ECE 175 Computer Programming for Engineering Applications

Homework Assignment 7

Due Date: Tuesday October 24, 2017, 11:59 PM, via D2L Drop-box

Conventions: Name your *C* programs *hw***x***p***y**.*c* where *x* corresponds to the homework number, and *y* corresponds to the problem number. For example, the *C* program for homework 7, problem 1 should be named as *hw***7***p***1**.*c*.

Write comments to your programs. Programs with no comments will receive PARTIAL credit. For each program that you turn in, at least the following information should be included at the beginning of your file as comments

- Author:
- Date created:
- Brief description of the program:
  - input(s):
  - output(s):
  - brief description or relationship between inputs and outputs

Submission Instructions: Use **Zylab** and the **"Assignments"** drop-box on D2L to submit your homework. Submit the *hw7p1.c* file only.

1 Connect Four in a Line

Create a video game version of *Connect Four in a Line* in *C*. *Connect Four in a Line* is a two-player connection game in which the players first choose a symbol, either *X's* or *O's*, and then take turns dropping an *X* or an *O* into the grid. The grid has seven columns, each column of the grid is labeled *A*-*G*, and six rows. A player, on their turn, chooses a column from *A*-*G*. The grid is oriented vertically such that the symbol, *X* or *O*, falls to the lowest available space on the grid. The objective of the game is to be the first to form a horizontal, vertical, or diagonal line of four of one's own symbols. Your *C* program must

- Alternate turns between play *X* and player *O*
- Ask the player which column (*A*-*G*) he/she would like to drop their symbol into. When a player chooses a column the symbol must fall to the lowest available space in that column. If the column is full (i.e. no more spaces available in that column) then the program must tell the player to choose a different column.
- Check for a win condition. Once a valid column is chosen the program must check to see if a line of four is formed, in a row, column, or diagonal.
- Check for a tie game. It is possible to end in a tie game so your program must checks for this possibility.
- Announce end game. If a winner is found, or if a tie game is achieved, then the program must announce the end game condition and offer to start a new game.
- Clear the board and start a new game if the player's choose to play again.
- Check for invalid entries after every input.
- Allow both upper and lower case inputs (i.e inputs 'B' and 'b' are treated the same).

1.1 Example Situations

Below are some sample situations. These are not sample code executions, as one situation is not related to the next. The are snapshots of what might happen during play. Red text indicates information entered by the user.

1.1.1 The Game Begins

```
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? M
Invalid Entry
Player 1: Which column would you like to add an 'X' ?
```

1.1.2 Column is Full

```
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    | O |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | X |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | O |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | X |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | O |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | X |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? a
That Column is full
Player 1: Which column would you like to add an 'X' ?
```

1.1.3 Player 1 Wins

```
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    | O | X | O | X |   |   |   |
    |---|---|---|---|---|---|---|
    | O | X | O | X |   |   |   |
    |---|---|---|---|---|---|---|
    | O | X | O | X | X |   |   |
    |---|---|---|---|---|---|---|
    | X | O | X | O | X | O |   |
    |---|---|---|---|---|---|---|
    | X | O | X | O | X | O |   |
    |---|---|---|---|---|---|---|
    | X | O | X | O | X | O |   |
    |---|---|---|---|---|---|---|
Player 1 is a WINNER
Player 2 is a LOSER
Do you want to play again (y/n)? k
Do you want to play again (y/n)? n
Goodbye
```

1.1.4 Player 2 Wins

```
   Let's play Connect Four in a Line

      A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | O |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | X | O |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    | X | X | O |   |   |   |   |
    |---|---|---|---|---|---|---|
    | X | O | X | O |   |   |   |
    |---|---|---|---|---|---|---|
Player 2 is a WINNER
Player 1 is a LOSER
Do you want to play again (y/n)? n
Goodbye
```

1.1.5 Tie Game

```
   Let's play Connect Four in a Line

      A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    | O | X | O | X | O | X | O |
    |---|---|---|---|---|---|---|
    | O | X | O | X | O | X | X |
    |---|---|---|---|---|---|---|
    | O | X | O | X | O | X | O |
    |---|---|---|---|---|---|---|
    | X | O | X | O | X | O | X |
    |---|---|---|---|---|---|---|
    | X | O | X | O | X | O | O |
    |---|---|---|---|---|---|---|
    | X | O | X | O | X | O | X |
    |---|---|---|---|---|---|---|
TIE GAME.  You should try again
Do you want to play again (y/n)? j
Do you want to play again (y/n)? l
Do you want to play again (y/n)? n
Goodbye
```

1.2 Sample Game Execution

Red text indicates information entered by the user.

```
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? c
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   | X |   |   |   |   |
    |---|---|---|---|---|---|---|
Player 2: Which column would you like to add an 'O' ? p
Invalid Entry
Player 2: Which column would you like to add an 'O' ? f
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   | X |   |   | O |   |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? f
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X |   |   | O |   |
    |---|---|---|---|---|---|---|
Player 2: Which column would you like to add an 'O' ? e
```

```
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X |   | O | O |   |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? g
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X |   | O | O | X |
    |---|---|---|---|---|---|---|
Player 2: Which column would you like to add an 'O' ? d
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X | O | O | O | X |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? e
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   | X | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X | O | O | O | X |
    |---|---|---|---|---|---|---|
Player 2: Which column would you like to add an 'O' ? d
```

```
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | O | X | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X | O | O | O | X |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? e
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   | X |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | O | X | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X | O | O | O | X |
    |---|---|---|---|---|---|---|
Player 2: Which column would you like to add an 'O' ? d
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | O | X |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | O | X | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X | O | O | O | X |
    |---|---|---|---|---|---|---|
Player 1: Which column would you like to add an 'X' ? d
   Let's play Connect Four in a Line

     A   B   C   D   E   F   G
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   |   |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | X |   |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | O | X |   |   |
    |---|---|---|---|---|---|---|
    |   |   |   | O | X | X |   |
    |---|---|---|---|---|---|---|
    |   |   | X | O | O | O | X |
    |---|---|---|---|---|---|---|
Player 1 is a WINNER
Player 2 is a LOSER
Do you want to play again (y/n)? 9
Do you want to play again (y/n)? n
Goodbye
```