

OTHELLO

DOCUMENTATION

Random:

This agent chooses moves randomly from the legal moves available and perform that move to progress the game further. There are 50% chance of winning if random agent is used.

Time used by this agent is 0.0281 secs.

Testing:

```
ak4229@tux1: ~/IntrotoAI/othello
X . X X 0 0 0 0
X X 0 0 0 0 X 0
X 0 X X 0 X X 0
X X 0 0 X 0 0 0
X X 0 0 0 X 0 0
X 0 0 0 0 0 X 0
. . 0 0 0 0 0 X

0: Player X to 1,1
1: Player X to 7,1
Player X to 1,1

Current state, 0 to move:
0 0 0 0 0 0 0 0
X X X X 0 0 0 0
X X X 0 0 0 X 0
X 0 X X 0 X X 0
X X 0 0 X 0 0 0
X X 0 0 0 X 0 0
X 0 0 0 0 0 X 0
. . 0 0 0 0 0 X

0: Player 0 to 7,0
Player 0 to 7,0

Current state, X to move:
0 0 0 0 0 0 0 0
0 X X X 0 0 0 0
0 X X 0 0 0 X 0
0 0 X X 0 X X 0
0 X 0 0 X 0 0 0
0 X 0 0 0 X 0 0
0 0 0 0 0 0 X 0
0 . 0 0 0 0 0 X

0: Player X to 7,1
Player X to 7,1
Total time taken: 0.02817368507385254

*** Final winner: 0 ***
0 0 0 0 0 0 0 0
0 X X X 0 0 0 0
0 X X 0 0 0 X 0
0 0 X X 0 X X 0
0 X 0 0 X 0 0 0
0 X 0 X 0 X 0 0
0 X X 0 0 0 X 0
0 X X X X X X X

ak4229@tux1:~/IntrotoAI/othello$
```

Minimax:

This agent performs minimax algorithm for selecting the most optimal move. This agent accepts the depth from the user upto which it should perform the search.

Time used by this agent for depth 2 is 2.7940 secs.

Time used by this agent for depth 3 is 24.50secs.

Testing:

Depth=2

```
ak4229@tux1: ~/IntrotoAI/othello
X X X X X 0 0 X
X 0 X X 0 X 0 X
X X 0 0 X 0 X X
X 0 0 0 X 0 0 X
X 0 0 0 X X 0 X
X 0 0 0 0 0 X X
X 0 0 . X . . X

0: Player 0 to 7,6
Player 0 to 7,6

Current state, X to move:
X X X X X X X X
X X X X X 0 0 X
X 0 X X 0 X 0 X
X X 0 0 X 0 X X
X 0 0 0 X 0 0 X
X 0 0 0 X X 0 X
X 0 0 0 0 0 0 X
X 0 0 . X . 0 X

0: Player X to 7,3
1: Player X to 7,5
Player X to 7,5

Current state, 0 to move:
X X X X X X X X
X X X X X 0 0 X
X 0 X X 0 X 0 X
X X 0 0 X 0 X X
X 0 X 0 X 0 0 X
X 0 0 X X X 0 X
X 0 0 0 X X X X
X 0 0 . X X X X

0: Player 0 to 7,3
Player 0 to 7,3
Total time taken: 2.794010639190674

*** Final winner: X ***
X X X X X X X X
X X X X X 0 0 X
X 0 X X 0 X 0 X
X X 0 0 X 0 X X
X 0 X 0 X 0 0 X
X 0 0 X X 0 0 X
X 0 0 0 0 X X X
X 0 0 0 X X X X

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```

Depth=3

C:\ ak4229@tux1: ~/IntrotoAI/othello

```
0 X 0 X 0 X 0 0
0 0 0 0 0 0 0 0
0 0 0 X 0 X 0 0
. 0 X 0 X X X 0
X 0 0 0 0 X 0 0
X 0 X . X X X .
```

0: Player X to 5,0

1: Player X to 7,3

2: Player X to 7,7

Player X to 5,0

Current state, 0 to move:

```
0 X X X X X X X
X X X X 0 X 0 0
X X 0 X 0 X 0 0
X 0 X 0 0 0 0 0
X X 0 X 0 X 0 0
X X X 0 X X X 0
X X 0 0 0 X 0 0
X 0 X . X X X .
```

0: Player 0 to 7,3

Player 0 to 7,3

Current state, X to move:

