CSC10002 - PROJECT
THE MATCHING GAME

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1 Information

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Contents

2 Tutorial

2.1 Game state

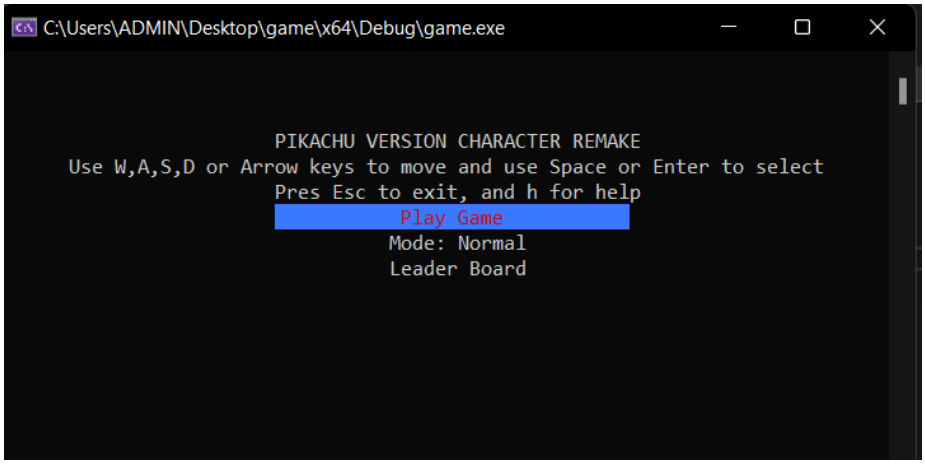

