CSE 102 SPRING 2025-COMPUTER PROGRAMMING ASSIGNMENT-5

Learning Outcome:

Through this project, I learned how to work with two-dimensional arrays in the C programming language and how these arrays can be used to represent structures like a game board. I also improved my understanding of key topics in C, such as generating random values with rand(), working with files using fopen, fprintf, and fclose, and creating modular code using functions. I experienced firsthand how turning repetitive code into functions increases both readability and reusability. This project helped me not only improve my coding skills but also gain experience in organizing, testing, and logging code outputs.

Working Principle:

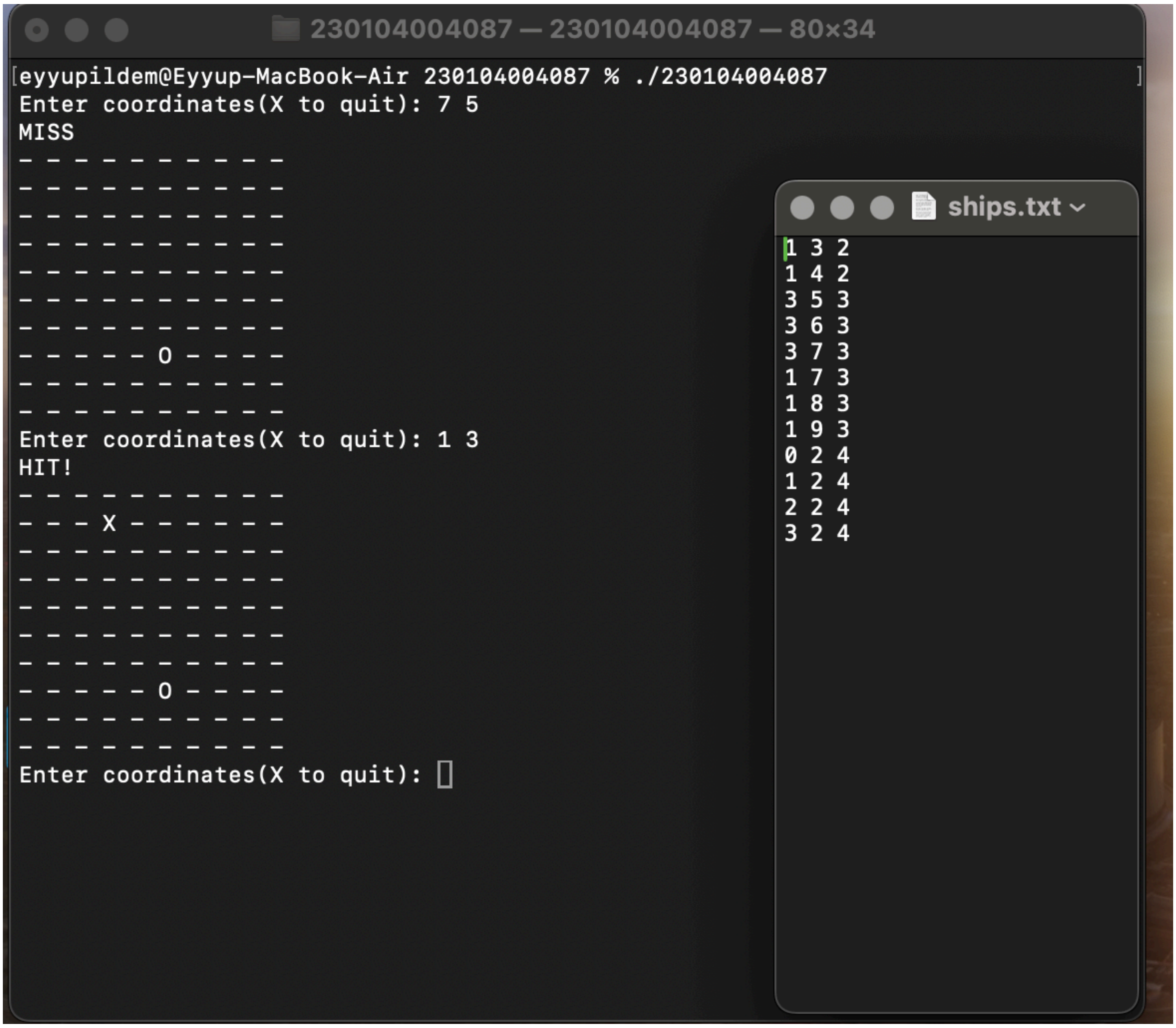
This project simulates the core mechanics of the "Battleship" game, such as ship placement and move tracking. When the program starts, it creates a 10x10 game board using a two-dimensional array (int arr[10][10]). Ships of various sizes and labels are randomly placed on this board. During placement, the program checks to ensure that ships do not overlap. Each ship is randomly placed either horizontally or vertically.

