Assignment 3: Gomoku

Due: 20:00, Wed 9 Nov 2016 Full marks: 100

1 Introduction

In this assignment, you will use two-dimensional array to implement a game called Gomoku (五子棋). It is played on a $n \times n$ game board. (We assume n=13 in this assignment.) Two players O and X take turns to put their game discs into one unoccupied square of the board. The player who first forms a line of five or more consecutive discs horizontally -, vertically |, or diagonally | wins the game. ("Go" in Gomoku means "five" in Japanese.) The game is a draw when the board is full but no player wins. Figure 1 shows an example configuration of Gomoku. The character '.' denotes an empty square. The rows and columns are named in numbers (0–12) and letters (A–M) respectively. If Player X puts a disc to the square G7, then a diagonal line / of five consecutive X's will be formed and thus X will win.

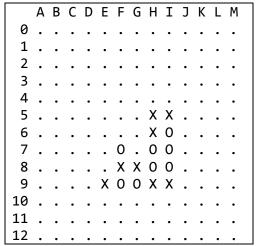


Figure 1: An Example Game Configuration of Gomoku

2 Program Specification

2.1 Game Board

You can use a two-dimensional array of char to represent the game board.

```
const int N = 13;
...
char board[N][N];
```

The array elements board[0][0], board[0][12], board[12][0], and board[12][12] denote the four corner squares A0, M0, A12, and M12 respectively.

2.2 Game Flow

1. The game starts with an empty game board. Player O takes the first turn.

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- 2. In each move, you should prompt the player to enter two inputs denoting the square location to be placed. You can assume that <u>the first input is always a character</u> and <u>the second input is always an integer</u>.
 - A user input is invalid if: (a) it is not a proper cell location (i.e., rows 0–12 and columns A–M, capital letters only), or (b) the input location is already occupied.
 - You should warn the player about invalid inputs and prompt the same player to enter again until a valid input is entered.
- 3. Update the board by putting a disc to the appropriate square.
- 4. Determine if the current player has connected five or above.
- 5. Repeat Steps 2–4 until the game is finished. Alternate Players O and X in each round.
- 6. Once the game is finished, display the message "Player O wins!", "Player X wins!", or "Draw game!" accordingly.

2.3 Other Notes

- You are <u>not allowed to use global variables</u> in your program. (That is, you cannot declare any variables outside any functions.) Nonetheless, const ones (e.g., N) do not count.
- Your program should be decomposed into <u>at least four functions</u> (including main()). At least <u>two functions</u> should have <u>array parameter(s)</u>.

3 Program Output

The following shows some sample output of the program. The **bold blue** text is user input and the other text is the program output. You can try the provided sample program for other input. <u>Your program output should be exactly the same as the sample program</u> (i.e., same text, same symbols, same letter case, same number of spaces, etc.). Otherwise, it will be considered as *wrong*, even if you have computed the correct result.

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4 Submission and Marking

- ➤ Your program file name should be gomoku.cpp. Submit the file in Blackboard.
 (https://elearn.cuhk.edu.hk/).
- Insert your name, student ID, and e-mail address as comments at the top of your source file.
- > Besides the above information, your program should further include suitable comments as documentation.
- You can submit your assignment multiple times. Only the latest submission counts.
- Your program should be *free of compilation errors and warnings*.
- Plagiarism is strictly monitored and heavily punished if proven. Lending your work to others is subjected to the same penalty as the copier.