Figure 1: Menu

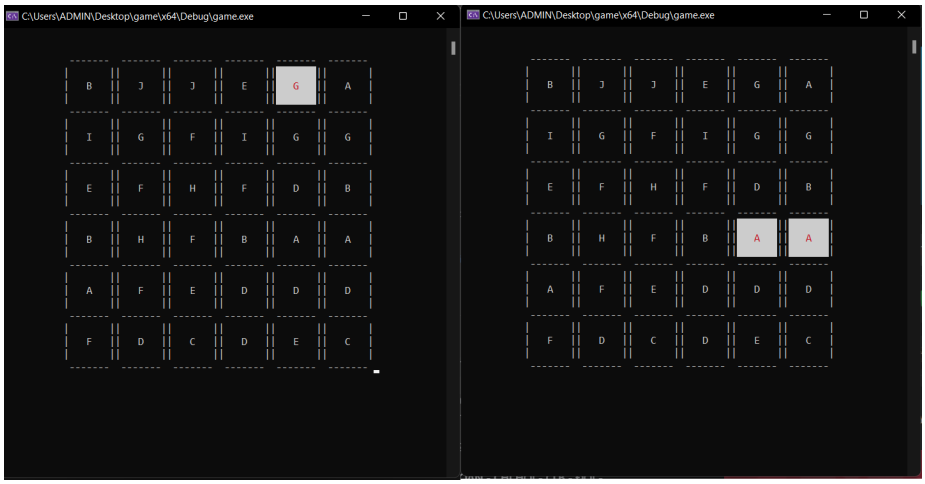

Figure 2: Gameplay

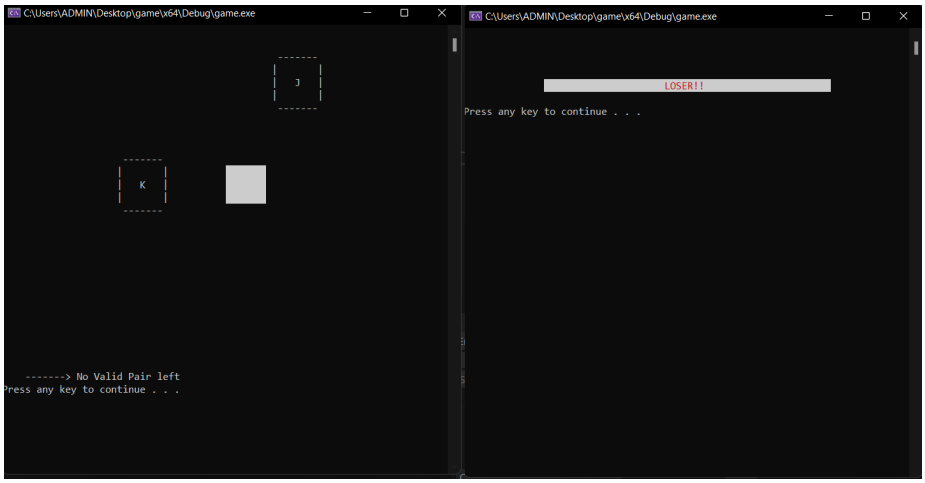

Figure 3: "Lost" screen

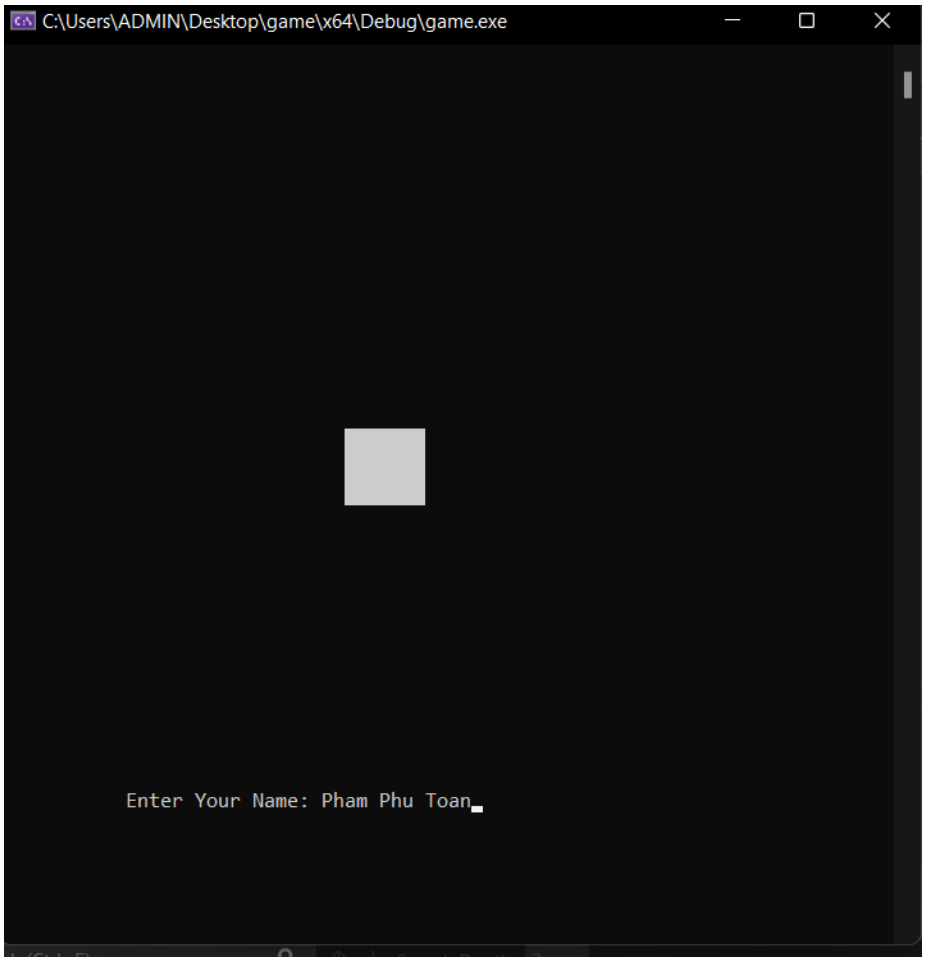

Figure 4: "Won" screen

