

Project 3 GOMOKU

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```

226 node alphabeta(int depth, double a, double b, bool maximizingPlayer) {
227     if (depth == 0) {
228         double val = evalBoard(!maximizingPlayer);
229         return node(val, -1, -1);
230     }
231     std::vector<std::pair<int, int>> avail_move = findMoves();
232     if (avail_move.empty()) return node(evalBoard(!maximizingPlayer), -1, -1);
233     node bestMov(-1, -1);
234     if (maximizingPlayer) {
235         bestMov.value = -DBL_MAX;
236         bestMov.x = avail_move[0].first;
237         bestMov.y = avail_move[0].second;
238         for (auto m : avail_move) {
239             board[m.first][m.second] = (color) ? BLACK : WHITE;
240             node tmpMov = alphabeta(depth - 1, a, b, !maximizingPlayer);
241             board[m.first][m.second] = EMPTY;
242             a = std::max(tmpMov.value, a);
243             if (tmpMov.value >= b) return tmpMov;
244             if (tmpMov.value > bestMov.value) {
245                 bestMov = tmpMov;
246                 bestMov.x = m.first; bestMov.y = m.second;
247             }
248         }
249     }

```

Minimax with Alpha-Beta Pruning

```

253 else {
254     bestMov.value = DBL_MAX;
255     bestMov.x = avail_move[0].first;
256     bestMov.y = avail_move[0].second;
257     for (auto m : avail_move) {
258         board[m.first][m.second] = (!color) ? BLACK : WHITE;
259         node tmpMov = alphabeta(depth - 1, a, b, !maximizingPlayer);
260         board[m.first][m.second] = EMPTY;
261         b = std::min(tmpMov.value, b);
262         if (tmpMov.value <= a) return tmpMov;
263         if (tmpMov.value < bestMov.value) {
264             bestMov = tmpMov;
265             bestMov.x = m.first; bestMov.y = m.second;
266         }
267     }
268 }
269 return bestMov;
270 }

```

Minimum part

```

206 ~ std::vector<std::pair<int, int>> findMoves() {
207     std::vector<std::vector<bool>> is_res(SIZE, std::vector<bool> (SIZE, false));
208     std::vector<std::pair<int, int>> moves;
209 ~   for (int i = 0; i < SIZE; i++) {
210 ~       for (int j = 0; j < SIZE; j++) {
211           if (board[i][j] != EMPTY || is_res[i][j]) continue;
212           if ((i - 1 >= 0 && board[i - 1][j]) || (i + 1 < SIZE && board[i + 1][j]) ||
213               (j - 1 >= 0 && board[i][j - 1]) || (j + 1 < SIZE && board[i][j + 1]) ||
214               (i - 1 >= 0 && j - 1 >= 0 && board[i - 1][j - 1]) ||
215               (i + 1 < SIZE && j - 1 >= 0 && board[i + 1][j - 1]) ||
216               (i - 1 >= 0 && j + 1 < SIZE && board[i - 1][j + 1]) ||
217 ~               (i + 1 < SIZE && j + 1 < SIZE && board[i + 1][j + 1])) {
218               moves.emplace_back(std::pair<int, int> {i, j});
219               is_res[i][j] = true;
220           }
221       }
222   }
223   return moves;
224 }

```

Find Next Move

```
192 double evalBoard(bool turn) {
193     double blkScore, whtScore;
194     if (color) {
195         blkScore = calBoard(true, !turn);
196         whtScore = calBoard(false, !turn);
197         if (whtScore == 0) whtScore = 1;
198         return blkScore / whtScore;
199     } else {
200         blkScore = calBoard(true, turn);
201         whtScore = calBoard(false, turn);
202         if (blkScore == 0) blkScore = 1;
203         return whtScore / blkScore;
204     }
205 }
```

State Value Function

