

Questions of Advanced-Programming course at Shahid-Beheshti-University

## Minesweeper Game

*by*

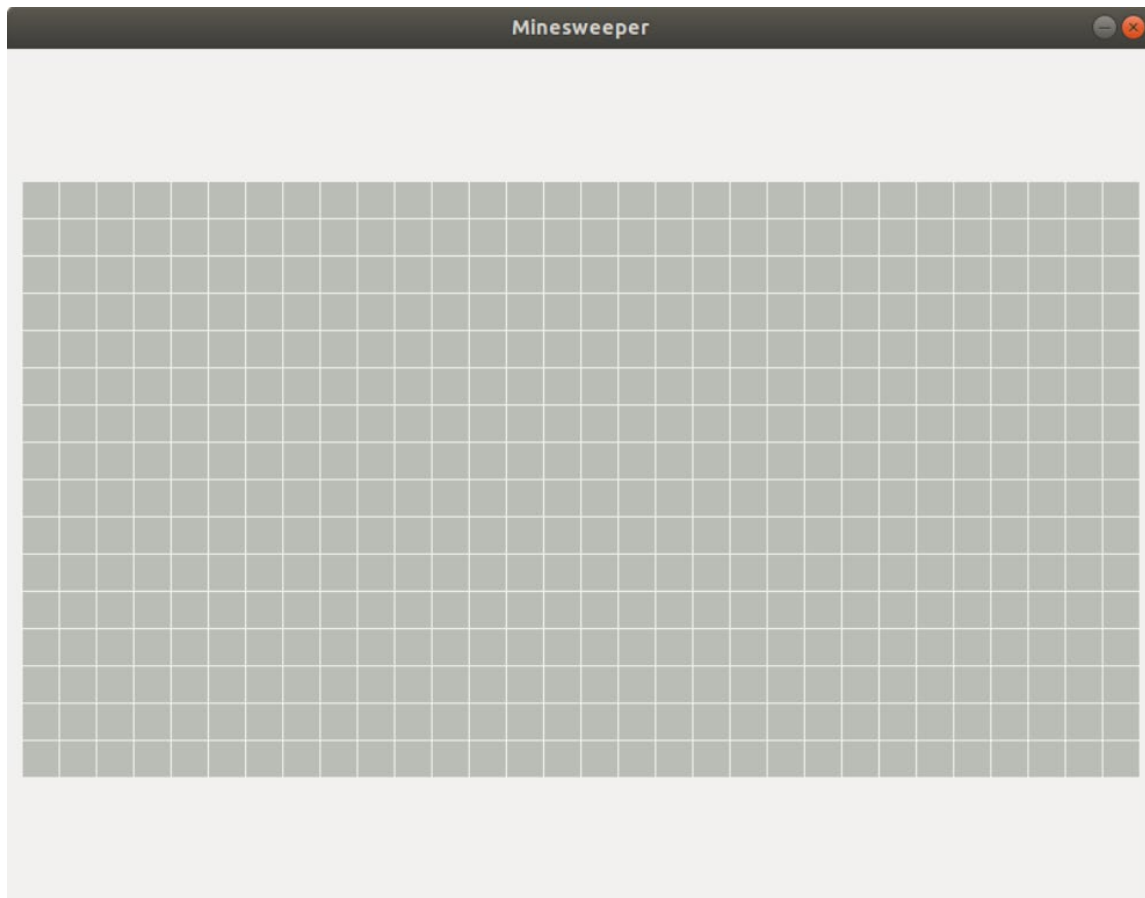
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In this project, we plan to implement the famous Minesweeper game. The language of this question is C++. The screenshots that came in the question are for better understanding of the question, and you just need to implement the game on the console.

### Explanation about the game

The game board is an  $n$  by  $m$  table. In some houses of this table there are bombs that the user cannot see. The goal of the game is for the user to discover the location of the bombs without detonating any bombs.