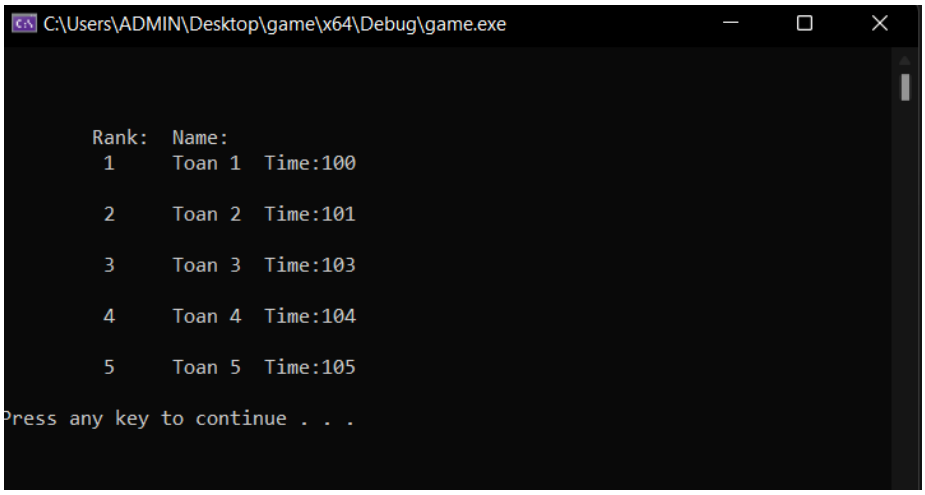

Figure 5: Leaderboard list

2.2 Game utilities

2.2.1 Difficult Mode

- Normal

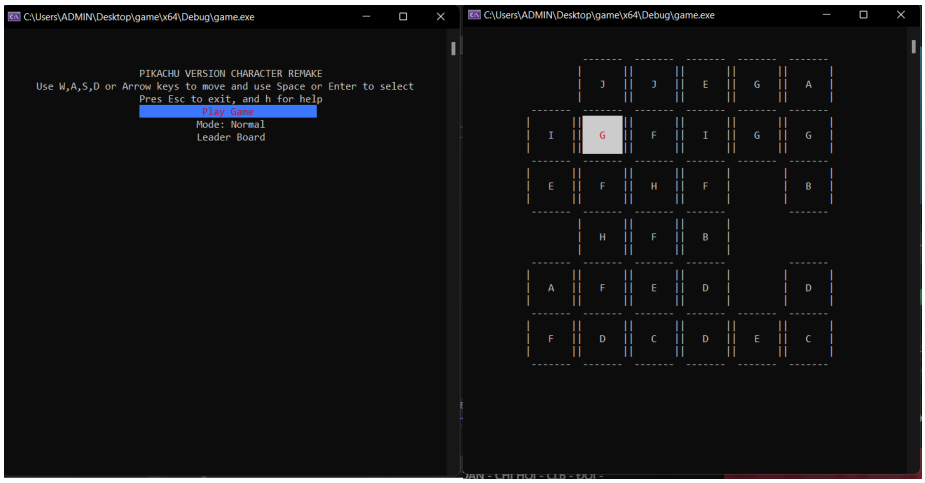

Figure 6: Normal

- Difficult
  - All the cells in the board will be pushed to left.

