Project #3: Chain Reaction

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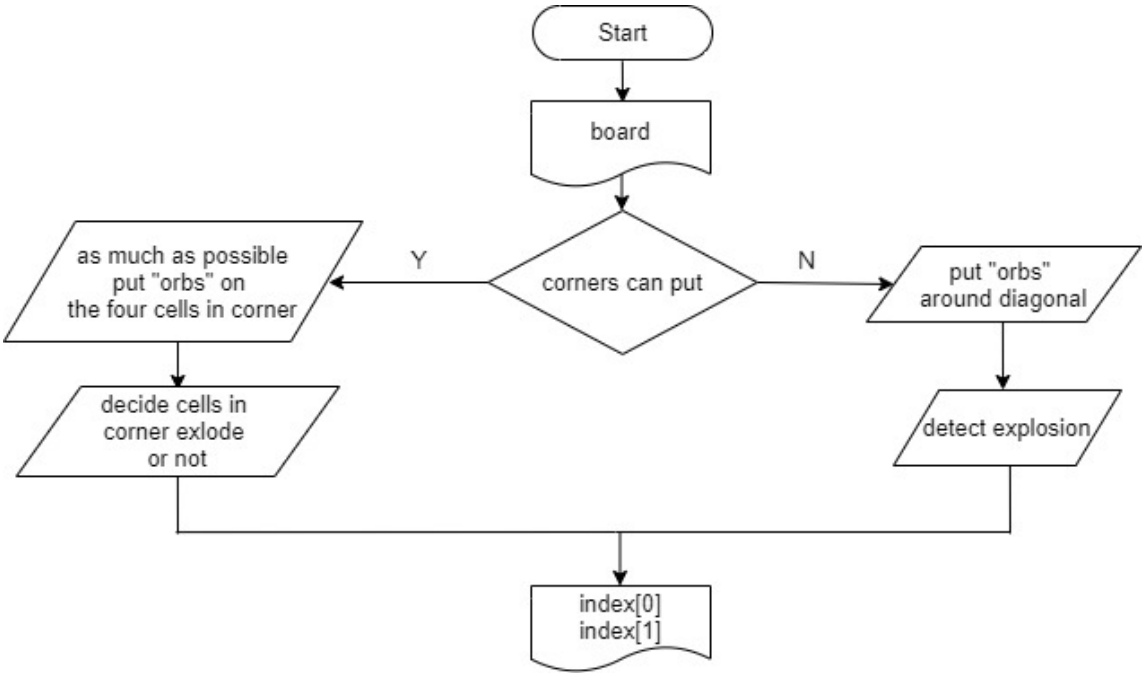
1) Project Description

1-1) Program Flow Chart



1-2) Detailed Description

我設計的 algorithm_A 主要分成兩個部分。

第一個部分就是四個角落的情況，因為四個角落只要放置兩個“orbs”就會引發爆炸，而且角落的 orthogonal adjacent cells 只有兩個，只要控管好旁邊的兩個 cells（如果有敵方 color 的棋子==2，就將角落引爆，根據連續爆炸的規則，旁邊的 cells 爆炸之後又會在 corner 放上一個己方 color 的“orbs”），就可以確保角落裡一直都是己方 color，所以盡量先佔據角落。

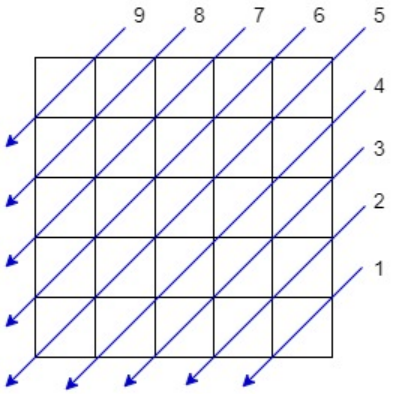
如果角落是空的，就將“orbs”放置在上面。

```
//put "orbs" on four cells in corner
if(board.get_cell_color(0, 0) == 'w'){
    index[0] = 0;
    index[1] = 0;
}
else if(board.get_cell_color(4, 5) == 'w'){
    index[0] = 4;
    index[1] = 5;
}
```

