Coding Assignment 4

CSE 1320 Spring 2020

The format and content of the output is not a suggestion – it is the specification given to you to follow so please follow. Points will be lost for not following the specification. This includes using the specified functions. This is essential to the grading process.

Create an ASCII drawing tool.

1. Please watch the videos attached to the assignment to see how tool runs and how it reacts to invalid input and how to run your program with an input file using redirection.
2. Use the following pseudocode to get you started on the program.

`Code4.c`

Declare a 2D array with a max size of 20 for both dimensions. Anything larger than 20 tends to wrap and be messy on the screen. This max size should be set as a `#define` in `DrawTool.h`.

Call a function to initialize the map

Parameters

array

user-chosen size of the map (pass by reference).

Call a function to print the instructions

No parameters

Call a function to print the map

Parameters

array

user-input size of the map

Prompt for a draw command and use `strtok()` to parse out the draw command (Q, P, V or H). If the user enters 'Q' or 'q' as the draw command, then your program should quit. If the user did not enter Q, then use `strtok()` to parse out the rest of the components of the draw command. If the mark value is not entered, then 'X' should be used.

The draw command should be entered as described in the instructions. Each draw command is one prompt – not multiple prompts.

All draw commands should be validated to ensure they will not go out of bounds. Check for out of bounds for both the coordinate and line. You cannot draw a line that will end of out of bounds.

For the point command ('P'), update that point in the array with the input mark.

For the horizontal ('H') and vertical ('V') commands, call a function to "draw" that line. Drawing a line means marking those spots with the input mark in the array. This function should be passed the array, the row,col from the command, the action (H or V), the number of spots to mark and the mark itself. The function will use

for loops to appropriately move through the array and mark the spots. See `DrawTool.c` section for more details.

Any draw command that do not start with Q, P, V or H will generate an output of "That draw command is unknown".

Draw commands of P, V and H can be entered in upper or lowercase.

The program will continue to prompt for draw commands and display the array until the user quits.

`DrawTool.c`

Function to initialize the map

Array should be passed in.

Prompt the user for how big of an array they want to use – this value is the user input size. Use a `while` loop to verify that the entered size fits within the bounds of the max array size. If a value too big or small is entered, then ask again.

Prompt the user for a background character.

Initialize the array with the background character using the user input size (NOT the max size). **However, you cannot use [][] notation to update the array element – you must use pointer notation.**

The user input size should be passed back (not returned) by the function via a parameter (pass by reference).

Function to print the instructions

Print the instructions for using the tool. I have provided them here in the assignment so you can copy them into your program. You will need to provide the proper line breaks and tabs to get the same format. All of the instructions should fit on one screen.

Function to print the map

Print the array to screen. The array should be passed to the function and the function should use nested for loops to print it to the screen. The size of the array (the user entered size – not the max size) will need to be passed to the function. **You cannot use [][] notation to print the array elements – you must use pointer notation.**

Function to draw lines

Since setting a single point is one line of code, it is not necessary to create a function. **However, you cannot use [][] notation to update the array element – you must use pointer notation.**

The function to draw a line should handle both a vertical line and a horizontal line. A for loop should be used to update the array elements. **However, you cannot use [][] notation to update the array element – you must use pointer notation.**

`DrawTool.h`

All of the functions in `DrawTool.c` must have prototypes in `DrawTool.h`. Any defines used by `DrawTool.c` should be defined in `DrawTool.h`. This header must have an include guard.

3. Create the `makefile` to compile `Code4.c` and `DrawTool.c`. You are required to use the makefile template presented in class.

4. **Files to submit in a zip file named "`Code4_xxxxxxxxxx.zip`"**

    1. `Code4_xxxxxxxxxx.c`
    2. Submit a file that you created named "`input.txt`" that contains the draw commands to output your initials. Be sure to state in your assignment submission what those initials are. Your input file needs to contain ALL of the commands to complete a full run. See video for how to use this file and how your program should behave. Test this process using the UNIX redirect command as shown in the video.
    3. `makefile`
    4. `DrawTool.c`
    5. `DrawTool.h`

Miscellaneous Notes

1. Array is statically allocated using a define set to the maximum value (20). The user will be prompted for what size array they want to display within that 20x20 array. When passing the array, you must use the max size, not the user input size in function calls/definitions.
2. Rubric criteria "Test" involves the GTA's running your program with your file and a file of draw commands that are both valid and invalid to test the functionality of your program. Be sure to test for and reject commands that go out of the bounds of the array. Be sure to test that you can draw along the edges of your array.
3. Using the following command

    ```
    Code4_xxxxxxxxxx.e < input.txt
    ```

    is using the UNIX redirect command. The < symbol takes the contents of `input.txt` and dumps it completely into `stdin`. Your program then reads from `stdin` for each prompt rather than asking you. During this process, the actual commands do not show on the screen since they are not being typed.

