ReverseCohol™

Reversi with Alcohol

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Concept

Implementation of the famous board game Reversi (a.k.a "othello") with few 'twists':

- Instead of the classic partition of "Black and White" – the game pieces are glasses filled with alcohol (or empty).

- Since alcohol consumption impairs human coordination and judgment – a 'drinking' simulation is inserted to the computer game.
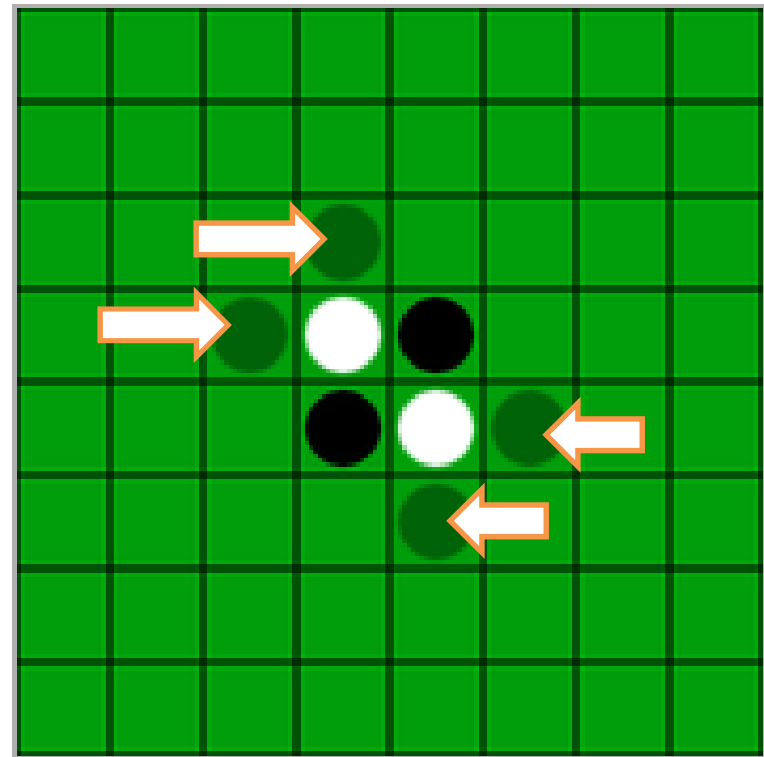
Game Rules

- Goal: to be the player with most pieces on the board at the end of the game – when the board is full.

- Start position: the game begins with four pieces placed in a square in the middle of the grid, two facing white up, two pieces with the black side up.
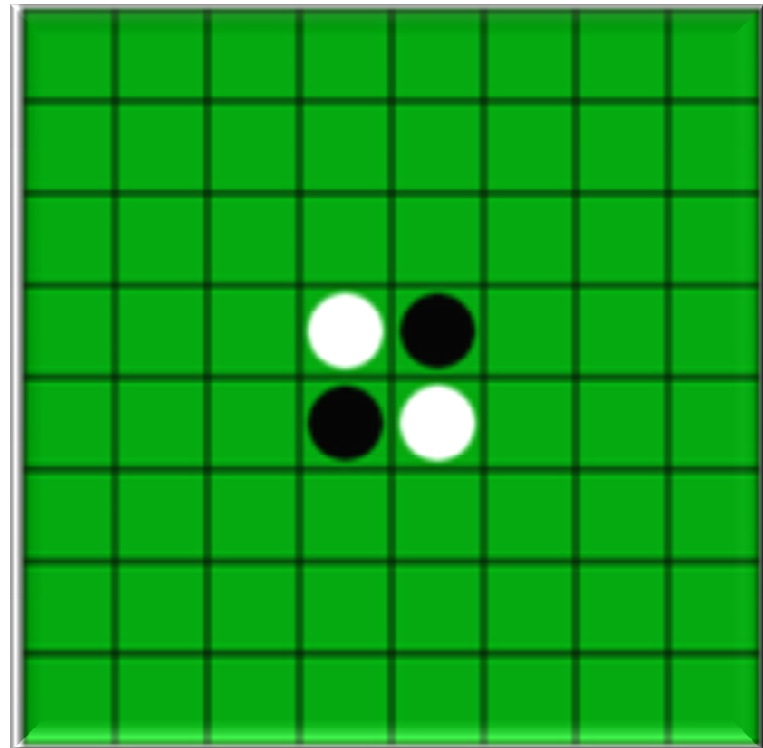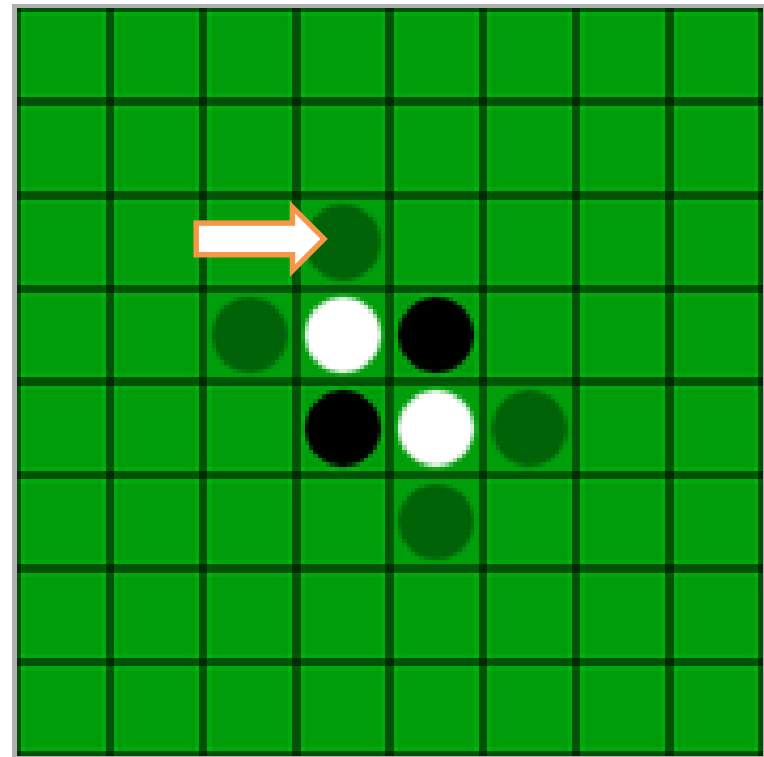
Game Rules