如果角落的旁邊有可以引發爆炸的敵方 cells，就將 corner 引爆。

```
//four corner explode or not
else if( board.get_cell_color(0,0)==color &&
        ((board.get_cell_color(0,1)!=color && board.get_orbs_num(0,1)==2) ||
         (board.get_cell_color(1,0)!=color && board.get_orbs_num(1,0)==2))){
    index[0] = 0;
    index[1] = 0;
}
```

第二個部分就是當角落已經被佔據了之後其餘 cells 的處理方式，就是依照下圖的順序，依序從右下到左上將每一個 cells 的“orbs”放到差一個會爆炸的程度，然後再以類似角落的處理方式來判斷要不要引爆 cells（周圍有敵方“orbs”並且已經到差一個“orbs”的程度）



從右下往左上掃，如果還沒滿（capacity – orbs_num>1）就將“orbs”放上去

```
//put "orbs" around diagonal
for(int k=0;k<ROW;k++){
    for(int i=0, j=k;i<=k &&j>=0;i++, j--){
        if(board.get_cell_color(i,j)==color || board.get_cell_color(i,j)=='w'){
            if( (board.get_capacity(i,j)-board.get_orbs_num(i,j))>1 ){
                row=i;
                row_tmp=i;
                col=j;
                col_tmp=j;
            }
            else{
                row = row_tmp;
                col = col_tmp;
            }
        }
    }
}
```

如果己方可引爆的 cells 旁邊有可以引發爆炸的敵方 cells，就將這個 cells 引爆。

```
//detect explosion
bool explode=false;
for(int i=0;i<ROW;i++){
    for(int j=0;j<COL;j++){
        if(board.get_cell_color(i,j)==color || board.get_cell_color(i,j)=='w'){
            if( (board.get_capacity(i,j)-board.get_orbs_num(i,j))==1 ){
                if( (i-1)>=0 && board.get_cell_color(i-1, j)!=color &&
                    (board.get_capacity(i-1,j)-board.get_orbs_num(i-1,j))==1){
                    row=i;
                    col=j;
                    explode=true;
                    break;
                }
```