```

74 > int eval_dgn(bool is_blk, bool turn) { ...
131 > int eval_hrz(bool is_blk, bool turn) { ...
159 int eval_vtc(bool is_blk, bool turn) {
160     bool is_special = false;
161     int csct = 0, blocks = 2, score = 0;
162     for (int j = 0; j < SIZE; j++) {
163         for (int i = 0; i < SIZE; i++) {
164             if (board[i][j] == (is_blk ? BLACK : WHITE)) csct++;
165             else if (board[i][j] == EMPTY) {
166                 if (csct > 0) {
167                     if (i + 1 < SIZE && board[i + 1][j] == (is_blk ? BLACK : WHITE)) is_special = true;
168                     else {
169                         blocks--;
170                         score += getCsctScore(csct, blocks, is_special, is_blk == turn);
171                         csct = 0; blocks = 1; is_special = false;
172                     }
173                 }
174                 else blocks = 1;
175             }
176             else if (csct > 0) {
177                 score += getCsctScore(csct, blocks, is_special, is_blk == turn);
178                 csct = 0; blocks = 2; is_special = false;
179             }
180             else blocks = 2;
181         }
182         if (csct > 0) score += getCsctScore(csct, blocks, is_special, is_blk == turn);
183         csct = 0; blocks = 2; is_special = false;
184     }
185     return score;
186 }

```

You, 3 days ago • alphaBeta_ver01

Value Calculation

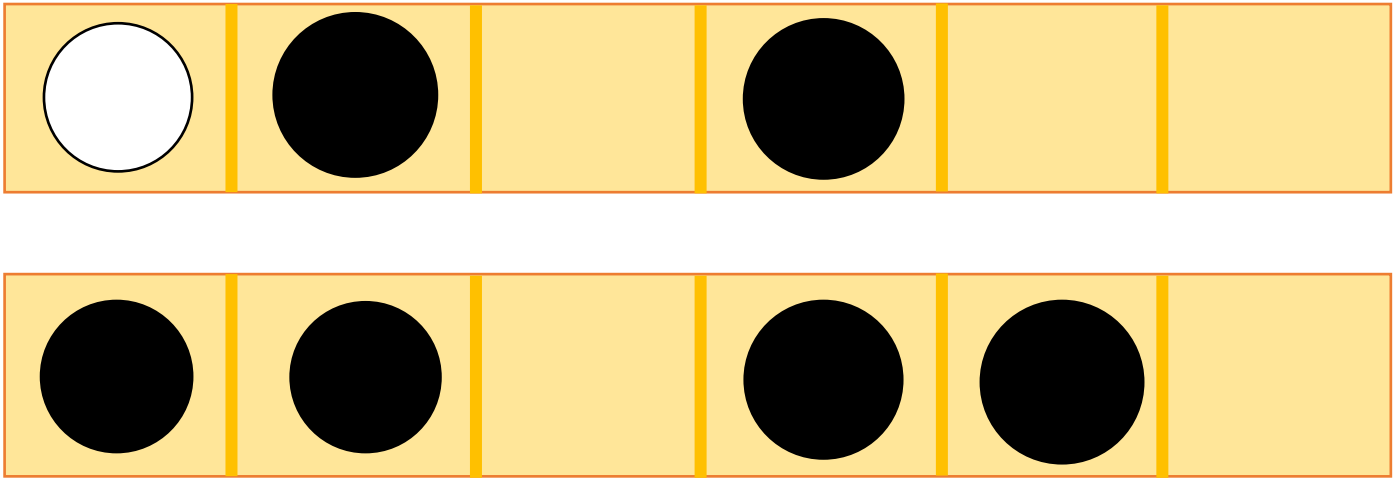
- Blocks == 0 or not ?
- Calculating mine or opponent's board ?
- Special pattern or not ?
- How many same color continuous stones are placed ?

```
54 int getCstScore(int cnt, int blocks, bool is_special, bool turn) {  
55     if (blocks == 2 && cnt < 5) return 0;  
56     if (cnt >= 5) {  
57         return (is_special) ? ((turn) ? 35000 : (blocks == 0) ? 30000 : 25000) : INF;  
58     }  
59     else if (cnt == 4) {  
60         return (is_special) ? ((turn) ? 30000 : (blocks == 0) ? 25000 : 20000) :  
61         ((turn) ? 100000 : ((blocks == 0) ? 50000 : 200));  
62     }  
63     else if (cnt == 3) {  
64         return (is_special) ? ((blocks == 0) ? ((turn) ? 10000 : 100) : 20) :  
65         ((blocks == 0) ? ((turn) ? 50000 : 400) : ((turn) ? 10 : 5));  
66     }  
67     else if (cnt == 2) {  
68         return (is_special) ? ((blocks == 0) ? ((turn) ? 5 : 3) : 1) : ((blocks == 0) ? ((turn) ? 7 : 5) : 2);  
69     }  
70     else if (cnt == 1) return 1;  
71     return 0;  
72 }
```











You, 13 hours ago • 111.06.21 (Fix serious)

Special Pattern

e.g













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▼ Staged Changes 1

110062207_project3.cpp R

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copy_Gomoku_04 U

Gomoku U

Gomoku_ver_04 U

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> 111.06.21 (Little uptimizing) You, 6 hours ago

> 111.06.21 (Little value optimizing) You, 9 hours ago

> 111.06.21 (Fix serious bugs in ver_03) You, 13 hours ago

> 111.06.21 (Improve state value function) You, 21 hours ago

> 111.06.20 (Optimizing performance) You, yesterday

> 111.06.20 (Optimizing performance) You, yesterday

> 111.06.20 (fix some serious bugs) You, yesterday

> Update README.md jason1260, 2 days ago

> Update README.md jason1260, 2 days ago

> 111.06.19 You, 2 days ago

> alphaBeta_ver01 You, 3 days ago

> 111.06.18 You, 3 days ago

> 111.06.18 You, 3 days ago

> 111.06.16 You, 5 days ago

> FILE HISTORY

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This branch is 14 commits ahead, 2 commits behind main. Contribute

jason1260 Final_ver d0ff5a7 22 seconds ago 18 commits

.vscode	111.06.20 (Optimizing performance)	yesterday
110062207_project3.cpp	Final_ver	22 seconds ago
README.md	Update README.md	2 days ago
main.cpp	111.06.20 (fix some serious bugs)	yesterday
makefile	111.06.15	6 days ago
tmp.cpp	111.06.21 (Little value optimizing)	9 hours ago

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