At the beginning of the game, the game screen is like this:

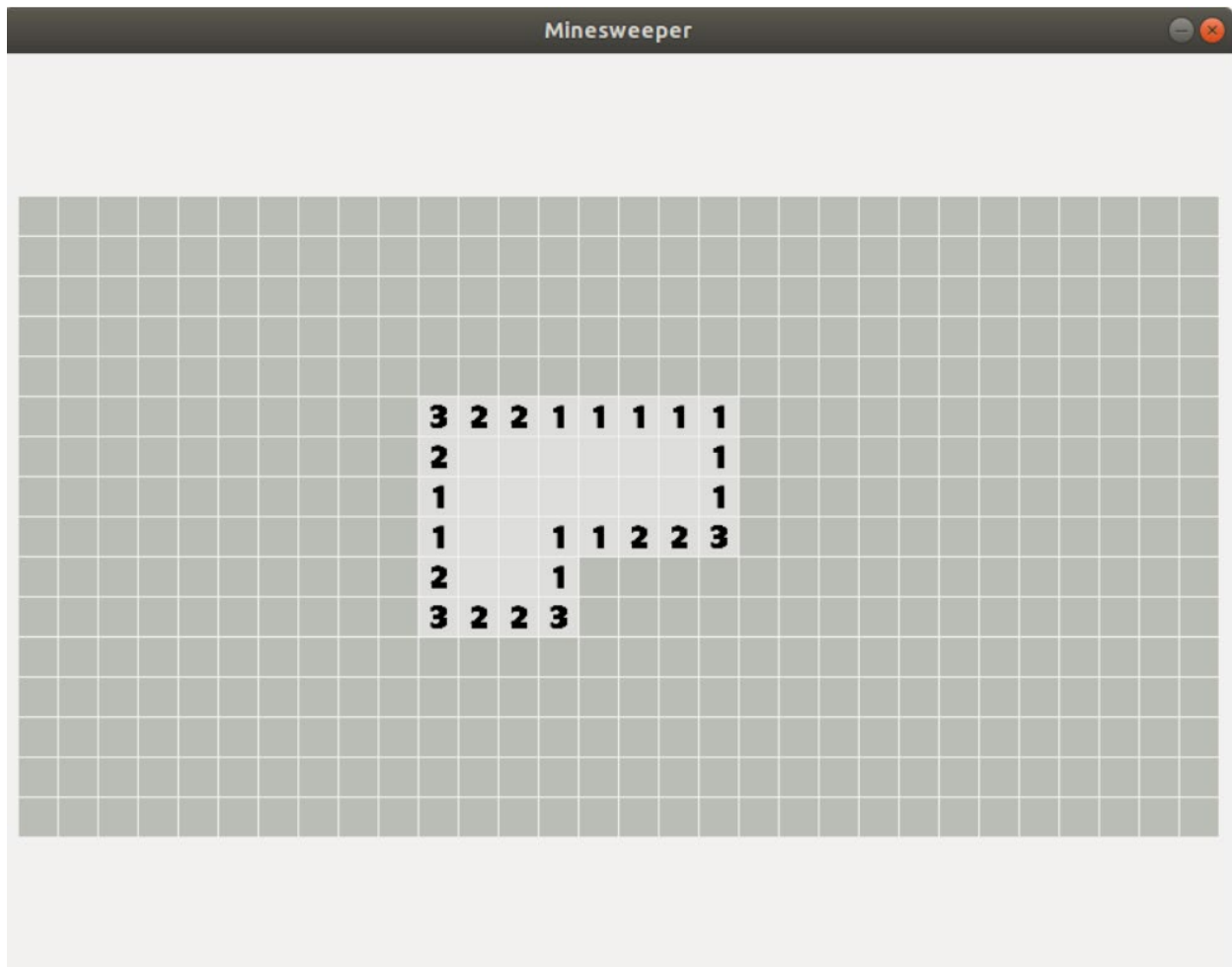


The user can start the game by clicking on any of the houses in the table. It is guaranteed that the user will not lose on the first click.