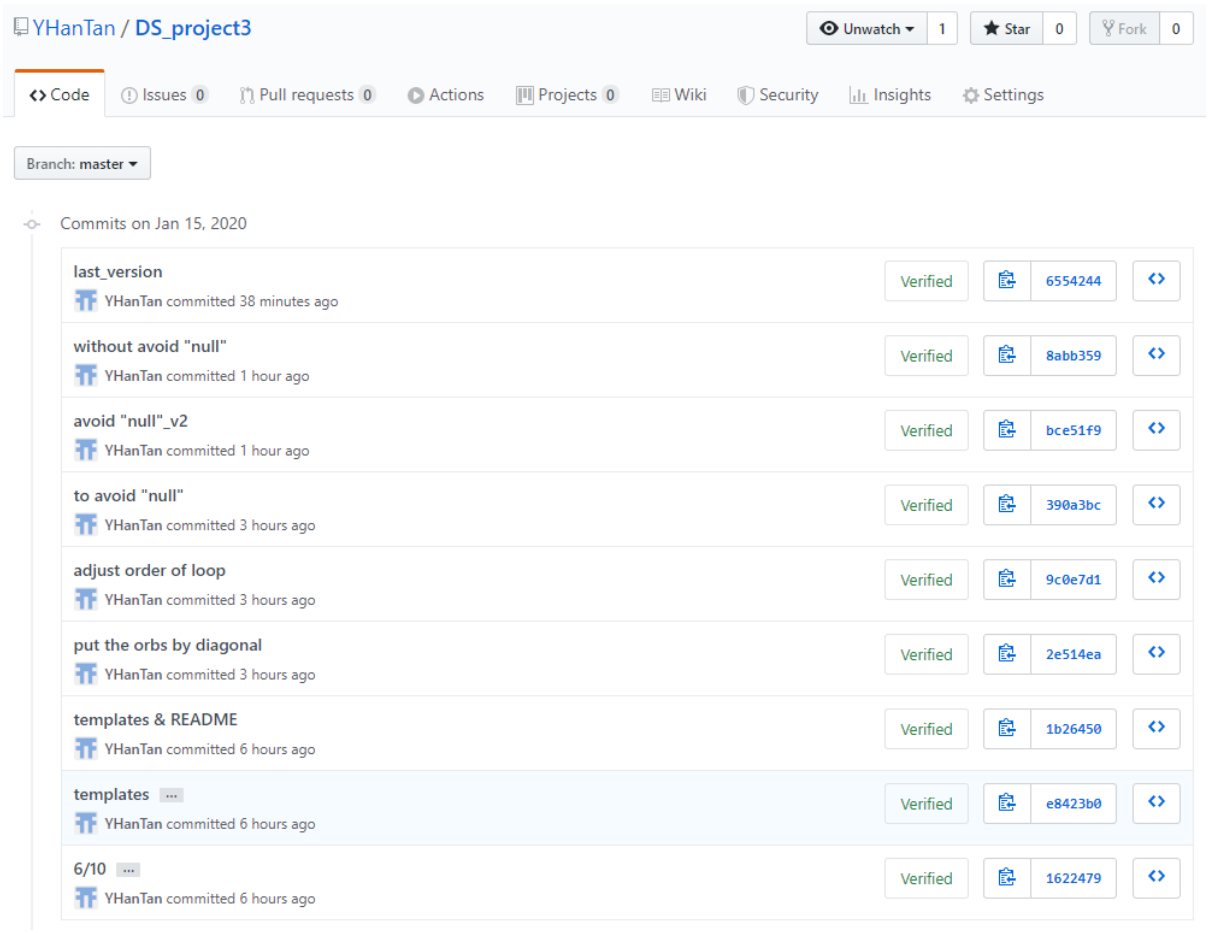
2) Screen Shots

2-1) Partial Implemented Code

```
1.  void algorithm_A(Board board, Player player, int index[]){
2.
3.      srand(time(NULL));
4.      int row, col;
5.      int row_tmp, col_tmp;
6.      int color = player.get_color();
7.
8.      //put "orbs" on four cells in corner
9.      if(board.get_cell_color(0, 0) == 'w'){
10.         index[0] = 0;
11.         index[1] = 0;
12.     }
13.     else if(board.get_cell_color(4, 5) == 'w'){
14.         index[0] = 4;
15.         index[1] = 5;
16.     }
17.     else if(board.get_cell_color(4, 0) == 'w'){
18.         index[0] = 4;
19.         index[1] = 0;
20.     }
21.     else if(board.get_cell_color(0, 5) == 'w'){
22.         index[0] = 0;
23.         index[1] = 5;
24.     }
25.     //four corner explode or not
26.     else if(board.get_cell_color(0,0)==color && ((board.get_cell_color(0,1)!=color
    && board.get_orbs_num(0,1)==2) || (board.get_cell_color(1,0)!=color && board.get_or
    bs_num(1,0)==2))){
27.         index[0] = 0;
28.         index[1] = 0;
29.     }
30.     else if(board.get_cell_color(4,5)==color && ((board.get_cell_color(4,4)!=color
    && board.get_orbs_num(4,4)==2) || (board.get_cell_color(3,5)!=color && board.get_or
    bs_num(3,5)==2))){
31.         index[0] = 4;
32.         index[1] = 5;
33.     }
34.     else if(board.get_cell_color(4,0)==color && ((board.get_cell_color(3,0)!=color
    && board.get_orbs_num(3,0)==2) || (board.get_cell_color(4,1)!=color && board.get_or
    bs_num(4,1)==2))){
35.         index[0] = 4;
36.         index[1] = 0;
37.     }
38.     else if(board.get_cell_color(0,5)==color && ((board.get_cell_color(0,4)!=color
    && board.get_orbs_num(0,4)==2) || (board.get_cell_color(1,5)!=color && board.get_or
    bs_num(1,5)==2))){
39.         index[0] = 0;
40.         index[1] = 5;
41.     }
42.     else{
43.         //put "orbs" around diagonal
44.         for(int k=0;k<ROW;k++){
45.             for(int i=0, j=k;i<=k &&j>=0;i++, j--){
46.                 if(board.get_cell_color(i,j)==color || board.get_cell_color(i,j)=='
    w'){
47.                     if( (board.get_capacity(i,j)-board.get_orbs_num(i,j))>1 ){
48.                         row=i;
49.                         row_tmp=i;
50.                         col=j;
51.                         col_tmp=j;
52.                     }
53.                     else{
54.                         row = row_tmp;
55.                         col = col_tmp;
56.                     }
57.                 }
```

