Kuncheng Feng
CSC 466 Presentation

Tier List Player Plus

Abstract

This play is an improvement from the “Tier List Player”, now when it sinks a ship, it will move the unexplored locations around that ship from preferred list into avoid list, allowing it to move on quicker to explore other potential ship positions. But in the rare case that there is an unsunk ship that is right next to the current sunken one, it won’t remove the inferred locations of the unsunk ship and will explore it later in a few moves.

Demo

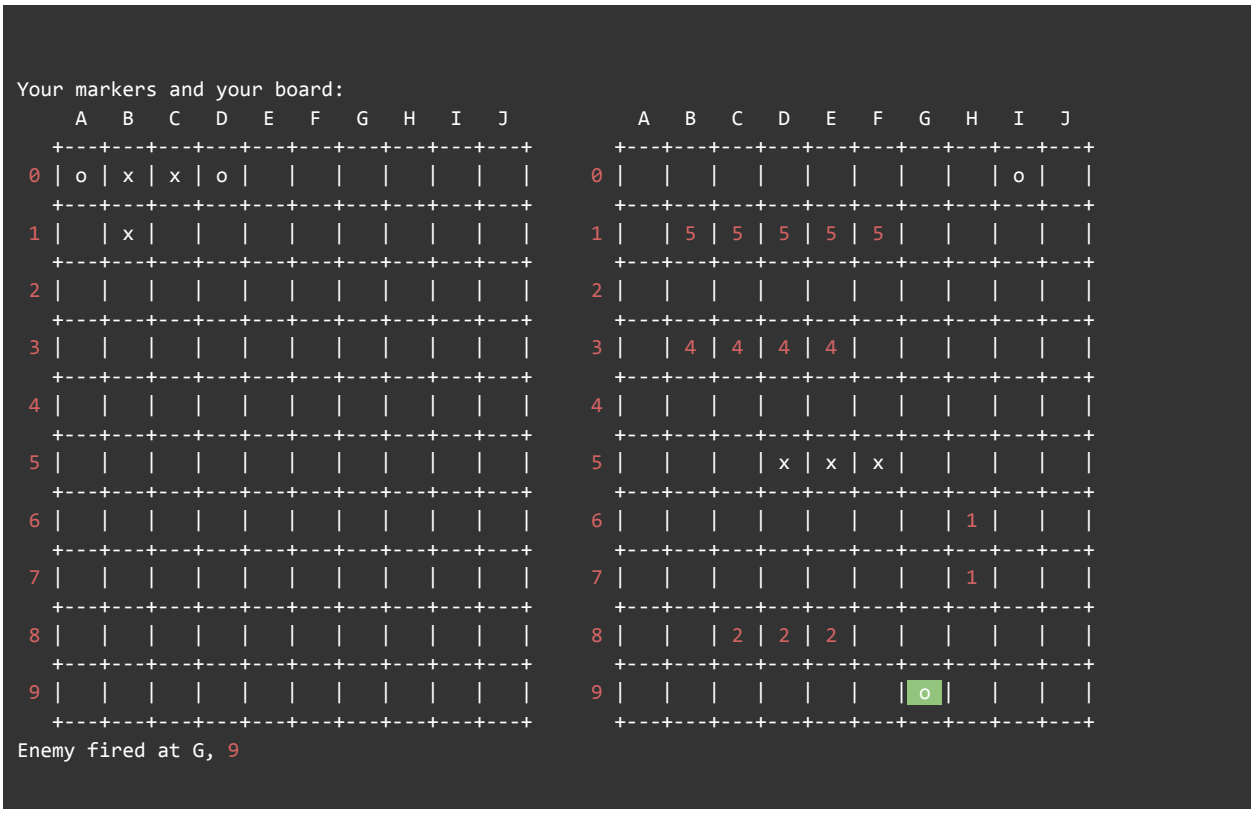
In this game, the AI is very lucky, landing a hit on its second shot. What is luckier is that it also landed the third shot, allowing it to infer my location for the fourth shot.