- Every player can place a piece in such a position that there exists at least one straight (horizontal, vertical, or diagonal) occupied line between the new piece and another Existing piece, with one or more **contiguous** opponent's pieces between them.

- In this situation, dark has the following options indicated by the arrows

Game Rules

- Assume that the black
  player starts, and
  decided to put a piece
  in the topmost location,
  one piece gets turned
  over, and the board
  appears thus:

Game Rules

- Now white's plays under the same rules. (where he can place a new piece?)
- Players take alternate turns. If one player cannot make a valid move, the turn passes back to the other player. When neither player can move, the game ends.. The player with the most pieces on the board at the end of the game wins.
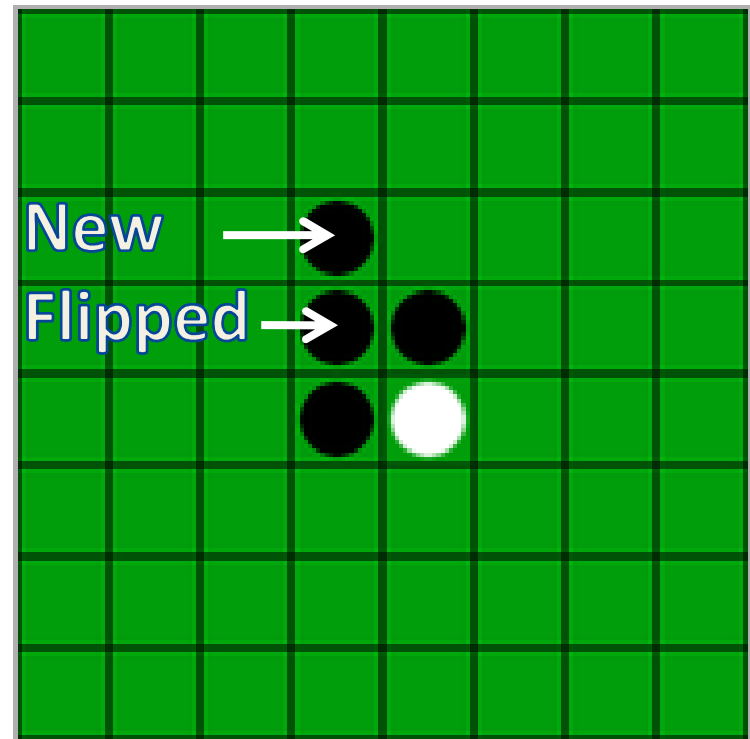
Physical implementation

- In our case, the human plays the full glasses, and the computer plays the empty ones.
- When Human makes a move – he places a new glass on the board, according to the rules there are now empty glasses that should be filled. (TBD - electronic valve system that connects every glass port to the favorite drink).
- The computer's BAC (blood alcohol content) is updated

Physical implementation

- When the computer makes a move – he signals where the next move is, and waits. When a glass is placed, all the appropriate glasses are lighted up till they are lifted up (TBD – pressure sensor under glass)

