Project3

```cpp
7
8
9     int player;
10    const int SIZE = 8;
11
12    std::array<std::array<int, SIZE>, SIZE> value = {{{200,-100,100,75,75,100,-100,200},
13    {-100,-150,100,50,50,100,-150,-100},
14    {100,100,100,60,60,100,100,100},
15    {75,50,60,60,60,60,50,75},
16    {75,50,60,60,60,60,50,75},
17    {100,100,100,60,60,100,100,100},
18    {-100,-150,100,50,50,100,-150,-100},
19    {200,-100,100,75,75,100,-100,200}}};
20
21    struct Point {
22        int x, y;
23        Point() : Point(0, 0) {}
24        Point(float x, float y) : x(x), y(y) {}
25        bool operator==(const Point& rhs) const {
26            return x == rhs.x && y == rhs.y;
27        }
```

```cpp
64        }
65
66        State(State& s) {
67            for (int i = 0; i < 8; i++)
68                for (int j = 0; j < 8; j++)
69                    cur_board[i][j] = s.cur_board[i][j];
70            heuristic = s.heuristic;
71            get_valid_spots();
72        }
73
74        void update(int newx, int newy){
75            this->cur_board[newx][newy] = this->state_player;
76            get_valid_spots();
77            set_heuristic(newx,newy);
78            this->prevx = newx;
79            this->prevy = newy;
80        }
81        void set_heuristic(int x, int y){
82            this->heuristic = value[x][y];
83        }
84        int get_next_player(int player) const {
```

```cpp
127    };
128
129    int minimax(State cur_state,int depth,int a,int b,int cur_player){
130        int value;
131        if(depth==3||cur_state.next_valid_nodes.size()==0){
132            return cur_state.heuristic;
133        }
134        if(cur_player==player){
135            int value = -200;
136            for(auto child:cur_state.next_valid_nodes){
137                State next_state = cur_state;
138                next_state.update(child.x,child.y);
139                if(next_state.heuristic>value){
140                    value = next_state.heuristic;
141                }
142                minimax(next_state,depth+1,a,b,3-player);
143                a = a > value ? a : value;
144                if(a>=b)
145                    break;
146            }
147            return value;
```

```cpp
145                    break;
146                }
147                return value;
148            }
149        else {
150            int value = 250;
151            for(int i=0;i<cur_state.next_valid_nodes.size();i++){
152                Point child = cur_state.next_valid_nodes[i];
153                State next_state = cur_state;
154                next_state.update(child.x,child.y);
155                if(next_state.heuristic<value){
156                    value = next_state.heuristic;
157                }
158                minimax(next_state,depth+1,a,b,3-cur_player);
159                if(b<=a)
160                    break;
161            }
162            return value;
163        }
164    }
165
```

Logs & others

```cpp
184        └}
185
186  □ void write_valid_spot(std::ofstream& fout) {
187        int n_valid_spots = next_valid_spots.size();
188        // Keep updating the output until getting killed.
189  □     while (true) {
190            State cur_state(board);
191            Point p;
192            int value = minimax(cur_state,0,250,-200,cur_state.state_player);
193  □         for(int i = 0;i < n_valid_spots;i++){
194                if(next_valid_spots[i].set_value()==value)
195                    p = next_valid_spots[i];
196            }
197            // Remember to flush the output to ensure the last action is written to file.
198            fout << p.x << " " << p.y << std::endl;
199            fout.flush();
200        }
201  └}
202
203
```

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