**INTERNATIONAL UNIVERSITY – HO CHI MINH NATIONAL UNIVERSITY**

**SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**

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**PROJECT FINAL REPORT**

**Course: Algorithms & Data Structures**

**Lecturer: Tran Thanh Tung**

**MINESWEEPER**

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| **Group 12** | | |
| **Name** | **ID** | **Contribution** |
| Nguyễn Võ Nhật Anh | ITITIU19001 | 60% |
| Trần Hoàng Phúc | ITITIU17107 | 40% |

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1. ***INTRODUCTION.***
   1. **Game Introduction.**

Minesweeper is a single-player puzzle video game. The objective of the game is to clear a rectangular board containing hidden "mines" or bombs without detonating any of them, with help from clues about the number of neighboring mines in each field. The game originates from the 1960s, and it has been written for many computing platforms in use today. It has many variations and offshoots.

* 1. **Scope.**

This report will go over the creation and execution of a basic MineSweeper game in further depth. The game is developed entirely in JAVA and requires no other libraries. The Java AWT library is used to implement the majority of the components.

We try to make The game as close to the original as possible including all the functions of the original like: New Game, Difficulty Selection, Level Customization as well as Leaderboard.

1. ***RULES AND HOW-TO-PLAY.***
   1. **Rules.**

Minesweeper has fairly basic rules. We starting with a board is divided into cells, and mines are placed around at random.In order to win you must reveal all the cells. The number in a cell indicates the number of bombs nearby. You may use this information to detect which cells are safe and which contain bombs. The right mouse button can be used to indicate cells that are suspected of being bombed. Despite the simple rules, minesweeper may be played in a variety of ways. There's something for everyone: race to be the quickest, solve the most challenging puzzles, or simply appreciate the logic. Many distinct categories have their own leaderboards.

**TLDR:** Open all Cells and Avoid Bomb (Cell number indicates nearby Bombs).

* 1. **How-To-Play.**

Each Minesweeper game starts out with a grid of unmarked squares. After clicking one of these squares, some of the squares will disappear, some will remain blank, and some will have numbers on them. It's your job to use the numbers to figure out which of the blank squares have mines and which are safe to click.

Use the mouse's left and right buttons. The mouse is the only tool that you'll need to play Minesweeper. The left mouse button is used to click squares that don't contain mines, while the right mouse button is used to flag squares that you think may have mines.

The first square will clear off some of the board while numbering other squares. The first click on the board will never have a mine to make sure that you might not get unlucky and instant lose in the first click.

Know what the numbers mean. A number on a square refers to the number of mines that are currently surrouding that square. For example, if there are two squares next to each other and one of the squares has "1" on it, you know that the square next to it has a mine.

**TLDR:** Left-click to open cells, Right-click to Flag, Question, Undo Flag.

* 1. **Game Features.**

Click the menu "Game" -> "Start" to start a new game.

Click the menu "Game" -> "Easy" (9x9) to enter the Easy game interface.

Click the menu "Game" -> "Medium" (16x16) to enter the Medium game interface.

Click the menu "Game" -> "Hard" (30x16) to enter the Hard game interface.

Click the menu "Game" -> "Custom" to enter the custom game control interface.

Click the menu "Game" -> "Leaderboard" to check the ranking of the time to complete the Game.

Click the menu "Game" -> "Exit" to exit the game.

Click the menu "Help" -> "Game Rules" a modal window will pop up, and a short simple of rules version will be displayed in the window.

Click the menu "Help" -> "Mines Hint" the games will now hint the mines location

Left-click on the minefield to open the current selected cell.

Right-click the minefield cell, click once will mark the cell with flag, twice will mark the cell with question mark, and click the third time to reinitialize the blank cell.

1. ***GAME DESIGN.***
   1. **Demo Interface.**

Table

Description automatically generated

**Main Interface:** This is the interface when you first start the game. By default, the game will start with the easy mode (10 mines and 9x9 board). The clock will start counting when open the first cell.

Graphical user interface, application, table

Description automatically generated

**Game Menu**: This is the game menu interface when you click it or press Alt + G. In Game menu you can select New game to open New game, Select the difficulty, Customize the board, Review the leaderboard and Exit the game.

Table

Description automatically generated

**Help:** This is the Help interface when you click it or press Alt + H. In Help you can select to see game Rules and Use Mines Hint feature to reveal all the mines’ spots.

**Disclaimer:** There are more Interfaces for example: Win, Customize box, Game Rules box, Mines hints,… But it will be showed more during the demo of this project.

* 1. **UML Diagram.**
     1. **Three Panels.**

**Diagram

Description automatically generated**

* + 1. **Main Frame.**

**Diagram

Description automatically generated**

* 1. **Game Implementation.**
     1. **Mine laying technique.**

**Diagram

Description automatically generated**

First we generate the bomb randomly in the coordinate. Then we check whether the coordinate have bomb or not if it’s laid with bomb we will then redo the generate. If the spot doesn’t have bomb we will laid bomb in there and change the status. We check if all bombs have been placed enough as required. If it false redo all the process else terminate.

* + 1. **Determine mine in the neighborhood cells.**

**Diagram

Description automatically generated**

First we will find the coordinate of each minefield. If the coordinate is placed with mine. We will redo the process until the coordinate is not mine. Then we calculate the surroundings area of that coordinate if it has mine increase the count then replace with corresponding count value image then terminate.

* + 1. **Clicks Cells.**

**Diagram

Description automatically generated**

For the clicked spot, we first check the coordinate of the clicked spots. After that we will check whether the spot have mine or not. If the spot have mine we the game will terminate. If the spot doesn’t have mine we will calculate the eight spots around the clicked coordinate and replace the image with corresponding count value then terminate.

1. ***CONCLUSION.***
   1. **Outcome.**

During the time working on the project we encounter a lots of problems. However, we managed to get through it and complete the project before the deadline. At the same time, we also learned many things through this project:

* How to apply algorithm
* How to use data structures
* And many more
  1. **Future Improvement.**

If we have more time to work on this project, we will try to:

* Implement more features for the game
* Add more game modes to the games.
* Maybe upgrade the UI so the game would look more modern.

***REFERENCES.***

***Wikipedia.com:*** <https://en.wikipedia.org/wiki/Minesweeper_(video_game)>

***Wikihow.com:*** <https://www.wikihow.com/Play-Minesweeper>

***English Tutorial:*** [Java Minesweeper - creating Minesweeper game clone in Java (zetcode.com)](https://zetcode.com/javagames/minesweeper/)

***Vietnamese Tutorial:*** [Làm game MineSweeper (Dò mìn) bằng Java – Mai trời sáng ! (wordpress.com)](https://maitroisang.wordpress.com/2019/07/27/lam-game-minesweeper-do-min-bang-java/)