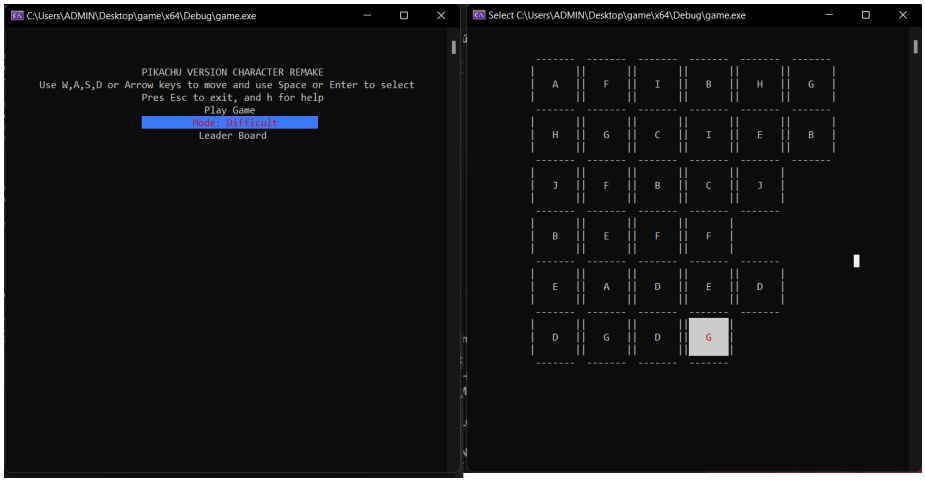

Figure 7: Difficult

2.2.2 Instructions

- Use W,A,S,D or arrow keys to move and use Space or Enter to select the cells.
- Press Esc to exit, and h for move suggestions.
- You can find these on the main menu.