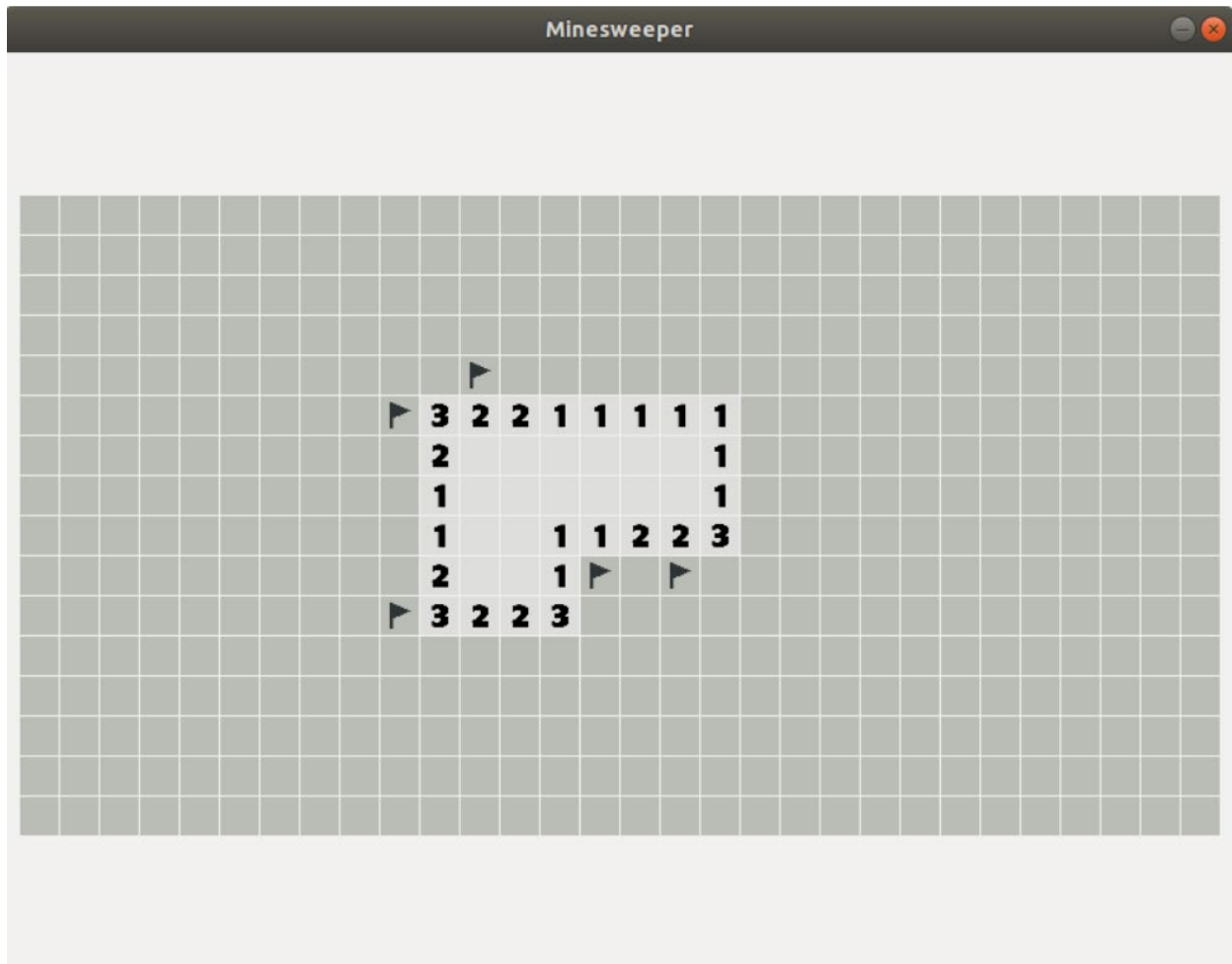
Clicking on any house will "reveal" that house. It means that its hidden content is displayed to the user. This content can have different modes:

- Bomb: If the house selected by the user has a bomb, the game ends with a loss.
- Number: Houses without bombs have a number inside. This number indicates the number of bombs that this house has in its vicinity.
- Empty: Houses that neither have bombs nor are there any bombs around them are empty.