The position and size of every placed ship are recorded in a file named ships.txt, which acts as a log for the initial ship layout. Additionally, every move made by the player is recorded in a separate file called battleship_log.txt. This file keeps track of the coordinates targeted by the player and whether the shot was a hit or miss. In this way, all player actions are logged. Whenever the program is restarted and a new game board is generated, the contents of ships.txt are reset to reflect the new game state.

Challenges:

One of the most difficult parts of this project was developing an algorithm that ensures ships are placed correctly and without overlapping. Initially, the code contained many repeated blocks, which made it hard to read and maintain. These were later refactored into a single function called gemi_koyma() to make the code more modular and readable. There were also challenges in correctly opening the ships.txt file and writing to it with fprintf. Ensuring that each player move was logged correctly to battleship_log.txt required careful logic. Additionally, the restriction of not using #define or const meant that some boundary checks had to be handled manually, increasing the risk of errors. Despite these difficulties, all issues were resolved step by step, and the project was successfully completed.

MISS and HIT OUTPUT:

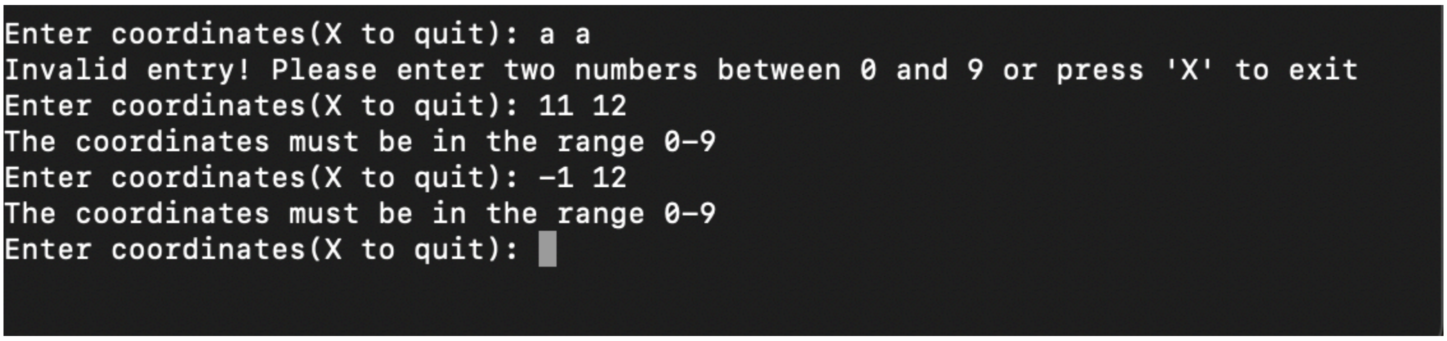

230104004087 — 230104004087 — 80×34

```
eyyupildem@Eyyup-MacBook-Air 230104004087 % ./230104004087
Enter coordinates(X to quit): 7 5
MISS
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - O - - - -
- - - - - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): 1 3
HIT!
- - - - - - - - - -
- - - X - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - O - - - -
- - - - - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): 
```