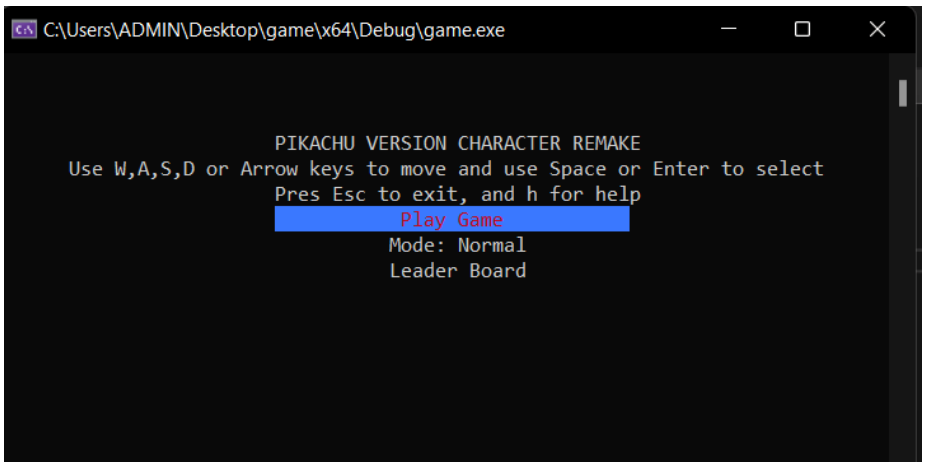

Figure 8: Instructions

2.2.3 Leaderboard

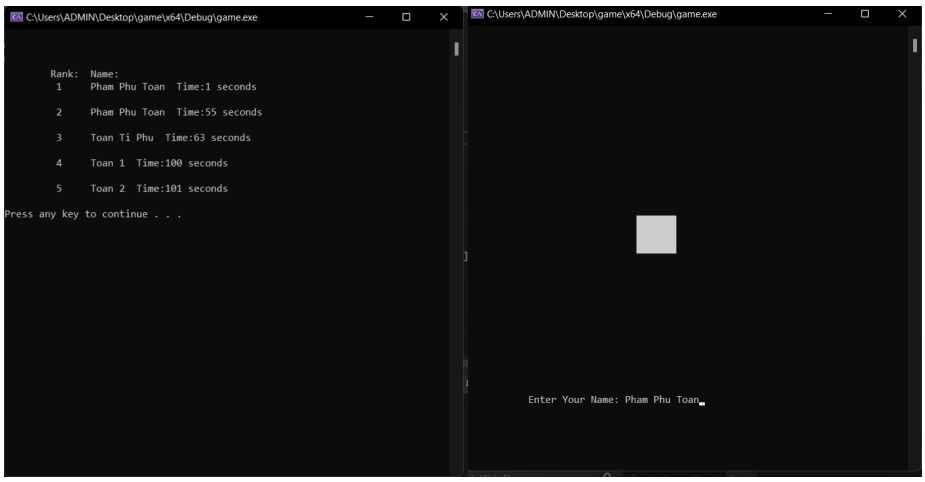

Figure 9: Leaderboard

2.2.4 Color effects

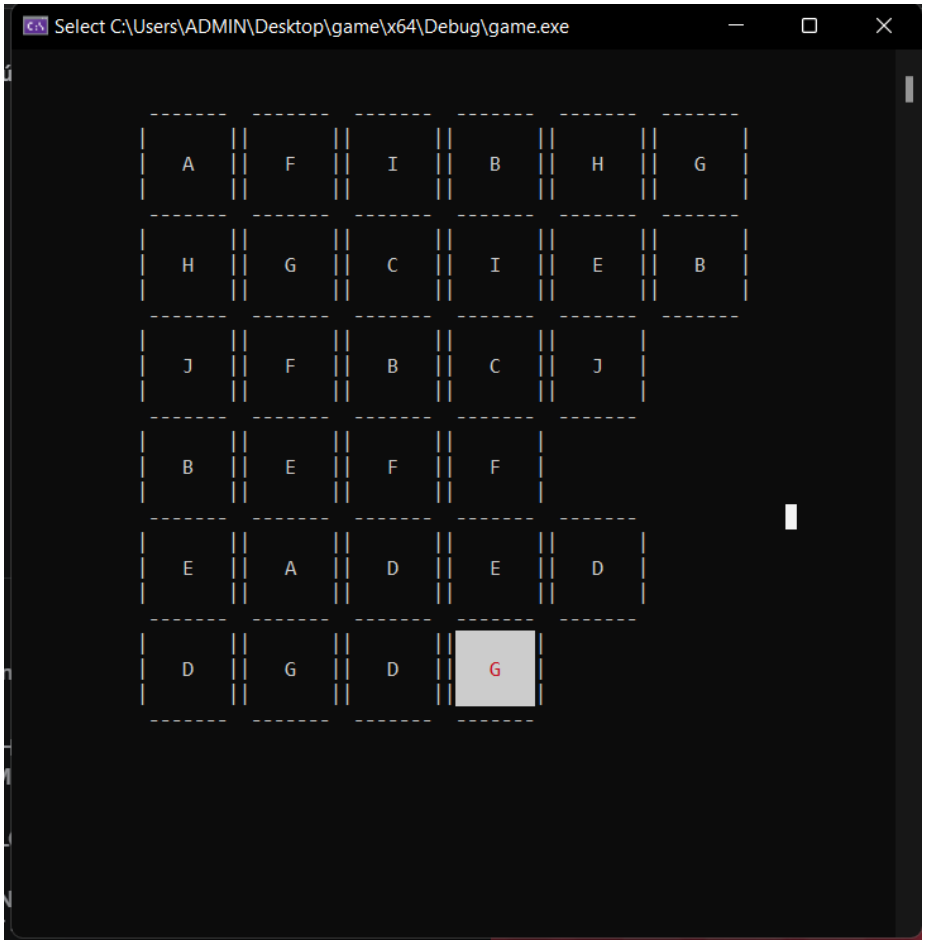

Figure 10: Color effects

3 Functional

3.1 File structural

- game.cpp
  - Contain int main()
- board.cpp
  - Contain functions which are related to board.

- MatchingFunction.cpp
  - Contain functions which are related to matching.
- board.h
  - Define functions which are used in board.cpp.
- MatchingFunction.h
  - Define functions which are used in MatchingFunction.cpp.

3.2 Functions

3.2.1 main

(**used to contain and link subfunctions**)

- Contain subfunctions and link them.
- Contain codes which are used for movements and selections.

3.2.2 generateBoard

(**used to set values for the board**)

- Generate Board with pointer (dynamic allocation).
- Set value for cells which are barrier.
- Set value for cells in board.