However the main demo point here is that after sinking my ship, it will quickly move on to explore other options, instead of previous version that will try to explore all around the ship because the preferred list was not cleared.

```
Your markers and your board:
     A   B   C   D   E   F   G   H   I   J          A   B   C   D   E   F   G   H   I   J
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 0 |   |   |   |   |   |   |   |   |   |   |    0 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 1 |   |   |   |   |   |   |   |   |   |   |    1 |   | 5 | 5 | 5 | 5 | 5 |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 2 |   |   |   |   |   |   |   |   |   |   |    2 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 3 |   |   |   |   |   |   |   |   |   |   |    3 |   | 4 | 4 | 4 | 4 |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 4 |   |   |   |   |   |   |   |   |   |   |    4 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 5 |   |   |   |   |   |   |   |   |   |   |    5 |   |   |   | 3 | 3 | 3 |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 6 |   |   |   |   |   |   |   |   |   |   |    6 |   |   |   |   |   |   |   | 1 |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 7 |   |   |   |   |   |   |   |   |   |   |    7 |   |   |   |   |   |   |   | 1 |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 8 |   |   |   |   |   |   |   |   |   |   |    8 |   |   | 2 | 2 | 2 |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 9 |   |   |   |   |   |   |   |   |   |   |    9 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
Enter target location: b 0
```

```
It's a hit!



Your markers and your board:
     A   B   C   D   E   F   G   H   I   J          A   B   C   D   E   F   G   H   I   J
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 0 |   | x |   |   |   |   |   |   |   |   |    0 |   |   |   |   |   |   |   |   | o |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 1 |   |   |   |   |   |   |   |   |   |   |    1 |   | 5 | 5 | 5 | 5 | 5 |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 2 |   |   |   |   |   |   |   |   |   |   |    2 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 3 |   |   |   |   |   |   |   |   |   |   |    3 |   | 4 | 4 | 4 | 4 |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 4 |   |   |   |   |   |   |   |   |   |   |    4 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 5 |   |   |   |   |   |   |   |   |   |   |    5 |   |   |   | 3 | 3 | 3 |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 6 |   |   |   |   |   |   |   |   |   |   |    6 |   |   |   |   |   |   |   | 1 |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 7 |   |   |   |   |   |   |   |   |   |   |    7 |   |   |   |   |   |   |   | 1 |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 8 |   |   |   |   |   |   |   |   |   |   |    8 |   |   | 2 | 2 | 2 |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 9 |   |   |   |   |   |   |   |   |   |   |    9 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
Enemy fired at I, 0
Enter target location: d 0
It missed.



Your markers and your board:
     A   B   C   D   E   F   G   H   I   J          A   B   C   D   E   F   G   H   I   J
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 0 |   | x |   | o |   |   |   |   |   |   |    0 |   |   |   |   |   |   |   |   | o |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 1 |   |   |   |   |   |   |   |   |   |   |    1 |   | 5 | 5 | 5 | 5 | 5 |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 2 |   |   |   |   |   |   |   |   |   |   |    2 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 3 |   |   |   |   |   |   |   |   |   |   |    3 |   | 4 | 4 | 4 | 4 |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 4 |   |   |   |   |   |   |   |   |   |   |    4 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 5 |   |   |   |   |   |   |   |   |   |   |    5 |   |   |   | x | 3 | 3 |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 6 |   |   |   |   |   |   |   |   |   |   |    6 |   |   |   |   |   |   |   | 1 |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 7 |   |   |   |   |   |   |   |   |   |   |    7 |   |   |   |   |   |   |   | 1 |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 8 |   |   |   |   |   |   |   |   |   |   |    8 |   |   | 2 | 2 | 2 |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
 9 |   |   |   |   |   |   |   |   |   |   |    9 |   |   |   |   |   |   |   |   |   |   |
   +---+---+---+---+---+---+---+---+---+---+      +---+---+---+---+---+---+---+---+---+---+
Enemy fired at D, 5
Enter target location: c 0
It's a hit!
```

```
Your markers and your board:
    A   B   C   D   E   F   G   H   I   J
  +---+---+---+---+---+---+---+---+---+---+
0 |   | x | x | o |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
1 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
2 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
7 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
8 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
9 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+

    A   B   C   D   E   F   G   H   I   J
  +---+---+---+---+---+---+---+---+---+---+
0 |   |   |   |   |   |   |   |   | o |   |
  +---+---+---+---+---+---+---+---+---+---+
1 |   | 5 | 5 | 5 | 5 | 5 |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
2 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
3 |   | 4 | 4 | 4 | 4 |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
5 |   |   |   |   | x | x | 3 |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   | 1 |   |   |
  +---+---+---+---+---+---+---+---+---+---+
7 |   |   |   |   |   |   |   | 1 |   |   |
  +---+---+---+---+---+---+---+---+---+---+
8 |   |   | 2 | 2 | 2 |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
9 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
Enemy fired at E, 5
Enter target location: a 0
It missed.



Your markers and your board:
    A   B   C   D   E   F   G   H   I   J
  +---+---+---+---+---+---+---+---+---+---+
0 | o | x | x | o |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
1 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
2 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
3 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
5 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
7 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
8 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
9 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+

    A   B   C   D   E   F   G   H   I   J
  +---+---+---+---+---+---+---+---+---+---+
0 |   |   |   |   |   |   |   |   | o |   |
  +---+---+---+---+---+---+---+---+---+---+
1 |   | 5 | 5 | 5 | 5 | 5 |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
2 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
3 |   | 4 | 4 | 4 | 4 |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
4 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
5 |   |   |   |   | x | x | x |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
6 |   |   |   |   |   |   |   | 1 |   |   |
  +---+---+---+---+---+---+---+---+---+---+
7 |   |   |   |   |   |   |   | 1 |   |   |
  +---+---+---+---+---+---+---+---+---+---+
8 |   |   | 2 | 2 | 2 |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
9 |   |   |   |   |   |   |   |   |   |   |
  +---+---+---+---+---+---+---+---+---+---+
Enemy fired at F, 5
Enter target location: b 1
It's a hit!
```