    It will be very important to this process that your file have UNIX end of lines rather than Mac.

    If you are on a Mac, you will need to run your input file through this UNIX command to transform the Mac CR EOLs to UNIX LF EOLs.

    ```
    cat file.txt | tr '\r' '\n' | tr -s '\n' > newfile.txt
    ```

    `file.txt` is the original file and `newfile.txt` is the new file with UNIX LF EOLs. If you do not do this step, your program will not behave correctly because it will try to process the `\r` symbol left by Mac at the end of each line.

Instructions

```
Draw commands start with

        P for a single point
        H for a horizontal line
        V for a vertical line

After the P/V/H, enter a row,col coordinate and the number of spots to mark
enclosed in () and separated by commas and then the character for the mark.
'X' will be used if a mark is not entered.  For example,

        P(2,3,1)*       start at point 2,3 in the array and mark one spot
                        with an *.  For P, the 3rd parameter is ignored.

        V(1,2,3)$       start at point 1,2 in the array and mark the next
                        3 spots down from the current position with $

        H(4,6,7)#       start at point 4,6 in the array and mark the next
                        7 spots to the right with #

Coordinates out of range and lines drawn past the borders are not allowed.

Enter Q at the draw command prompt to quit

Press <ENTER> to continue
```

Running program with one type of each command

```
[frenchdm@omega CA4]$ Code4_1000074079.e
How big is the array? (Enter a value between 1 and 20) 17
What is the background character? .

Draw commands start with

        P for a single point
        H for a horizontal line
```

V for a vertical line

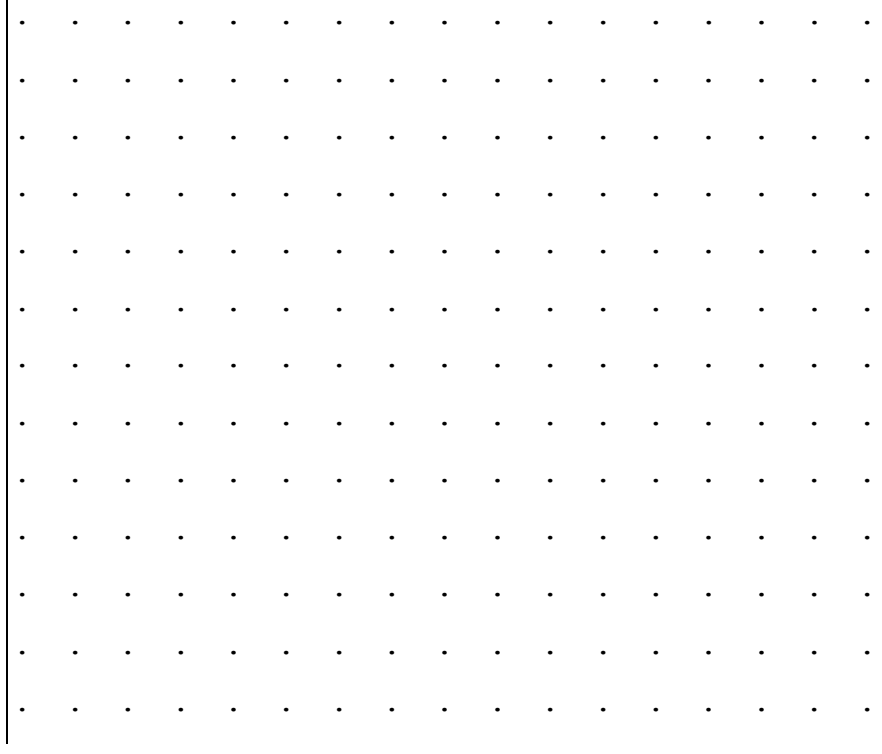
After the P/V/H, enter a row,col coordinate and the number of spots to mark enclosed in () and separated by commas and then the character for the mark. 'X' will be used if a mark is not entered. For example,

P(2,3,1)*	start at point 2,3 in the array and mark one spot with an *. For P, the 3rd parameter is ignored.
H(1,2,3)$	start at point 1,2 in the array and mark the next 3 spots to the right with $
V(4,6,7)#	start at point 4,6 in the array and mark the next 7 spots down from the current position with #

Coordinates out of range and lines drawn past the borders are not allowed.

