**18APCS2 – Group 12**

**CS161 Project Report**

**Caro/ Gomoku**

**INTRODUCTION**

This project is about creating a Gomoku/Caro console game which we can play in either PvP or PvC mode. The game allow us to save and load or remove our saved game from a list of saved game. We can also change the game settings, or see the player statistics of P-C mode. The game Artificial Intelligence in PvC mode is not easy to deal with, it will act as if it is a real person with high knowledge in playing Gomoku.

**MEMBERSHIP**

|  |  |  |  |
| --- | --- | --- | --- |
| STT | Student ID | Student Name | Percentage of contribution(\*) |
| 1 | 18125002 | Nguyễn Tiến Anh | 30% |
| 2 | 18125054 | Bùi Minh Đức Tài | 33% |
| 3 | 18125086 | Nguyễn Hữu Khang | 37% |

\* Approximated number

**WHAT WE HAVE DONE:**

1. Splash screen
2. Menu screen : Allow user to use keyboard to choose mode
3. P-P mode: Allow user to enter their names and play, show the game statistic ( name, whose turn, rule, board size, icon, score, introduction).
4. P-C mode: Allow user to enter his/her name and play, show the game statistic ( name, rule, board size, icon, score, introduction).
5. Save game : Allow user to enter the game name, can check whether its exist, the number of games can save are unlimited.
6. Load game: Allow user to choose a game from list to continue playing.
7. Remove game: Allow user to choose a game from list to remove.
8. Setting: Allow user to change icons (default O - X), able to announce if the two icons are the same. Allow user to choose either Blocked head (default) or Non-Blocked Head rule, user can also choose the size of play board 10x10, 15x15 or 20x20(default)
9. Player statistic: (Only for P-C mode) Announce the number of win games, games played, win rates. Allow user to choose 1 from saved game list ( limited 15 recently games) to see it game board.
10. About screen.
11. Exit screen.

**CONTRIBUTION:**

|  |  |  |
| --- | --- | --- |
| **Student Name:** | **Task have done** | **Number of hours to complete the task** |
| **Nguyen Huu Khang** | 1. **Spash screen** | **1 hours** |
| 1. **PVC Mode** | **2 hours** |
| 1. **AI development** | **80 hours** |
| 1. **Save game of PVC mode** | **15 hours** |
| 1. **Load game of PVC mode** | **2 hours** |
| 1. **Remove game of PVC mode** | **2 hours** |
| 1. **Link other member parts to main program** | **8 hours** |
| **Bui Minh Duc Tai** | 1. **Win condition** | **5 hours** |
| 1. **Save game in PVP mode** | **3 hours** |
| 1. **Load game in PVP mode** | **1 hours** |
| 1. **Remove game in PVP mode** | **1 hours** |
| 1. **Game control** | **10 hours** |
| 1. **PVP mode** | **3 hours** |
| 1. **Setting (rule)** | **5 hours** |
| 1. **Report** | **4 hours** |
| **Nguyen Tien Anh** | 1. **Menu** | **4 hours** |
| 1. **Draw game board** | **4 hours** |
| 1. **Graphics design** | **6 hours** |
| 1. **Setting ( board size)** | **2 hours** |
| 1. **Setting ( icon)** | **3 hours** |
| 1. **About screen vs exit screen** | **3 hours** |
| 1. **Report** | **1 hours** |
| 1. **Player statistic** | **10 hours** |

**PROJECT STRUCTURE**

* **Source file:**

+ Main.cpp: Store the main code of the game such as move key, menu layout, mode, setting layout,etc.

+ AI.cpp: The artificial intelligence of the PvC mode.

+ Wincondition.cpp: Check for the winning stage of the game.

* **Header file:**

+ AI.h: Funtion prototype of the AI source code

+ wincondition.h: Funtion prototype of the wincondition source code

+ color.hpp: Define the text color

+ about.hpp: The about screen.

+ Intro.hpp: The introduction screen.