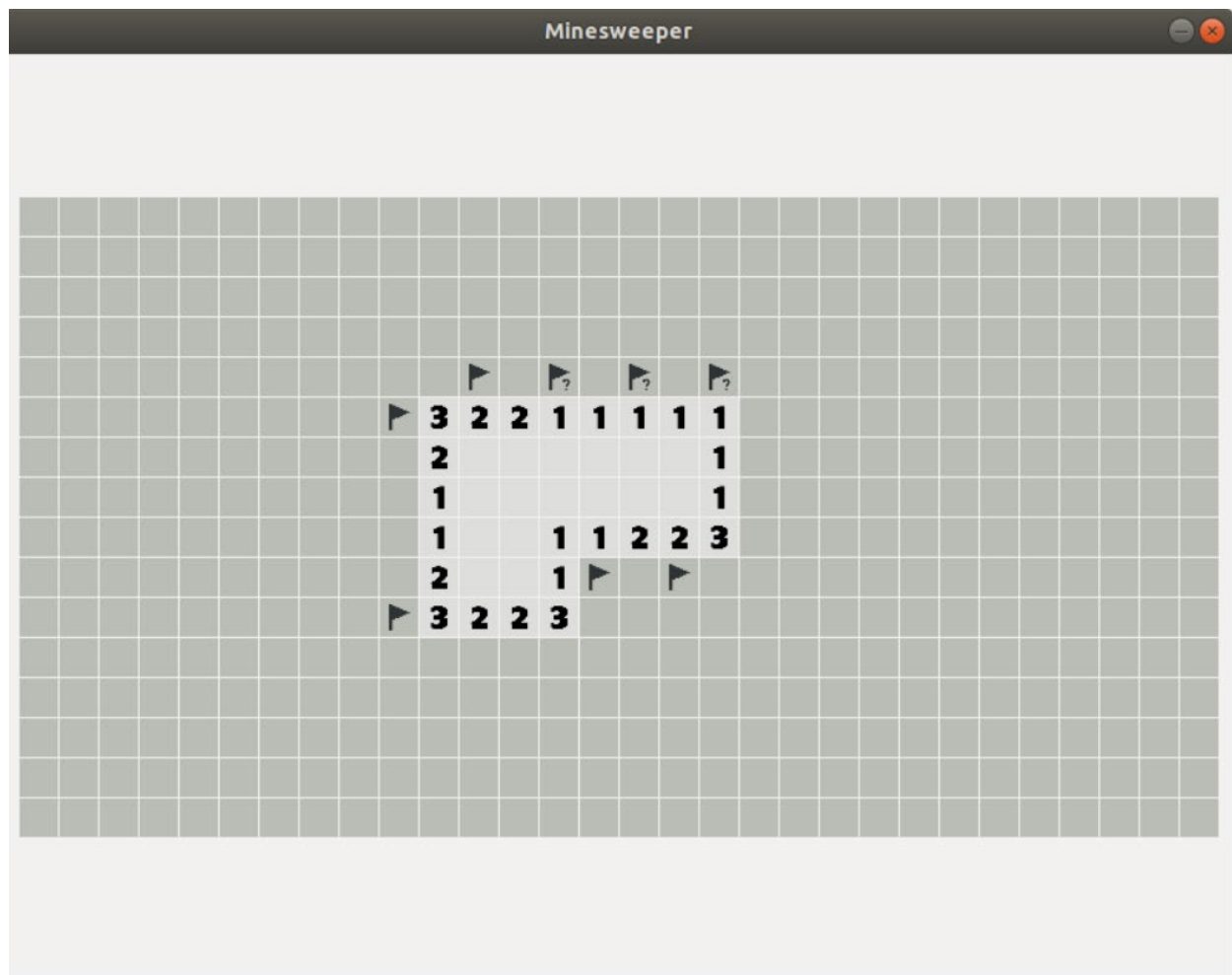
Pay attention to the following photo:



According to the numbers in the photo, you can guess the location of the hidden bombs. For example, in the photo below, the houses with flags indicate the houses where the user knows there are bombs based on the information he has. These flags are added to the table by right-clicking and selecting the user. These flags are only for the user not to accidentally click on bombed houses and have no other effect on the game process.