Your markers and your board:
A B C D E F G H I J
0 | o | x | x | o | | | | | | |
1 | | x | | | | | | | | |
2 | | | | | | | | | | |
3 | | | | | | | | | | |
4 | | | | | | | | | | |
5 | | | | | | | | | | |
6 | | | | | | | | | | |
7 | | | | | | | | | | |
8 | | | | | | | | | | |
9 | | | | | | | | | | |
A B C D E F G H I J
0 | | | | | | | | | o | |
1 | | 5 | 5 | 5 | 5 | 5 | | | | |
2 | | | | | | | | | | |
3 | | 4 | 4 | 4 | 4 | | | | | |
4 | | | | | | | | | | |
5 | | | | x | x | x | | | | |
6 | | | | | | | | 1 | | |
7 | | | | | | | | 1 | | |
8 | | | 2 | 2 | 2 | | | | | |
9 | | | | | | | o | | | |
Enemy fired at G, 9

Statistics

Let’s put it up against a few other playing machines:
Against Random Player:

```
[2]> (getStatistics)
Available AIs:
1 - RANDOMPLAYER
2 - RANDOMPLAYERPLUS
3 - RANDOMPLAYERPLUSPLUS
4 - TIERLISTPLAYER
5 - TIERLISTPLAYERPLUS
6 - TIERLISTPLAYERPLUSPLUS
Enter a corresponding number to choose AI 1: 1
Enter a corresponding number to choose AI 2: 5
Enter the number of iterations: 100

100 games played:
Player 1 (RANDOMPLAYER) victories: 0
Player 2 (TIERLISTPLAYERPLUS) victories: 100
Draws: 0
NIL
```

Against Random Player Plus

```
[3]> (getStatistics)
Available AIs:
1 - RANDOMPLAYER
2 - RANDOMPLAYERPLUS
3 - RANDOMPLAYERPLUSPLUS
4 - TIERLISTPLAYER
5 - TIERLISTPLAYERPLUS
6 - TIERLISTPLAYERPLUSPLUS
Enter a corresponding number to choose AI 1: 2
Enter a corresponding number to choose AI 2: 5
Enter the number of iterations: 100

100 games played:
Player 1 (RANDOMPLAYERPLUS) victories: 26
Player 2 (TIERLISTPLAYERPLUS) victories: 73
Draws: 1
NIL
```