3.2.3 drawBoard

(**used to draw the board on the screen**)

- Draw the top line of the current row.
- Draw the left and right lines for each cell of the current row.
- Draw the bottom line of the last row.
- When a cell is selected, it will delete the current board, draw a new board and highlight the selected cell.

3.2.4 bool iMatching

(**used to check the possibility of matching I lines**)

- Check if 2 cells are on a same row or on a same column.
- Check if it is possible to draw a straight line from the first cell to the second.

3.2.5 bool zMatching

(**used to check the possibility of matching Z lines**)

- Check if it is possible to draw a parallel line from each cell.
- Check if it is possible to connect those parallel lines.

3.2.6 bool lMatching

(**used to check the possibility of matching L lines**)

- Check if it is possible to draw a line from the first cell to the right then upward towards the second cell.
- Check if it is possible to draw a line from the first cell to the left then downward towards the second cell.

3.2.7 bool uMatching

(**used to check the possibility of matching U lines**)

- Check if it is possible to draw a parallel line from each cells.
- Check if it is possible to connect those parallel lines.
- If it is impossible, these 2 parallel lines will be extended until they cut the barrier of the board or there is a line which can connect those lines.

3.2.8 bool isMatching

(**used to check the possibility of all matching ways**)

- Check if one cell is selected twice.
- Check if one of four matching functions returns value true.

3.2.9 checkEndGame

(**used to check if the game is finished or not**)

- Check if all cells are empty or not.
- If they are empty, the game is over and player wins.
- If there is no other way to match the cells, the game is over and player loses.

3.2.10 moveSuggestion

(**used to give move suggestions to the player**)

- Check if one of four matching functions return value true.
- If the functions return value true, 2 cells which can be matched will be highlighted.

3.2.11 difficultMode

(**used to change the difficulties of the game**)

- Check every single cells.
- Check if there is an empty cell, the cell to the right of the empty cell and the empty cell will change positions.

3.2.12 leaderBoard

(**used to store the information of the 5 players with the fastest time**)

- There are 2 different modes in Leaderboard.
- First mode will show the list of the 5 players with the fastest time.
- Second mode will save players' information and time into a file. Player's time is counted from the time they play until the game ends.
- The file will be opened to show the list of the 5 players with the fastest time when players choose the "Leaderboard" on the main menu or after they save their information.

3.2.13 initialize

(**initialize values for row, column, type and countType variables**)

3.2.14 setColor

(**used to change the color of background and cells**)

3.3 C++ built-in data structures and functions

3.3.1 Data structures

1. `time_t`
    - Used to save the time when you playing the game and exiting the game.
2. HANDLE, COORD, RECT (**Windows's default data structures**)
    - Used to interact with console.

3.3.2 Functions

1. time(NULL)
    - Used to get time value from the computer.
2. difftime()
    - Used to calculate time.
3. srand(),rand()
    - Randomize cells'value
4. system(), SetConsoleCursorPostion(), SetConsoleTextAttribute()
    - Used to interact with console.

3.3.3 Conclusion

- Without these data structures and functions, it will take more time to code, codes will be longer as well as more complicated.

4 Comparison

Comparison	Pointers	Linked List
Definition	A fixed set of elements	A large set of data arranged in some order
Size	Fixed, defined at the time of declaration	Doesn't need to be defined
Storage Location	Locations of components are stored during compile time	The location of components is specified at run time
Arrange order	Stored consecutively	Randomly stored
Access	Direct or random	Sequential access
Inserting and deleting elements	Relatively slow due to shifting the array	Easy, fast and convenient
Searching	Binary search Linear search	Linear search
Memory	Need little	Need more
Memory usage	Inefficient	Efficient

5 Reference

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   - Article title : Lap trinh C/C++ - Lam game tren Console
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   - Article title : Thuat toan game pokemon (pikachu)
   - Author : nguyenvanquan7826
   - Link : https://cachhoc.net/2014/03/25/thuat-toan-game-pokemon-pikachu/#more