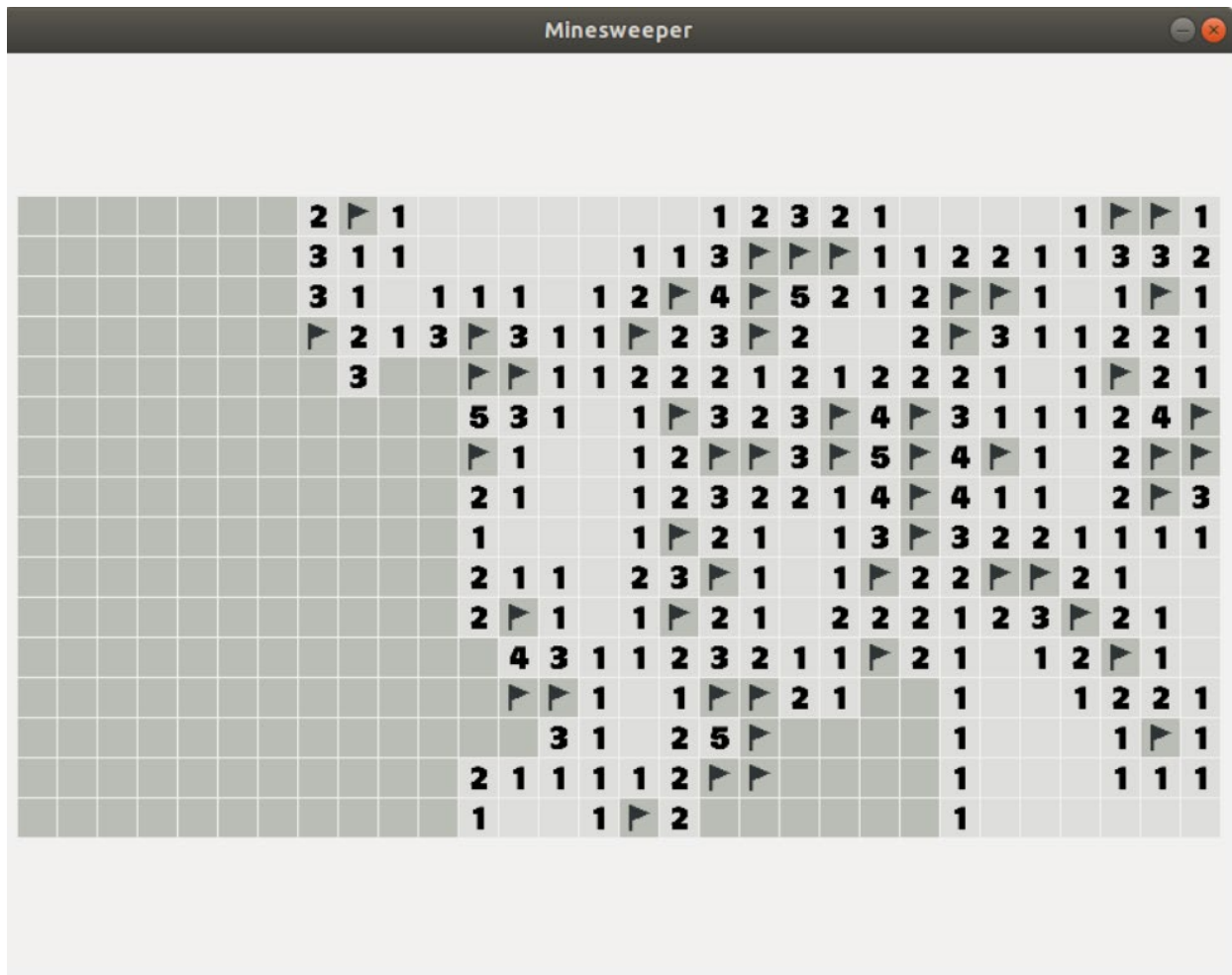


Also, in addition to the flag, the user can also put a question mark in the table. This sign is for houses where the user doubts whether there is a bomb or not. The difference between these types of houses and flag houses is that if the user clicks on the flag, the desired house will not be revealed. But the question mark is just a mark, and if the user clicks on a house, that house will be revealed. A number of question marks have also been added to the figure below.