ships.txt

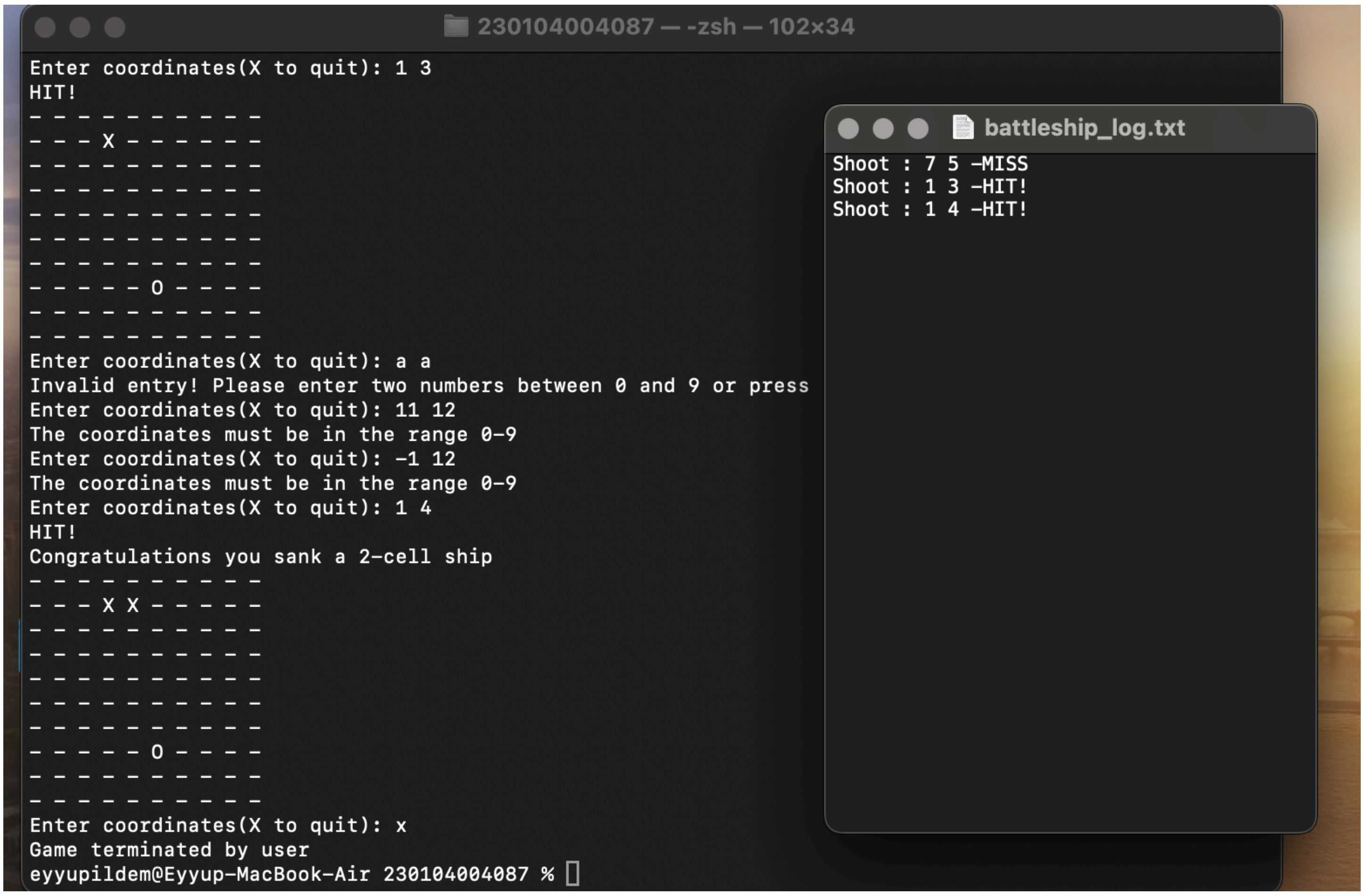
```
1 3 2
1 4 2
3 5 3
3 6 3
3 7 3
1 7 3
1 8 3
1 9 3
0 2 4
1 2 4
2 2 4
3 2 4
```

invalid input :



```
Enter coordinates(X to quit): a a
Invalid entry! Please enter two numbers between 0 and 9 or press 'X' to exit
Enter coordinates(X to quit): 11 12
The coordinates must be in the range 0-9
Enter coordinates(X to quit): -1 12
The coordinates must be in the range 0-9
Enter coordinates(X to quit): 
```