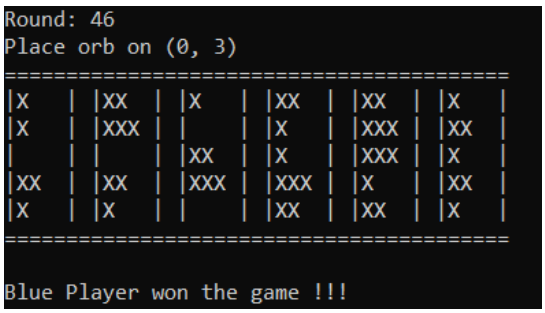
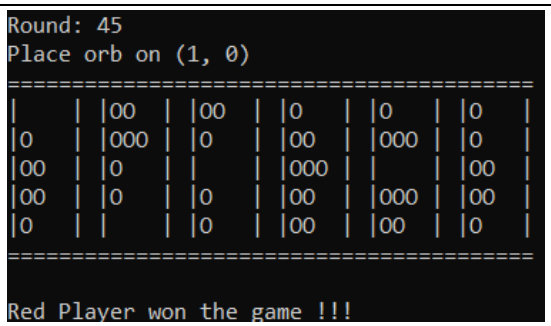
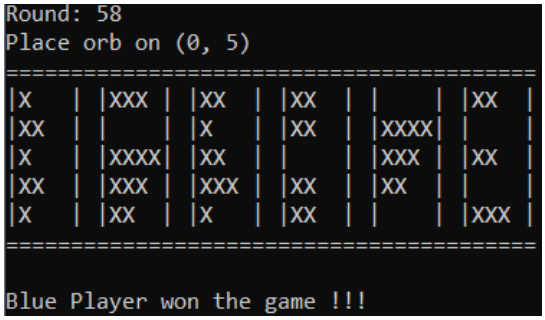
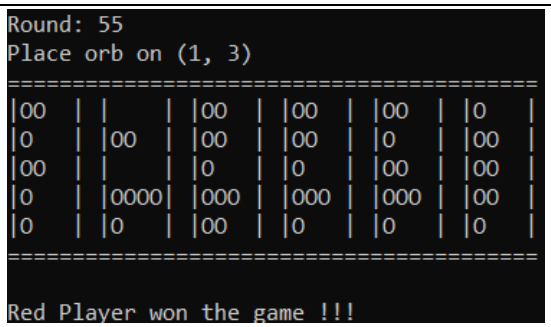
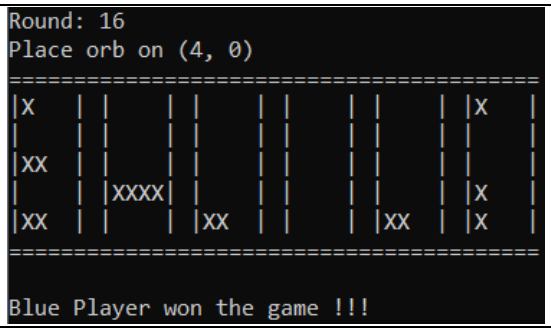
2-2) GitHub Control History

