Chinese Checker

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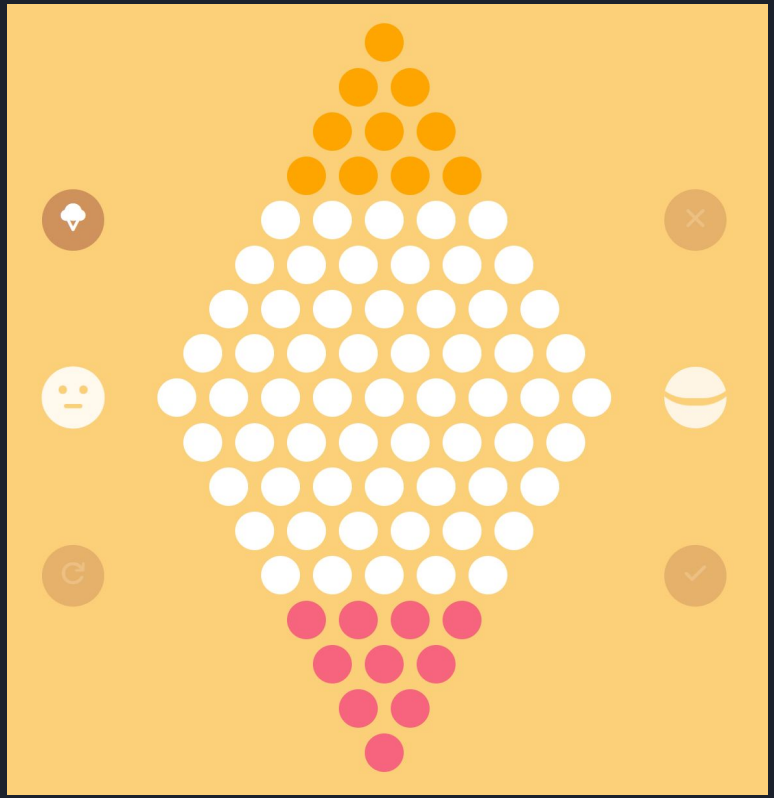
Rule

Goal: move all marbles of your color from your starting point to the opposite side of the board.

Move: rolling to a hole next to it or jumping over one marble to a blank hole.

The player can make several jumps in a row.



Greedy

Key point:

1) Determine the depth of each movement
2) Save all movement with greatest depth changes to the list
3) Choose the movement from saving list randomly

Advantage:

1) Much simpler logical complexit
2) Without complicated algorithm

Pitfall:

1) Strategy agent chose may not be an optimal solution

lv0 (0+0)	lv1 (0+1)	lv2 (0+2)	lv3 (0+3)	lv4 (0+4)	lv5 (0+5)
lv1 (1+0)	lv2 (1+1)	lv3 (1+2)	lv4 (1+3)	lv5 (1+4)	lv6 (1+5)
lv2 (2+0)	lv3 (2+1)	lv4 (2+2)	lv5 (2+3)	lv6 (2+4)	lv7 (2+5)
lv3 (3+0)	lv4 (3+1)	lv5 (3+2)	lv6 (3+3)	lv7 (3+4)	lv8 (3+5)
lv4 (4+0)	lv5 (4+1)	lv6 (4+2)	lv7 (4+3)	lv8 (4+4)	lv9 (4+5)
lv5 (5+0)	lv6 (5+1)	lv7 (5+2)	lv8 (5+3)	lv9 (5+4)	lv10 (5+5)