- Now, the human BAC is updated (…gloop)

Graph modeling

- Each node in the graph holds the board position and the players' BAC.
- Each turn, every player has limited number of moves (Rough estimate : 4 on the average)
- In our implementation, we're playing on 6x6 board, which has 36 squares, 4 of them are occupied in the beginning, thus the number of free squares is = 32
- Since pieces may be flipped from one color to another, but once played they are never removed from the board.
- Maximum number of turns = game-tree Depth = 32
- Estimated tree size = 4^32 ~ 10^19

Strategy

Reversi Strategy has many aspects, to name a few:

- Positional Strategy
- Greedy Strategy
- Stable Discs
- Mobility
- Evaporation Strategy
- Frontiers
- Stoner Traps
- Parity

We will focus on the first two.

Strategy

$\Rightarrow$ • **Positional Strategy**
- • **Greedy Strategy**
- • Stable Discs
- • Mobility
- • Evaporation Strategy
- • Frontiers
- • Stoner Traps
- • Parity

Positional Strategy

- **G = very good:**
  once corner is captured it can't be taken back.

  However, each piece that laid on the board may act as a 'stepping stone' for your opponent, thus:

- **X = very bad**, **C = bad** :
  they probably will give your opponent access to corners.

- **A & B-squares = good**

	a	b	c	d	e	f	g	h	
1	G	C	A	B	B	A	C	G	1
2	C	X					X	C	2
3	A							A	3
4	B			○	●			B	4
5	B			●	○			B	5
6	A							A	6
7	C	X					X	C	7
8	G	C	A	B	B	A	C	G	8
	a	b	c	d	e	f	g	h	

Positional Strategy

- The board has a number of symmetries, thus there are only 10 distinct types of squares.
- On the right: part of the weight table of the Reversi program that included with past versions of Microsoft Windows.

|	a	b	c	d	e	f	g	h	
1	99	-8	8	6					1
2		-24	4	-3					2
3			7	4					3
4				0					4
5									5
6									6
7									7
8									8
	a	b	c	d	e	f	g	h	

Strategy

- **Positional Strategy**
⇒ - **Greedy Strategy**
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Greedy Strategy

Greedy algorithm – capture as much as you can.

- Very tempting, trying to eliminate opponent's pieces.

- Fails on the most cases. for example: white leads 59-1, but loses eventually 40-24.

- Bad Strategy – only in **NORMAL** Reversi…
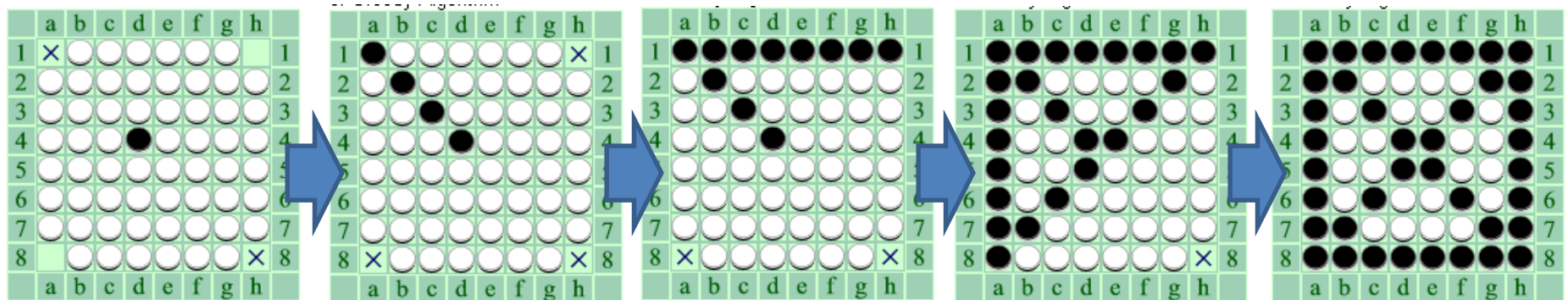
Greedy Strategy

- In **ReversCohol™** - Capturing as much as you can at the first steps can give you big advantage over the opponent – get him drunk fast!

Computer's AI

- Hard mode: The computer uses miniMax algorithm, using positional strategy, searching in depth of some predefined value.
  After every few drinks, the tree depth gets shorter – till the computer simply plays random.

- Fun mode: the computer uses greedy algorithm – you get drunk fast.

Bibliography

- http://en.wikipedia.org/wiki/Reversi

Source code:

- http://www.yk.rim.or.jp/~hyper01/java/reversi.html

Strategy:

- http://www.samsoft.org.uk/reversi/strategy.htm
- http://www.site-constructor.com/othello/Present/Basic_Strategy.html