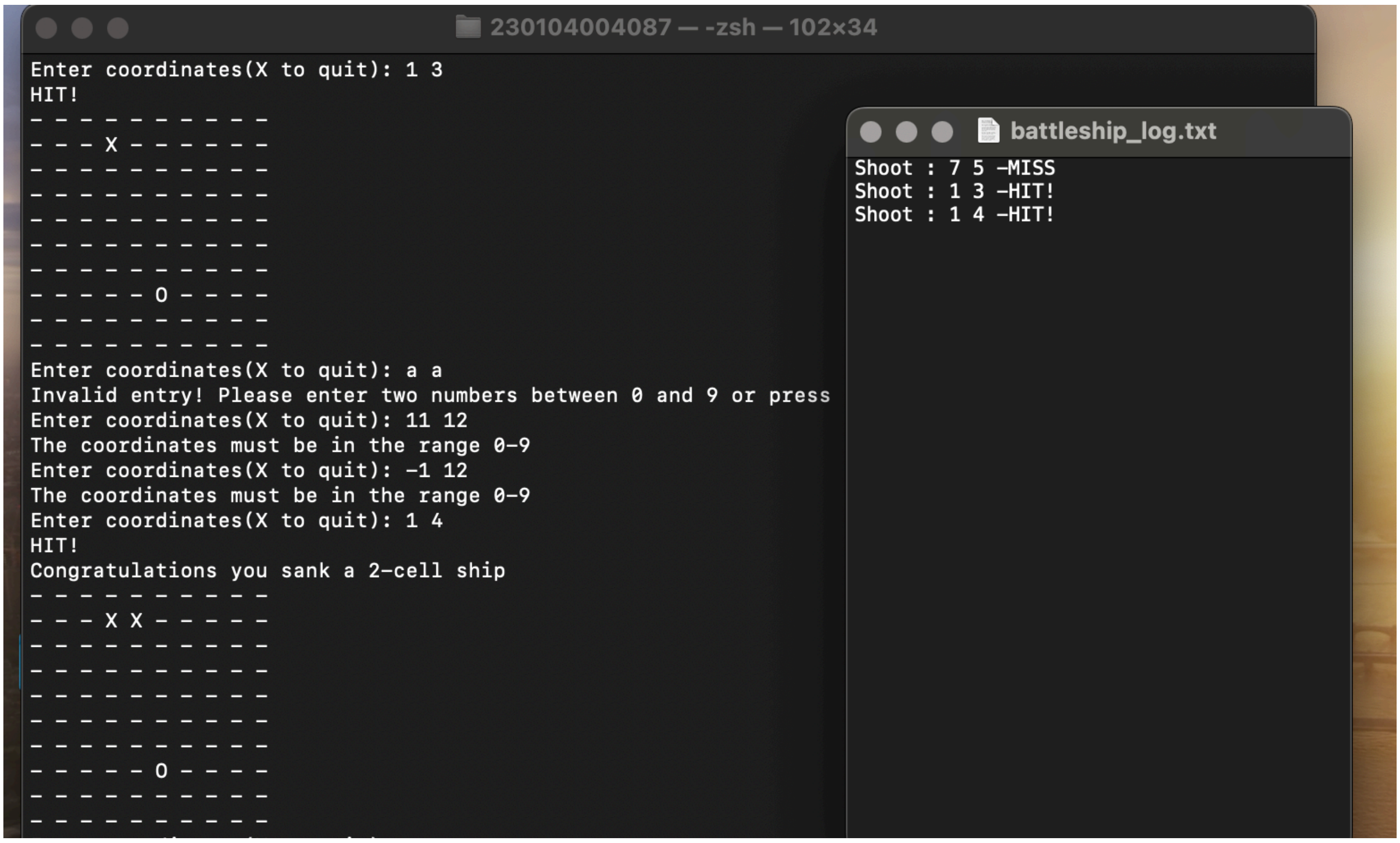
sank a ship output:



```
Enter coordinates(X to quit): 1 3
HIT!
- - - - - - - - - -
- - - X - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - O - - - -
- - - - - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): a a
Invalid entry! Please enter two numbers between 0 and 9 or press
Enter coordinates(X to quit): 11 12
The coordinates must be in the range 0-9
Enter coordinates(X to quit): -1 12
The coordinates must be in the range 0-9
Enter coordinates(X to quit): 1 4
HIT!
Congratulations you sank a 2-cell ship
- - - - - - - - - -
- - - X X - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - O - - - -
- - - - - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): x
Game terminated by user
eyyupildem@Eyyup-MacBook-Air 230104004087 %
```

```
Shoot : 7 5 -MISS
Shoot : 1 3 -HIT!
Shoot : 1 4 -HIT!
```