+ definecharvalue.hpp: set the board char array value

+ drawplayboard.hpp: draw the game board

+ escape.hpp: display the exit message, say thanks to user

+ gotoxy.hpp: define the function for repositioning the text cursor

+ spashscreen.hpp: display the spash screen of the game

* **Function:**

+ Main.cpp:

void menu(): display the menu of the game

void pvp():prepare to enter the pvp game

void controlpvp(int&x, int&y) : game control

void controlpvc(int&x, int&y) : game control

void pvc():prepare to enter the pvc game

void settings(): display the setting

int savegamepvp(): save the game in pvp mode

int loadgamepvp(): load the game in pvp mode

int savegamepvc(): save the game in pvc mode

int loadgamepvc(): load the game in pvc mode

int load\_removegame(): load or remove saved game menu

int removepvp(): remove saved pvp game

int removepvc(): remove saved pvc game

int playerstatistic(): display the player statistic

void main(): point to menu function only

+ AI.cpp:

void Findmove(): Find the next best move

int find\_4\_enermy(): Find enermy next move that can create 2 4-line, 1 4-line and 1 3-line, 2 3-line.

int find\_4\_enermy\_vertical(): Search on the vertical

int find\_4\_enermy\_horizontal(): Search on the horizontal

int find\_4\_enermy\_lr\_diagontal():Search on the left-right diagonal

int find\_4\_enermy\_rl\_diagontal():Search on the left right diagonal

int Check\_attack\_vertical(): Find attacking mark on the vertical

int Check\_attack\_horizontal():Find attacking mark on the vertical

int Check\_attack\_lr\_diagontal():Find attacking mark on the vertical

int Check\_attack\_rl\_diagontal():Find attacking mark on the vertical

int Check\_defend\_vertical():Find defend mark on the vertical

int Check\_defend\_horizontal():Find defend mark on the vertical

int Check\_defend\_lr\_diagontal():Find defend mark on the vertical

int Check\_defend\_rl\_diagontal():Find defend mark on the vertical

+ color.hpp:

void TextColor(): change the text color

+ definecharvalue.hpp:

void definecharvalue(): reset the board char array

+ drawplayboard.hpp:

void drawplayboard(): draw out the game board

+ escape.hpp:

void escape():display the exit message and say thanks to the user

+ about.hpp:

Void about() : about screen

+ intro.hpp:

Void intro() : game introduction

+ gotoxy.hpp:

void gotoxy(): define the function to change the position of the text cursor

+ splashscreen.hpp:

void splashscreen(): display the splash screen

+ wincondition.cpp:

int Xwincondition(): check the game for winning on the X side

int Owincondition(): check the game for winning on the O side

**DATA STRUCTURE**

**Save game mechanism:**

* The game name is input by user and save to file : savedgamepvc.txt or savedgamepvp.txt in folder save, each game name is separate by “\_”.
* The program will check whether it has exited or not if yes it will ask the user to enter again.
* The program then will create the file name : game name + “pvc.txt” or game name + “pvp.txt” in the folder pvc or pvp.
* It will store :

+ PVC: size, rule, player name, current score, player icon, current state of playboard.

+ PVP: size, rule, player name, current score, player icon, current state of playboard, whose turn.

\* Because the program can’t read empty space so if that position is empty we assign it to ‘p’. (that why we can’t change player icon to p)

**Load/Remove game mechanism:**

* In the load/remove screen, the user can choose to load or remove in pvp or pvc mode.
* In load mode: the program read the file “savedgamepvc.txt” or “savedgamepvp.txt” to get the name file then print them into screen. The user can enter a number to choose game to load. The program will search in the file “savedgamepvc.txt” or “savedgamepvp.txt” until get that name. And finally the program will read the file name: game name + “pvc.txt” or game name + “pvp.txt” in the folder pvc or pvp to get the data and go to play mode.
* In remove mode: the program read the file “savedgamepvc.txt” or “savedgamepvp.txt” to get the name file then print them into screen. The user can enter a number to choose game to load. The program will search in the file “savedgamepvc.txt” or “savedgamepvp.txt” to get game name. If the game name position isn’t in the position that the user choose it will be + in to list of saved game after remove, if yes it isn’t. Finally the list of saved game after remove is rewrite into file “savedgamepvc.txt”, “savedgamepvp.txt”.

**Save folder:**

1. Save: savegamepvc.txt, savegamepvp.txt, pvc folder, pvp folder
2. Statistic: numofgame.txt, game1.txt -> game15.txt