https://github.com/YHanTan/DS_project3



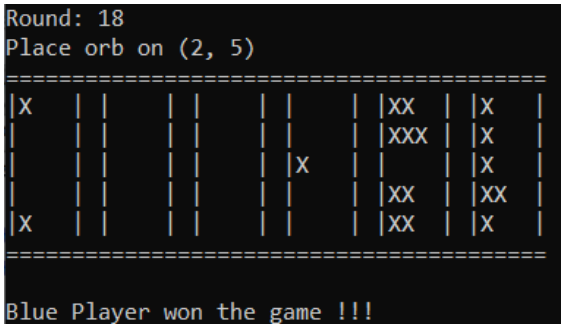
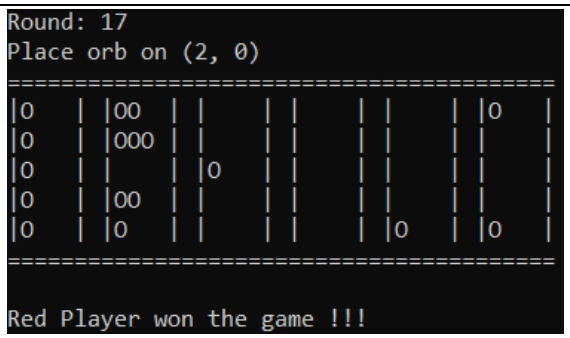
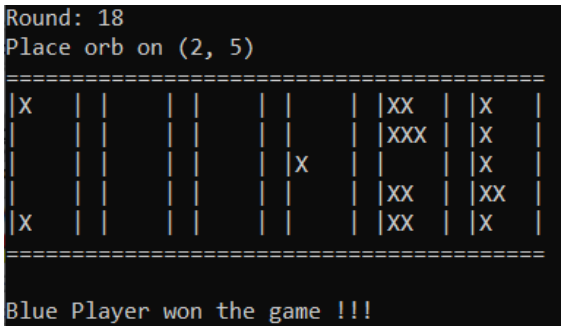
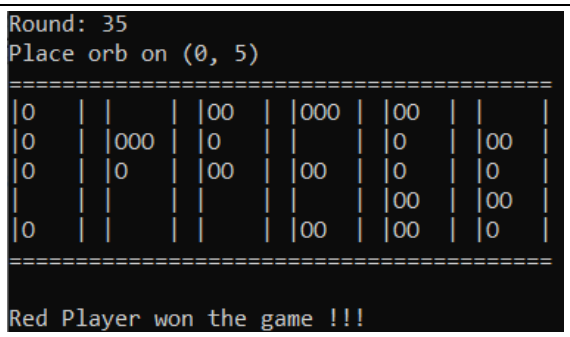
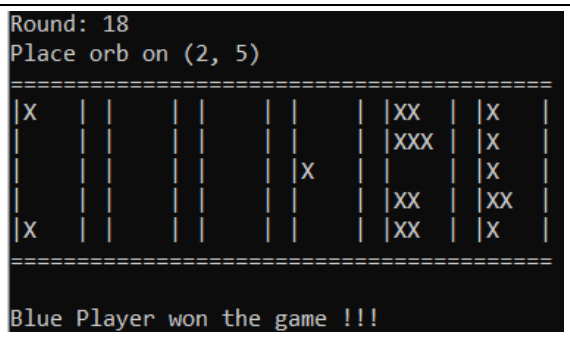
2-3) Compare with TA’ s AI Code with Student Id

algorithm_B

	Red	Blue	Result
1	algorithm_B	algorithm_A	
2	algorithm_A	algorithm_B	
3	algorithm_B	algorithm_A	
4	algorithm_A	algorithm_B	
5	algorithm_B	algorithm_A	
	algorithm_A vs algorithm_B		5:0