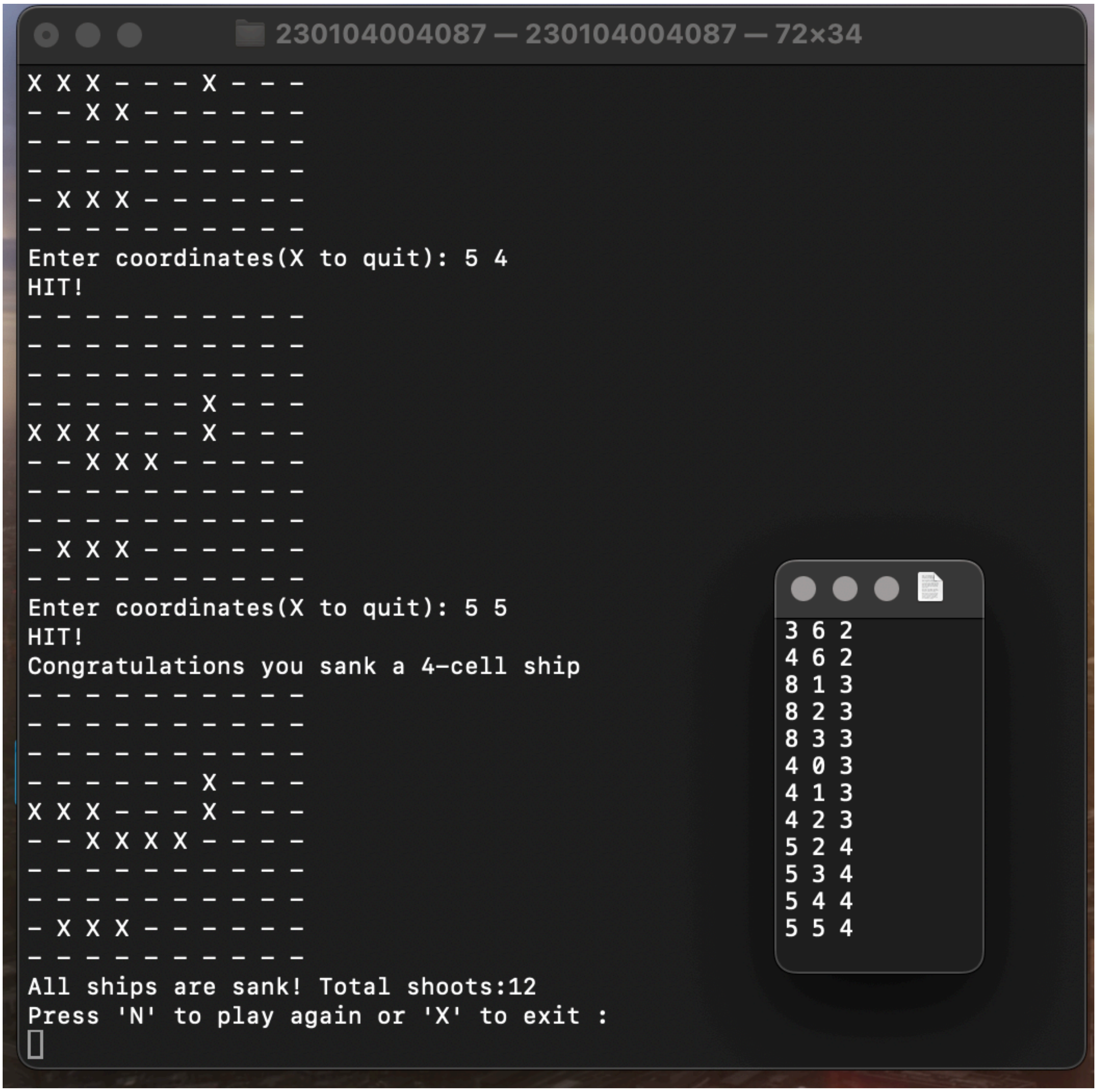
battleship_log.txt output:



```
Enter coordinates(X to quit): 1 3
HIT!
- - - - - - - - - -
- - - X - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - O - - - -
- - - - - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): a a
Invalid entry! Please enter two numbers between 0 and 9 or press
Enter coordinates(X to quit): 11 12
The coordinates must be in the range 0-9
Enter coordinates(X to quit): -1 12
The coordinates must be in the range 0-9
Enter coordinates(X to quit): 1 4
HIT!
Congratulations you sank a 2-cell ship
- - - - - - - - - -
- - - X X - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - O - - - -
- - - - - - - - - -
- - - - - - - - - -
```

```
Shoot : 7 5 -MISS
Shoot : 1 3 -HIT!
Shoot : 1 4 -HIT!
```