Against Random Player Plus Plus

```
[4]> (getStatistics)
Available AIs:
1 - RANDOMPLAYER
2 - RANDOMPLAYERPLUS
3 - RANDOMPLAYERPLUSPLUS
4 - TIERLISTPLAYER
5 - TIERLISTPLAYERPLUS
6 - TIERLISTPLAYERPLUSPLUS
Enter a corresponding number to choose AI 1: 3
Enter a corresponding number to choose AI 2: 5
Enter the number of iterations: 100

100 games played:
Player 1 (RANDOMPLAYERPLUSPLUS) victories: 22
Player 2 (TIERLISTPLAYERPLUS) victories: 76
Draws: 2
NIL
```

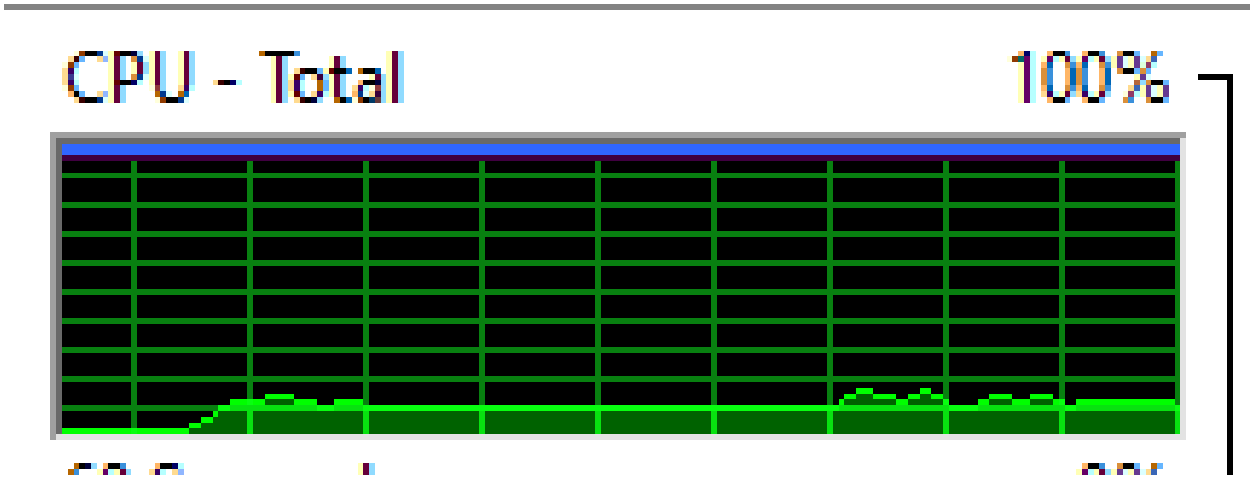
Against Tier List Player

```
[5]> (getStatistics)
Available AIs:
1 - RANDOMPLAYER
2 - RANDOMPLAYERPLUS
3 - RANDOMPLAYERPLUSPLUS
4 - TIERLISTPLAYER
5 - TIERLISTPLAYERPLUS
6 - TIERLISTPLAYERPLUSPLUS
Enter a corresponding number to choose AI 1: 4
Enter a corresponding number to choose AI 2: 5
Enter the number of iterations: 100

100 games played:
Player 1 (TIERLISTPLAYER) victories: 33
Player 2 (TIERLISTPLAYERPLUS) victories: 64
Draws: 3
NIL
```

Against itself

```
[6]> (getStatistics)
Available AIs:
1 - RANDOMPLAYER
2 - RANDOMPLAYERPLUS
3 - RANDOMPLAYERPLUSPLUS
4 - TIERLISTPLAYER
5 - TIERLISTPLAYERPLUS
6 - TIERLISTPLAYERPLUSPLUS
Enter a corresponding number to choose AI 1: 5
Enter a corresponding number to choose AI 2: 5
Enter the number of iterations: 100

100 games played:
Player 1 (TIERLISTPLAYERPLUS) victories: 51
Player 2 (TIERLISTPLAYERPLUS) victories: 47
Draws: 2
NIL
```

Against my CPU



Code

Most of the code is the same with TierListPlayer.l, its predecessor. However it now tracks a new variable called “all” that keeps track of all the locations it has. Oftentimes I find that I need to search for another location through all 5 tiers, in order words searching through 5 lists. WIth this variable it saves me the hassle of combining all those 5 lists again.