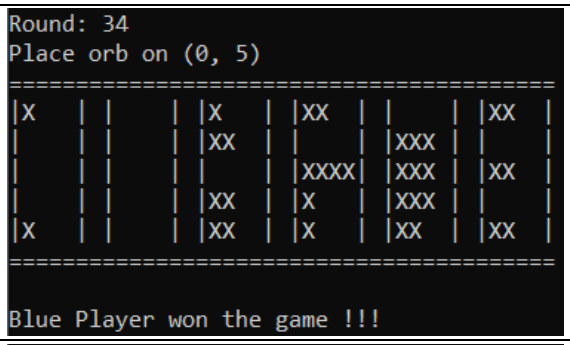
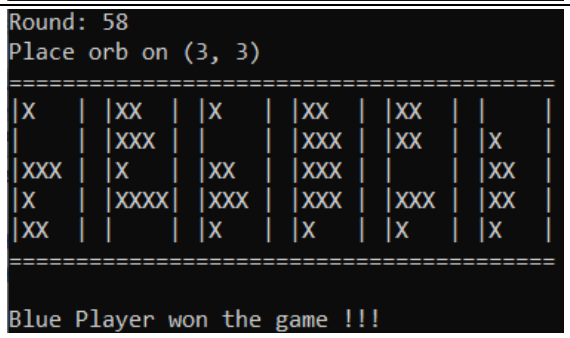
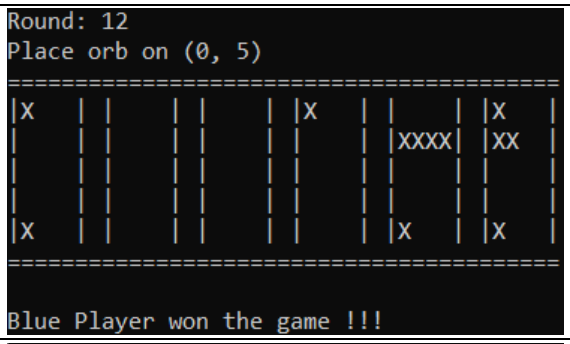
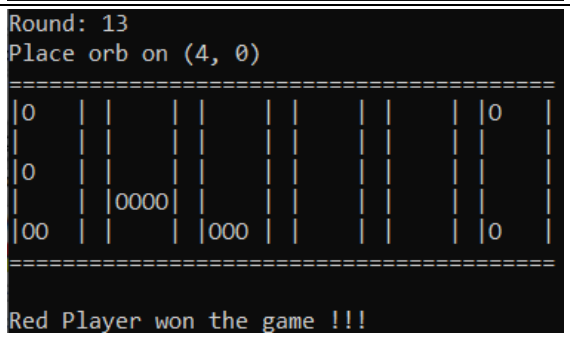
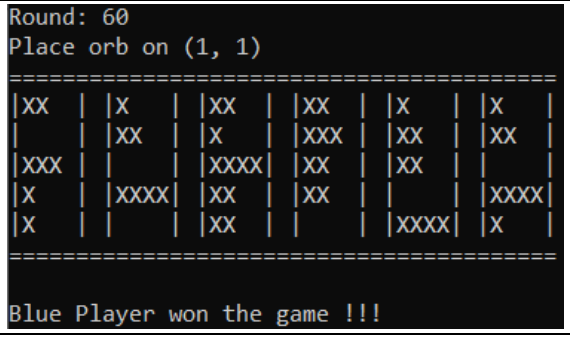
Result after 100 rounds: 87:13

algorithm_C

	Red	Blue	Result
1	algorithm_C	algorithm_A	
2	algorithm_A	algorithm_C	
3	algorithm_C	algorithm_A	
4	algorithm_A	algorithm_C	
5	algorithm_C	algorithm_A	
	algorithm_A vs algorithm_C		5:0