```
0 X X X X X X X
X X X X 0 X 0 0
X X 0 X 0 X 0 0
X 0 X 0 0 0 0 0
X X 0 X 0 X 0 0
X X X 0 X X X 0
X X 0 0 0 X 0 0
X 0 0 0 X X X .
```

0: Player X to 7,7

Player X to 7,7

Total time taken: 24.502174377441406

*** Final winner: X ***

```
0 X X X X X X X
X X X X 0 X 0 X
X X 0 X 0 X 0 X
X 0 X 0 0 0 0 X
X X 0 X 0 X 0 X
X X X 0 X X X X
X X 0 0 0 X X X
X 0 0 0 X X X X
```

Alphabeta:

This agent performs Minimax search with alpha beta pruning to get the optimal move and perform it to further progress in the game. This agent is similar to minimax agent, but is modified with aplhabeta pruning to get results fast and to perform search at more depths. As user increases the depth for alphabeta agent, the chances for winning increases.

Time taken by this agent at depth 5 is 0.2472 secs.

Time taken by this agent at depth 7 is 0.2767 secs.

Testing:

Depth=5

```

ak4229@tux1: ~/IntrotoAI/othello
X X 0 X X X X X
0 . 0 0 0 0 X X
0 0 0 0 0 X X 0
0 0 0 0 0 X 0 0
0 0 0 X 0 0 0 0
. 0 X 0 0 0 0 0
0 0 0 0 0 0 0 0

0: Player X to 2,1
1: Player X to 6,0
Player X to 2,1

Current state, 0 to move:
X 0 0 0 0 0 0 0
X X 0 X X X X X
0 X X X X X X X
0 0 0 0 0 X X 0
0 0 0 0 0 X 0 0
0 0 0 X 0 0 0 0
. 0 X 0 0 0 0 0
0 0 0 0 0 0 0 0

Player 0 passes the move!

Current state, X to move:
X 0 0 0 0 0 0 0
X X 0 X X X X X
0 X X X X X X X
0 0 0 0 0 X X 0
0 0 0 0 0 X 0 0
0 0 0 X 0 0 0 0
. 0 X 0 0 0 0 0
0 0 0 0 0 0 0 0

0: Player X to 6,0
Player X to 6,0
Total time taken: 0.24724841117858887

*** Final winner: 0 ***
X 0 0 0 0 0 0 0
X X 0 X X X X X
X X X X X X X X
X 0 0 X 0 X X 0
X 0 X 0 0 X 0 0
X X 0 X 0 0 0 0
X X X 0 0 0 0 0
0 0 0 0 0 0 0 0

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```

Depth=7

```

ak4229@tux1: ~/IntrotoAI/othello
. 0 0 X X 0 X 0
0 0 0 0 X 0 0 0
0 0 0 0 X 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 X .

0: Player X to 1,0
1: Player X to 3,0
2: Player X to 7,7
Player X to 3,0

Current state, 0 to move:
X 0 0 0 0 0 0 0
. 0 0 0 X 0 X 0
0 X X 0 0 0 X 0
X X X X X 0 X 0
0 0 0 0 X 0 0 0
0 0 0 0 X 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 X .

0: Player 0 to 1,0
1: Player 0 to 7,7
Player 0 to 1,0

Current state, X to move:
X 0 0 0 0 0 0 0
0 0 0 0 X 0 X 0
0 0 X 0 0 0 X 0
X X 0 X X 0 X 0
0 0 0 0 X 0 0 0
0 0 0 0 X 0 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 X .

0: Player X to 7,7
Player X to 7,7
Total time taken: 0.2767791748046875

*** Final winner: 0 ***
X 0 0 0 0 0 0 0
0 0 0 0 X 0 X 0
0 0 X 0 0 0 X 0
X X 0 X X 0 X 0
0 0 0 0 X 0 0 0
0 0 0 0 X X 0 0
0 0 0 0 0 0 X 0
0 0 0 0 0 0 X X

ak4229@tux1:~/IntrotoAI/othello$

```

Note: Sometimes Minimax and Alphabeta loose or results in draw because accuracy rate is not 100%. But at increased depths they both mostly wins against random agent.