D 3), meaning that a white piece is placed in column D (the fourth from the left), and it occupies row 3 (the third from the bottom). This would result in the black piece at (D,4) being converted to a white piece . It would then be player 2's turn. A possible move for Black would be (B C 3), placing a black piece in column C, row 3. This results in the white piece at (D,4) being converted to a black piece .
- **Game Rules**

A game will consist of a sequence of the following actions:

1. It is selected at random which player will use the white pieces and which player will use the black pieces. In what follows, the player that gets to use the white pieces is called *player 1* and the player that gets to use the black pieces is called *player 2*.
2. Player 1 gets to play first.
3. After that, the players take turns moving. A move (*color column row*) must satisfy the following constraints:
 1. **Move preconditions** (if not passing)
 1. *color* is W if it is player 1's turn and B if it is player 2's turn.
 2. There is no piece at *column, row*.
 3. *column, row* is a valid board location ($A \leq column \leq H$, $1 \leq row \leq 8$)
 4. There is a sequence of opponent pieces followed by your piece starting from *column, row* in at least one of eight directions. If not, the turn is lost and the other player goes again.
 2. **Move postconditions** (if not passing)
 1. After the move, the place at *column* and *row* on the board will be occupied by a *color* piece.
 2. For each of eight directions (up, up-right, right, right-down, down, down-left, left, left-up) any sequence of opponent pieces followed by your piece starting at *column, row* is converted to a *color* piece.
 3. It will be the other player's turn.
 3. **Move preconditions** (if column = P)
 1. There is no open (col,row) with a necessary sequence of opponent pieces followed by your piece starting there.

4. **Move postconditions** (if column = P)
 1. The board configuration remains unchanged
 2. It will be the other player's turn.
4. The game ends in any of the following cases:
 1. The board is full. The player with the most pieces *wins* the game, and the other *loses* the game. If the number of pieces is equal, then the game is a *draw*.
 2. neither player can make a legal move, the player with the most pieces *wins*.
 3. a player makes an illegal move - the other player *wins*.
 4. a player fails to move within the time limit - the other player *wins*.