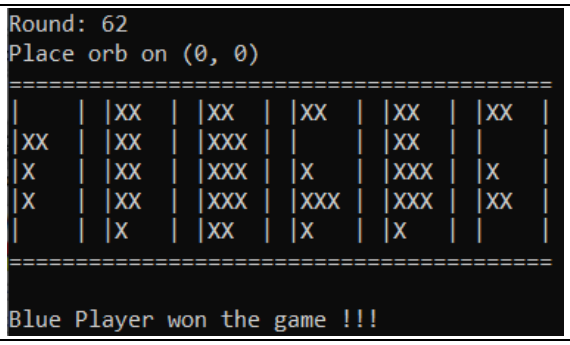
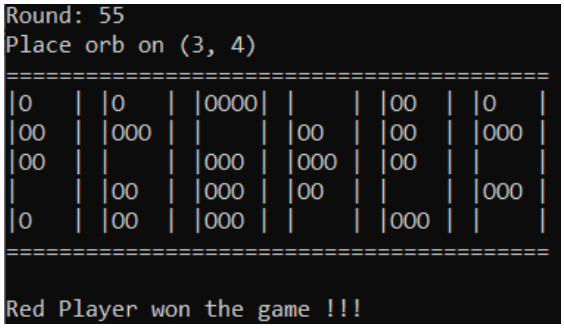
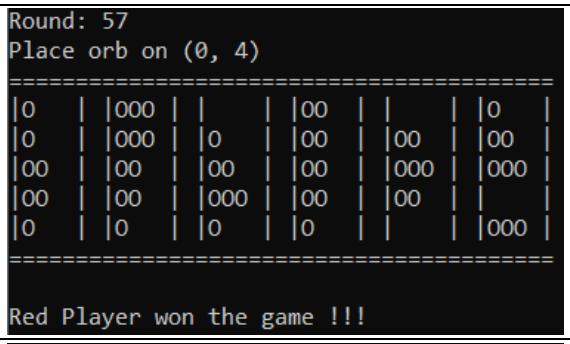
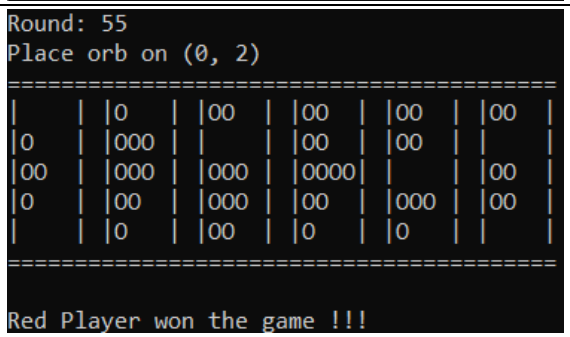
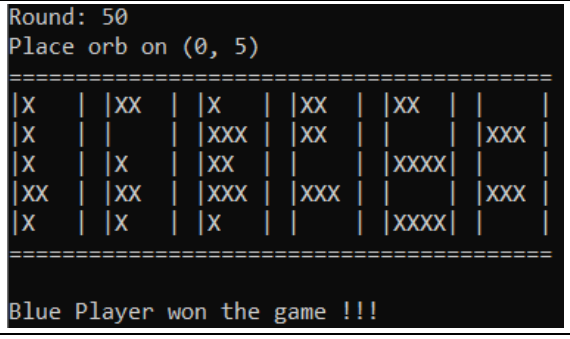
Result after 100 rounds: 72:28

algorithm_D

	Red	Blue	Result
1	algorithm_D	algorithm_A	
2	algorithm_A	algorithm_D	
3	algorithm_D	algorithm_A	
4	algorithm_A	algorithm_D	
5	algorithm_D	algorithm_A	
	algorithm_A vs algorithm_D		4:1

Result after 100 rounds: 92:8

algorithm_E

	Red	Blue	Result
1	algorithm_E	algorithm_A	
2	algorithm_A	algorithm_E	
3	algorithm_E	algorithm_A	
4	algorithm_A	algorithm_E	
5	algorithm_E	algorithm_A	
	algorithm_A vs algorithm_E		4:1

Result after 100 rounds: 90:10

可以打敗各個 algorithmn 的理由我覺得是因為我的 algorithm 是以比較保守的方式去處理“orbs”的放置，我判斷的方式是保證引爆過後敵方的至少一個 cells 會變成己方的 cells，而且引爆的 cells 也會被放置回己方的 cells，不會為 empty，就是保證起碼會有一次連環爆，讓己方的 cells 在每次決定引爆的時候都會+1，這樣在對上助教的 algorithm 時，因為助教的 algorithm_D&E 單單只是從“orbs”的多寡來判斷要不要放置和引爆，所以我這種保守的策略就挺有效的。但是在對付 algorithm_B&C 這兩個隨機和半隨機的 algorithm 的時候，我的 algorithm 的效果就沒那麼好了，但是因為我的第一個部分是要盡量佔據角落，那可以保證不會一開始就落於下風，至於後面的放置和引爆，如果不要形成拉鋸戰（“orbs”的位置過於零散），我的 algorithm 的勝率還是偏高的。