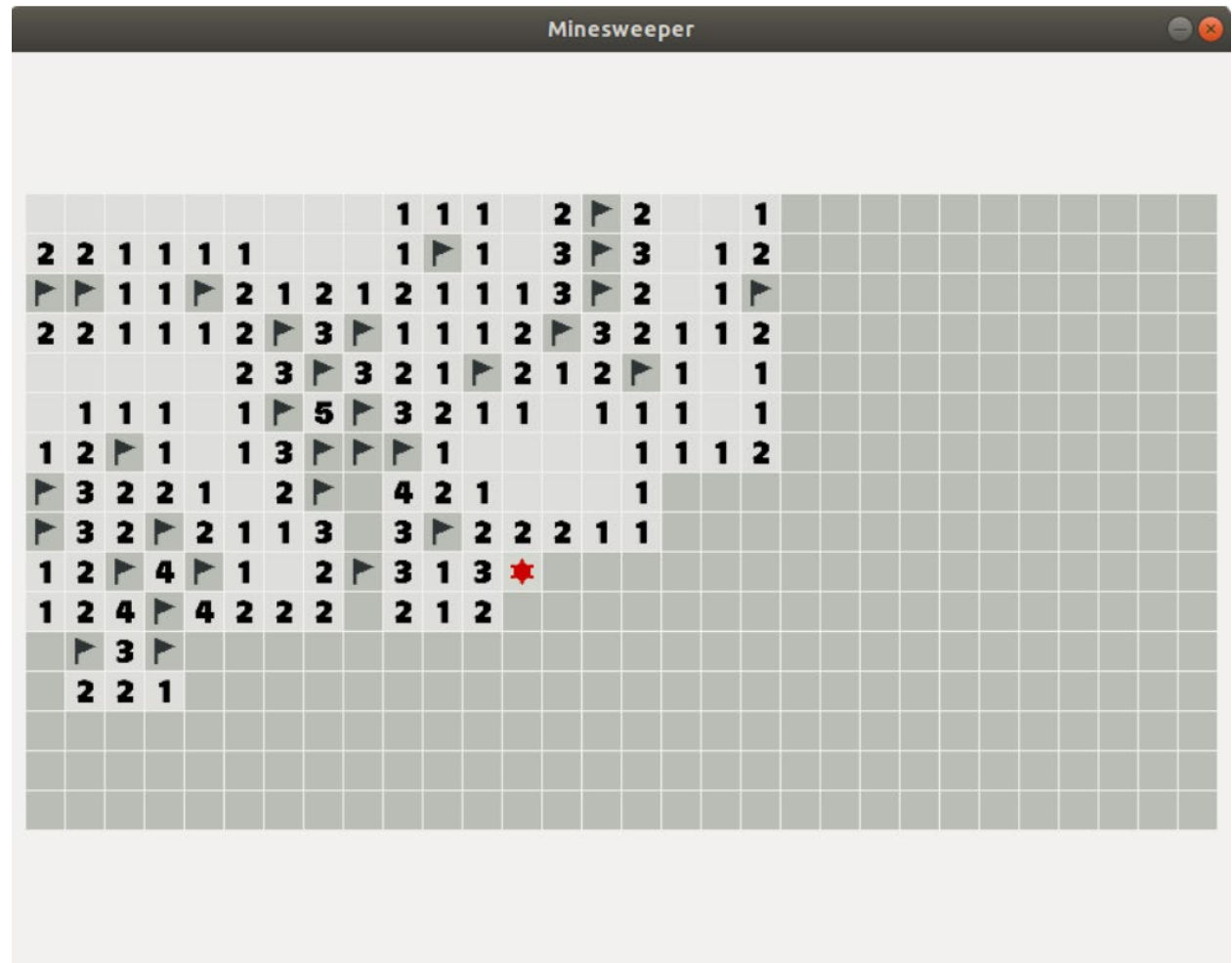


The goal of the game is for the user to find all the houses that do not have bombs. In this case, the user wins. If in this process the user clicks on a bomb by mistake, he loses.

Other screenshots of the game:



Lost:



I suggest you to download the game yourself and play with it a little to learn more about this game.

## Implementation cases in the project

In this assignment, you must implement this game on the console.

When the program runs, get the length, width, and number of bombs from the user. Note that the number of bombs should not exceed the number of houses. There should also be room for at least one bomb-free house.

After getting the screen specifications from the user, show him the game screen. The way of presentation is up to you and there is no compulsion in this field. Every time you show the page to the user, you need to get a command from them. This command can be one of the following commands:

- **Print:** This command prints the page (as far as the user has gone). This display should show the same details as you see in the screenshots above.
- **Clicking on a house:** This command gets the row and column from the user, and reveals the desired house to the user. If the desired house is the flag, nothing will happen. If a bomb explodes, the user loses. Otherwise, the corresponding number in that house will be shown to the user.
- **Placing a flag on a house:** with this command, after getting the row and column from the user, a flag is placed in the corresponding house. Note that the flag can only be placed on unrevealed houses.
- **Placing a question mark on a house:** with this command, a question mark is placed on the corresponding house after receiving the row and column from the user. Note that the question mark can only be placed on houses that are not revealed.
- **Total number of bombs:** Prints the number of bombs in the table.
- **Number of Undiscovered Bombs:** Assuming the user has flagged the correct houses, this number represents the number of bombs the user has yet to discover.

Also, in case of winning or losing, display the corresponding message to the user. After this, it is not necessary to ask the user for instructions.

## Privilege

- Add a command to the game that shows the user the past time. This time should be measured relative to the start time of the game.
- Save the best times that the user has achieved in previous games in a file. Load this file in your program every time you open the program. By entering a command, the user can see the top ranks (along with the name of the person who registered the record). Also, if the user solves the game in a time when he can be in the Top 10, you should get his name from him and save it in the rankings. For this you can read the fstream library.
- If you look at the original game, sometimes when the user clicks on a house with the number zero (before he knows it's zero!), all the houses adjacent to the clicked house will open! This issue can also be seen in the screenshots in case

of questions. For example, in the second screenshot, I have clicked on only one empty house, but many houses are revealed. Hint: You can study the DFS algorithm.