The class:

```
(defclass tierListPlayerPlus()
    (
        (name :accessor player-name :initform 'TierListPlayerPlus)
        (thisBoard :accessor player-board :initarg :thisBoard)
        (otherBoard :accessor player-otherBoard :initarg :otherBoard)
        (ships :accessor player-ships :initarg :ships)
        (t0 :accessor player-t0 :initform '())
        (t1 :accessor player-t1 :initform '())
        (t2 :accessor player-t2 :initarg :t2)
        (t3 :accessor player-t3 :initform '())
        (t4 :accessor player-t4 :initform '())
        (all :accessor player-all :initarg :all)
    )
)
```

Since “doWhenNotHit” method is a one liner, it no longer exists:

```
(defmethod modifyLists((l location) hit (p tierListPlayerPlus))
    (moveToTier l p 0)
    (if hit
        (doWhenHit l p)
        (moveNeighborsToTier l p 1)
    )
)
```

The modified “doWhenHit”:

```
(defmethod doWhenHit((thisL location) (p tierListPlayerPlus) &aux opposite board ship)
    ; Move all unexplored (not t0) neighbors to preferred (t3) list.
    (moveNeighborsToTier thisL p 3)

    ; Get next inferred ship location, if qualified, move to critical (t4) list.
    (setf opposite (getOpposite thisL p))
    (if (isQualifiedOpposite opposite p)
        (moveToTier opposite p 4)
    )

    ; But ... if this hit sinks a ship
    (setf board (player-otherBoard p))
    (if (isLocationSunk thisL board)
        (progn
            (setf ship (getLocationShip thisL board))
            ; For all of the locations around this ship
            (loop for otherL in (getLocationsAroundTheShip ship p) do
                ; If not next to an known unsunk ship, and is unexplored, move to avoid (t1) list.
                (if (and (not (isNextToUnsunkShip otherL p)) (isUnexplored otherL p))
                    (moveToTier otherL p 1)
                )
            )
        )
    )
)
```

The “getLocationShip” method returns a ship instance:

```
(defmethod getLocationShip((l location) (b board))
    (cell-resident (getLocationCell l b))
)
```

The “getLocationAroundTheShip” method returns every location that surrounds this ship:

```
(defmethod getLocationsAroundTheShip((s ship) (p tierListPlayerPlus) &aux board cells all-ls ship-ls adjs
result)
    (setf board (player-otherBoard p))
    (setf cells (ship-cells s))
    (setf all-ls (player-all p))
    (setf ship-ls (list))
    (setf result (list))

    ; First translate the cell coordinates into this player's location instances.
    (loop for cell in cells do
        (setf ship-ls (cons (getFromList (cell-num cell) (cell-row cell) all-ls) ship-ls))
    )
```

```
    ; For each of the location of the ship
    (loop for l in ship-ls do
        ; Get all the locations that surrounds the current one
        (setf adjs (getAdjacents l all-ls))
        ; And for each of the surrounding location
        (loop for adj in adjs do
            ; Add to the result if it is not this ship's location
            (if (not (member adj ship-ls))
                (setf result (cons adj result))
            )
        )
    )

    result
)
```

The “isNextToUnsunkShip” will check if any adjacent location of the current one have an unsunk ship:

```
(defmethod isNextToUnsunkShip((l location) (p tierListPlayerPlus) &aux board
adjacents result)
    ; An location is considered next to an unsunk ship if:
    (setf board (player-otherBoard p))
    (setf result nil)

    ; For each of its adjacent locations
    (loop for adjacent in (getAdjacents l (player-all p)) do
        ; If one of them:
        ; Has been explored! (Else it would be cheating)
        ; And it had result in a hit
        ; But the ship has not sunk
        (if (and
                (isExplored adjacent p)
                (isLocationHit adjacent board)
                (not (isLocationSunk adjacent board))
            )
            (setf result t)
        )
    )

    result
)
```