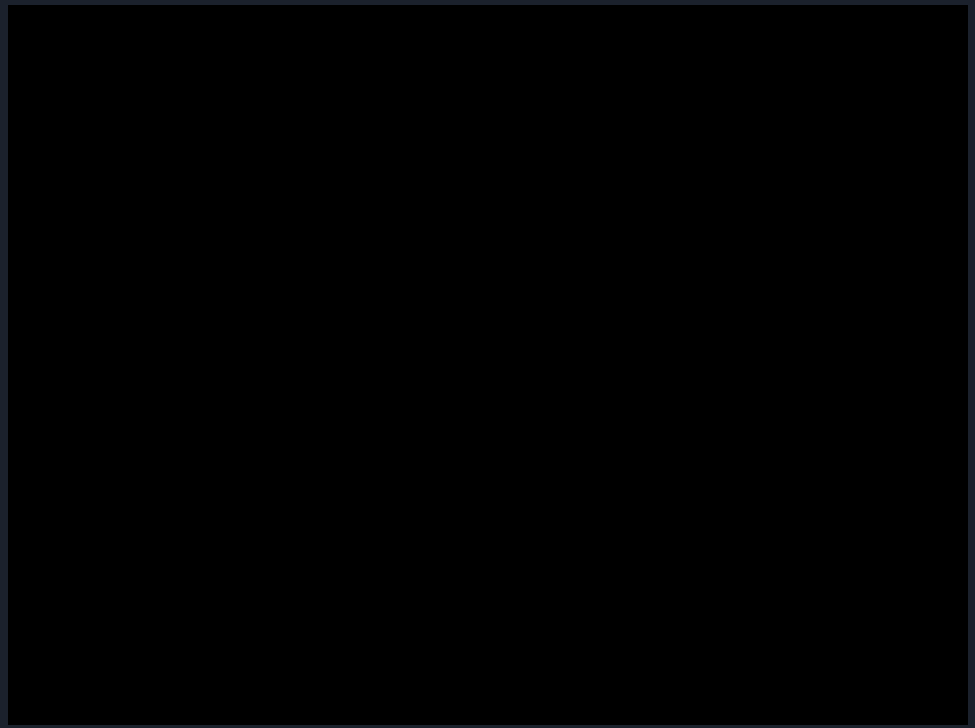
Alpha Beta Pruning

Key point

1. Ultimate goal does not involve other players' state
2. Rare interactions among players in the start and end of game
3. Not a typical zero-sum game

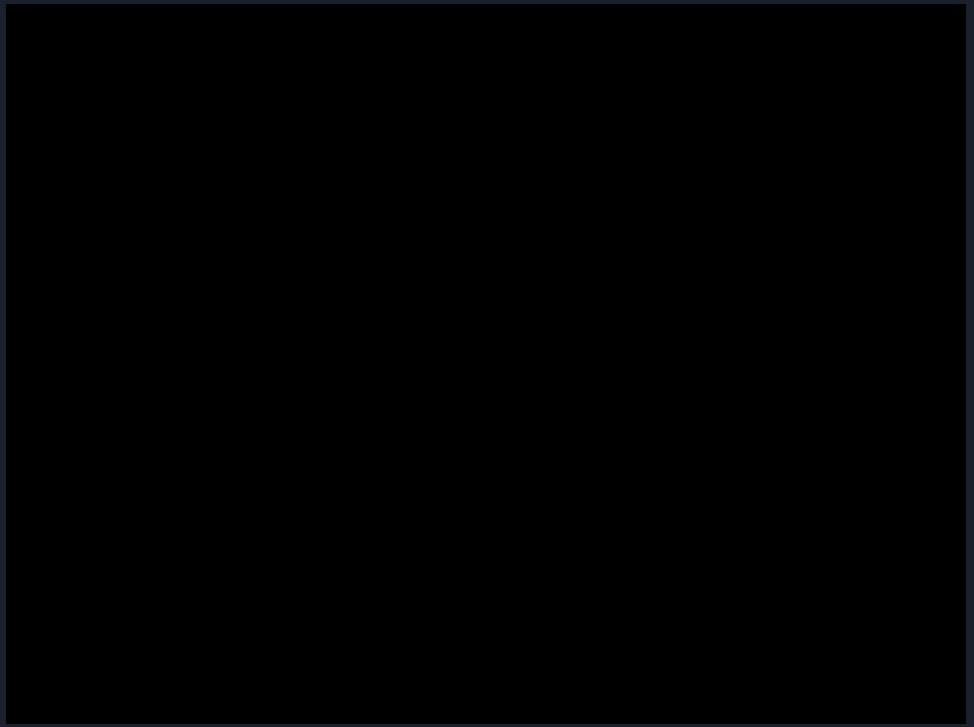
Evaluation function

1. Distance from goal
2. Bias from the center
3. Last chess penalty



MCTS

- Simulate games using random bot and record the winner of each game
- Select move with the greatest winning percentage
- UCB to help with selection
- Choice of number of simulation
- Choice of Temperature
- No evaluation function
- Time consuming



Testing Data

AlphaBeta vs Greedy

	Winner	Winning percent	Average Round
AB(red)	98	0.98	33.92
Greedy(blue)	2	0.02	33.92
Greedy(red)	7	0.07	35
AB(blue)	93	0.93	35

Alphabeta vs Alphabeta

	Winer	Winning percent	Average Round
AB1(red)	55	0.55	36
AB2(blue)	45	0.45	36

Greedy vs Greedy

	# win	% win	Min R	Q1 R	Median R	Q3 R	Max R
G1(red)	60	0.6	29	42	45.5	49	250
G2(blue)	39	0.39	29	42	45.5	49	250

Conclusion

1.AlphaBeta agents : it is better compared to greedy agents, but the average round of greedy agents completing the game is pretty close to AlphaBeta agents.

2.MCTS: it does not perform really well as it does in game of go. The main reason could be it is easy to see which side is going to win and random bots do not always finish the game in simulations.

Thanks for watching!