Altay Acar - 2018400084
Engin Oğuzhan Şenol - 2020400324

CMPE 300 Project 2
MPI Programming Project

Introduction

Unfortunately, we were unable to submit the project in given time. We send our work by sending an email at 00:44. We completed our code and the rest of the project at 03.28 and then submit it to the Moodle system. Our code runs successfully for every input that given with the project. I hope you will take account our work while you are evaluating our score.

Structure of the Implementation

While implementing our project, we used striped pattern while splitting the processor.

Firstly, we defined a function to place the towers in the specific places of the game_board.

After that, we opened the input file and read it line by line and copy each line into a list. The values in the first line stored as board_size, num_of_waves, and num_of_towers, respectively. Then, we created a two-dimensional list as our game_board and created a two two-dimensional which one of them holds the value of the healths as integer, and the other holds the types as char.

We created a for loop to represent each wave, The manager process placed the towers into the game_board (if the place is not occupied) as given in input by using our function. After that, the manager process splits the necessary parts of the table to worker processes in striped pattern. Then, we create a for loop for each round in a wave. Then, we split the the ranks of the worker processes into two groups as odd and even. We made a communication between worker processes. Then we checked that how much a tower can be damaged in all different rank types. For each round, our code is checking is that tower is destroyed and make a communication with other ranks. At the end of the worker process, we are checking the health for all the places of the game_board. If any place's health is less or equal than zero, we are changing values of the place to default. After a wave, we sent all the information to the manager process.

After all the waves has completed, our manager process prints the last version of the game_board as an output file.

Analysis of the Implementation

We could not complete this part of the project.

Test Outputs

input1.txt

```
o . o .

. . . .

. . + +

o . . +
```

Altay Acar - 2018400084
Engin Oğuzhan Şenol - 2020400324

input2.txt

```
+ + . o . . + +
+ . . o . . . +
+ + . o . . + .
+ . . . . . . .
+ . . . . o o .
+ . o . . . . .
. . . o . . . o
+ + . o o . . o
```

input3.txt

```
+ + + + . + + +
+ + + . . . + +
+ + . + . . + +
+ + + + . . . +
+ + + + . . . +
+ + + . . + . +
+ + + + + + + +
+ + + + + + + +
```

input4.txt

```
+ + + . . + + + + + + + + + + +
+ . . + + . . . + + + + . + + +
+ + . . . + . . + + + + + . + +
+ + + . + . . . + . + . + + + +
+ + + + + + + . + + + . + + . .
+ + + + + + + + + + + . . + . .
+ + + + + + + + + + + . + + . o
+ + + + + + + . . + + + + + . .
+ + + + . + + . + + . . . . + .
+ + . . . + . . + + + + + + + .
+ . . . . . . . . + + + + + . .
+ . . o . + . + . . + + + + + +
```

Altay Acar - 2018400084
Engin Oğuzhan Şenol - 2020400324

```
+....++.+..+++++
++..+.+......+++
+...+++.o..+++++
+..++++.oo.+++++
```

input5.txt

```
+++++....oo.ooo....++++++...o...++.....+....++.+++++++++++++.+.+
...+..o...o..o..+..+++++++.o..o.+..o.....o...+.+++..++++++++.++.
oo...o..o....o..++.++++++......++....+.o..o...++++.++++++......
.o...o..o...o.o.....++.+++.o.+++.....+...o.o..+..+..++++++++....
..........+.o..ooo.+.+.+++....+.+.o..+.+.oo...++.++++++.++++.o.+
++++.++++.+...o...........oo..+.....+.+.o..++....++++++++++.o.+
++++.....++.oooo..+..oo...ooo.++.o.+..+.o...+.o.+++++++++++...+
++++..++..+........+.o....o.oo......+.+.ooo...o..++++++++++++..
+.+....+..+++++..+......+....oo..+++...+.o.o.+...++++++++++....+
+...o..++++..+......o.o..++.oo..+++++..+.oo..+...+.++++++.++...+
+......+.++.+.o.o.oo...+++.oo..+++..+...o..++.o...+++++++.+....
++.+......+.+...o..oo.+.+++.o..++++++..o...+++..o..+++++++..+.oo
++.+...o.+........oo.+++++...+.++++.+.o.+.++++....+.++++++.....
++...oo...++.+...o.o....++.....++++.+....++++..++....++++...++.
+++.ooo...+++.+.ooo........o....+++.+....+.+++....o.....+++.+++
+++.ooo....+++..oo...o.o....ooo..+++...oo..+....o.oo.....+++++++
+++.oo..+++++++..o...ooo.o....o.........o..+..o.o.oo....+.+++++
..+.o......+++...ooo.oo.....ooo.o.++++..o.+..ooo..ooo.o..+.....
o.+.....oo........o.o....o.o.ooo...+.+..o......oo..ooo..o...o..o
...+.+.o....oo.++.o.o.+......oo.+.+.++.o.o.++......o.....+.....
+.+.++..oo.....++..oo...+...+....+++.++..oo.....++....++++....+.
..+++++.....++++++.ooo.....++++...+++....o..+..+..........+....
..++.+...++.++++++.oooo..o.+++++.++++..oooo....+...++..oo.+....o
+..+....+.+++.+.+..oooo..o.++++++..++..oooo..++......o.o....o.o
+..++..++++++.+..+..oooo...+++++.+++...o..oo..+++.+.o.oooo.....o
```