copmleted game output:

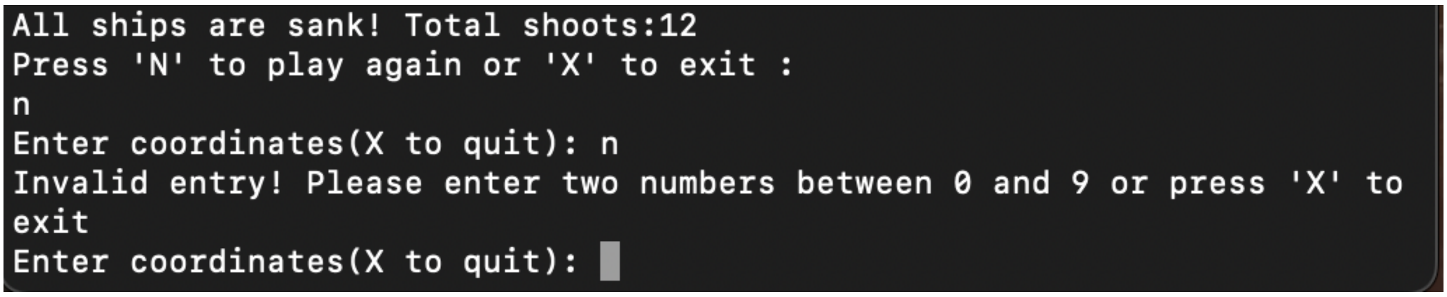


230104004087 — 230104004087 — 72×34

```
X X X - - - X - - -
- - X X - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- X X X - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): 5 4
HIT!
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - X - - -
X X X - - - X - - -
- - X X X - - - - -
- - - - - - - - - -
- - - - - - - - - -
- X X X - - - - - -
- - - - - - - - - -
Enter coordinates(X to quit): 5 5
HIT!
Congratulations you sank a 4-cell ship
- - - - - - - - - -
- - - - - - - - - -
- - - - - - - - - -
- - - - - - X - - -
X X X - - - X - - -
- - X X X X - - - -
- - - - - - - - - -
- - - - - - - - - -
- X X X - - - - - -
- - - - - - - - - -
All ships are sank! Total shoots:12
Press 'N' to play again or 'X' to exit :
```

```
3 6 2
4 6 2
8 1 3
8 2 3
8 3 3
4 0 3
4 1 3
4 2 3
5 2 4
5 3 4
5 4 4
5 5 4
```

new game output:



```
All ships are sank! Total shoots:12
Press 'N' to play again or 'X' to exit :
n
Enter coordinates(X to quit): n
Invalid entry! Please enter two numbers between 0 and 9 or press 'X' to
exit
Enter coordinates(X to quit): 
```