Enter Q at the draw command prompt to quit

Press <ENTER> to continue



```
. . . . . .
. . . . . .
. . . . . .
. . . . . .

Enter draw command (enter Q to quit) q

[frenchdm@omega CA4]$ Code4_1000074079.e
How big is the array? (Enter a value between 1 and 20) 14
What is the background character? *

Draw commands start with

        P for a single point
        H for a horizontal line
        V for a vertical line

After the P/V/H, enter a row,col coordinate and the number of spots to mark
enclosed in () and separated by commas and then the character for the mark.
'X' will be used if a mark is not entered.  For example,

        P(2,3,1)*       start at point 2,3 in the array and mark one spot
                        with an *.  For P, the 3rd parameter is ignored.

        H(1,2,3)$       start at point 1,2 in the array and mark the next
                        3 spots to the right with $

        V(4,6,7)#       start at point 4,6 in the array and mark the next
                        7 spots down from the current position with #

Coordinates out of range and lines drawn past the borders are not allowed.

Enter Q at the draw command prompt to quit

Press <ENTER> to continue
```

```
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *

Enter draw command (enter Q to quit) V(1,1,10)H

*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
```

```
Enter draw command (enter Q to quit) H(2,4,4)Y



*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  Y  Y  Y  Y  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *

Enter draw command (enter Q to quit) p(13,13,9999)@



*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  Y  Y  Y  Y  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  H  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  *
*  *  *  *  *  *  *  *  *  *  *  *  *  @
```

```
Enter draw command (enter Q to quit) q

[frenchdm@omega CA4]$
```

Running program with invalid inputs (out of bounds)

```
How big is the array? (Enter a value between 1 and 20) 5
What is the background character? .

Draw commands start with

        P for a single point
        H for a horizontal line
        V for a vertical line

After the P/V/H, enter a row,col coordinate and the number of spots to mark
enclosed in () and separated by commas and then the character for the mark.
'X' will be used if a mark is not entered.  For example,

        P(2,3,1)*       start at point 2,3 in the array and mark one spot
                        with an *.  For P, the 3rd parameter is ignored.

        H(1,2,3)$       start at point 1,2 in the array and mark the next
                        3 spots to the right with $

        V(4,6,7)#       start at point 4,6 in the array and mark the next
                        7 spots down from the current position with #

Coordinates out of range and lines drawn past the borders are not allowed.

Enter Q at the draw command prompt to quit

Press <ENTER> to continue
```

```
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .

Enter draw command (enter Q to quit) p(0,6,123)X

That draw command is out of range


.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .

Enter draw command (enter Q to quit) p(0,5,123)X

That draw command is out of range


.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .

Enter draw command (enter Q to quit) p(0,4,123)x


.  .  .  .  x
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
```

```
.  .  .  .  .

Enter draw command (enter Q to quit) h(2,2,5)z

That draw command is out of range



.  .  .  .  x
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .
.  .  .  .  .

Enter draw command (enter Q to quit) H(2,2,2)Z



.  .  .  .  x
.  .  .  .  .
.  .  Z  Z  .
.  .  .  .  .
.  .  .  .  .

Enter draw command (enter Q to quit) V(-1,1,2)*

That draw command is out of range



.  .  .  .  x
.  .  .  .  .
.  .  Z  Z  .
.  .  .  .  .
.  .  .  .  .

Enter draw command (enter Q to quit) V(1,1,4)*
```

```
.  .  .  .  x
.  *  .  .  .
.  *  Z  Z  .
.  *  .  .  .
.  *  .  .  .

Enter draw command (enter Q to quit) V(1,0,5)*

That draw command is out of range



.  .  .  .  x
.  *  .  .  .
.  *  Z  Z  .
.  *  .  .  .
.  *  .  .  .

Enter draw command (enter Q to quit) Q

[frenchdm@omega CA4]$
```

Checking array size

```
[frenchdm@omega CA4]$ Code4_1000074079.e
How big is the array? (Enter a value between 1 and 20) 21
That value is outside of the max bounds of the array.  Please reenter

How big is the array? (Enter a value between 1 and 20) -1
That value is outside of the max bounds of the array.  Please reenter

How big is the array? (Enter a value between 1 and 20) 0
That value is outside of the max bounds of the array.  Please reenter

How big is the array? (Enter a value between 1 and 20) 4
```

Quitting at a draw command prompt

```
[frenchdm@omega CA4]$ Code4_1000074079.e
How big is the array? (Enter a value between 1 and 20) 12
What is the background character? ^

Draw commands start with

        P for a single point
        H for a horizontal line
        V for a vertical line

After the P/V/H, enter a row,col coordinate and the number of spots to mark
enclosed in () and separated by commas and then the character for the mark.
'X' will be used if a mark is not entered.  For example,

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                        with an *.  For P, the 3rd parameter is ignored.

        H(1,2,3)$       start at point 1,2 in the array and mark the next
                        3 spots to the right with $

        V(4,6,7)#       start at point 4,6 in the array and mark the next
                        7 spots down from the current position with #

Coordinates out of range and lines drawn past the borders are not allowed.

Enter Q at the draw command prompt to quit

Press <ENTER> to continue


^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
```

```
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^
^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^  ^


Enter draw command (enter Q to quit) q


[frenchdm@omega CA4]$
```