Altay Acar - 2018400084
Engin Oğuzhan Şenol - 2020400324

```
.++.....+++.+.+....oo...+++++++++++..o.....+..+....ooooo.....o
+++.+..o.++++.+.+..ooo.+...+...........++.+++.....oooooo....oo
++++..o..+++++...+......++.+..oo....+....++....oo...ooo.oo..ooo
.+++.o........o...oo.oo.++.+.o...oo....o.+...o.o..+.o.oooo..ooo
+....o..oo.+..o.o.o...o....++.oooo....oo.........+..o.oo..oooo
++++.....o..+.ooo..oo...++..+...oo....o...+.....+++..oo.o......
+++++.+....+...ooo.....+++++.+..o................+..o.o....++
++++++...+....o.o.o...+.++++.++.o...o....o...o..oo.++......++..
+++++.....+.....oo.o..+.+...++.o.+....oo..o...oo...+++++++++++
+++++.oo..+.+.....o.......+..++....+.o..o.o.o.+..oo....+++++++.+
++.++.........oo......o....+++++.+.o........+.oo.o..+.+....++
++++...+.oo.o.....+.+....++.+........o....+..o.......o..+.......
++++.+...oo.oooo.++....++++++.o..oo.....++++...+..++...+...oo...
..+++..+........++...+++++++.o...oo.+++++++......+.+....ooo..+.
o.+.+++.+...oo.++++.o.+++++++...oooo.......+.oo.+++..++.oooo..+
....++++..+.oo.+.+..o.+.++.++......o.o.......o...+....+...o...+
..+........oo.....oo..+.....+++.+......oo.ooo...+.+.o..+.ooo.++
++++..ooooo...o..o..o.++++..++++++.....o....ooo.++............
+..+..o..o.o..o.oooo....+++.+.++++++.+....o.ooo.....o....+...o..
+....oo.o.oo.ooooooo.......+++.+++++++.........o.......o......o.
+++..o..o..oo.ooooo.o.o..o..+++++++++..o.o....o.oo.+++....+....o
+.+..o.....o...o.o.....o.oo.++++++++++.....o.oooo....++.+.+++...
++...o...+..........oo.....+++.+++++.+++..ooooooo.o..+++++++..+
+....oo.....+....oo......+++++.+.++++++...oo..oo....o..+++++++++
+.o...ooo..++.+.o..o.+++.++..+.++++++++..oo......++.oo...+.+++++
+..o..oooo.+........++...+.....++.+.+..oo..........o....+++++++
++.....oo...+++.....++.+++..+.++...++...o...+++++..ooo.o.+++++++
++++.+.....++++.ooo...+.+............o.o.....+++...ooo..++++.++
+++++.+++....+.....o.+++.+..o.o.o.+.oo..o....++++++...o..+++++.+
+++.++....oo.++..+....+...+.oo.o..+.....oo....++..+.+.oo.+++....
+++.+.+++..o.++..+..+....++......+.+.+...o.+++++.+........+...o.
```

```
+ + + + + + + + . . . . . + . . . . . . . . + + . + + + + . . . + + + + + + . o o . . . . . . . + + + + + . + + + + + + . . . o

+ + + + + + + + + + . . . . . . o . . o . . + + + . . + + . + + + + + . + + . . . . . . . + . + + + + + + + + + + + . . . o o o

+ + + + + + + + . + + + . o . . . o . o o . . . . + + + + . + + + + + . + . + + + . . + . + + + . + . . . . . . + + + + . o . .

+ + + + + + + + + + + . . . o o o . . . . o . . . . . + + + + + + + + + + . . . + + + . + + + + . . . . o . o . . . . + . . . .

+ + + + + + + . + + . . o o o o o . . o o . o . o o . + + + + + . + + + + + . + + + + + . + + . . o . . o o o o . + + + . .
o o

+ + + + + + + . . . + . . o o o o . o o o . . . . . . + + + + + . + . + + + . + + + + + . + + + . . . . . . . o . . . . . o o o

+ + + + + + + + . . . . . . o o . . . o o . . . + . + + + + + . + + + + . + . + + + . + . + . . . . . . . . . . . . o o o o o o

+ + + + + . + + + . . . + . . o o . o . . . . + + + + + + + + + + . + + + + . . . + + + + + . + + . + . o o . o o o o o o o o
o
```

Difficulties Encountered and Conclusion

First and Last Worker Process: In communication of the worker processes, we realized that there should be a difference while receiving and sending data for the first and the last worker processes. The first worker should not be sent data to or receive data from the upper worker process, since there is no upper worker process. Also, the last worker should not be sent data to or receive data from the lower worker process, since there is no lower worker process. We solved that problem by implementing an if statement which checks the rank of the worker process is 1, p_num or other. Then, we made different implementation for each type of the worker processes.

Class: At the beginning of the coding, we defined a class for each cell in our game_table two-dimensional list. In the class, there were 3 variables which are tower types, health, and is_occupied. We implement our towers in manager process into our game_table. While sending data to worker processes, we could not receive a data of defined class in worker processes. We have tried a various of ways to receive the data. Yet, we could not encounter this situation and that costs us a huge amount of time. After that, we remove the classes and define two two-dimensional list. We could receive the data easily.