Homework 1: Working with Arrays, Files, and Structures

CS2028C (003)
Group 10

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Description of platforms
The entirety of the program was made with Visual Studio on Windows operating software.

Instructions

In order to compile and run this program, the user must have a C++ ide. Following this, the user must download cell.h, cell.cpp, and DSHW1.cpp as well as have 3 text files available for storing data values. The text files can be stored anywhere as long as the proper location is given by the user within the program. Once the user opens DSHW.cpp in their IDE, all the user must do is run the program and enter the desired file paths. The command interface will come up and the run number as well as the grid will be displayed. X represents a source fire, Y represents a visited location, and O represents a non-visited location. The user can change the run count as well as grid size by changing the values equal to RUN_COUNT and GRID_SIZE respectively.

Contributions

All team members met to read through and interpret the homework summary and instructions. The team collectively determined the appropriate parameters to cover in the code, as well as which parameters were most and least important in the movement of the fire. It was determined that fuel was the most important, wind was next important, and slope was the least important. These parameters were weighted accordingly in the code to determine the fire's movements.

Brendan Pollak:
        This assignment was definitely one of the more difficult ones out of previous assignments given from school. Fire propagation isn't a concept that was entirely known to any of the group members, although it is an important concept regarding fire safety and prevention. Since we didn't entirely know the algorithm for how fire worked, we made our own algorithm by using attributes that we felt would fit in a natural situation. A couple of different contributors were thought up and in the end, the decision was to use fuel content, slope, and wind. The fuel content determines if a fire can go somewhere and also if a cell can become a source fire. For the slope, weight is added to the target cell by computing (active cell weight - target cell weight) * 2. This means that if a target cell has a lower slope than the active cell, the target cell will gain weight because it is at a lower altitude, which helps fire spread. For wind, each cell has a value stored for wind and depending on that value, weight will get added to a target cell in one of 8 directions around the active cell. Figuring out the process for conducting the simulation took quite a while, but it helped us get a better understanding of fire spread.
        In terms of coding, I did the bulk of the assignment. I developed the class within a separate header and cpp file as well as implemented that class in the DSHW1.cpp file. It took quite a lot of time and thinking in order to get everything working properly, but I think it was a good experience for working with a grid and working on larger projects such as this.

Jacob Butler:
        Along with meeting with the team and brainstorming ideas, I thought through and helped program the file stream inputs and outputs. The program will prompt the user for a filename to

store fuel content, slope values, and wind values respectively. After inputting the file names, data is then initially randomly generated in each file. I also added a check to ensure that the file name is valid, prompting the user to reenter a filename if it's invalid.

The assignment allowed me to learn more about file stream and inputting data into files, which is something I had experience with before but not a lot. Learning how to initialize files, store the data, and also check if the filename is valid or not will help my programming skills a lot in the future.

Spencer Kleeh:

I helped Brendan with the programming, specifically creating the header file and the getters & setters that went with it. I also programmed the grid size and the for loops that would run through the grid and updated when the fire has been transmitted from cell to cell. Overall the experience allowed me to refine my object oriented programming and helped my skills working in a team as well.

Aaliyah Loechner:

Personally I helped work out the details surrounding how to code the weights of the parameters as well as how to have the code determine where the fire would move after the random numbers had been given. I helped decide how to account for the wind as well as how to indicate where the fire had been previously. I also helped determine how we could use a case structure to move the fire through the grid.

The programming experience allowed me to work on my problem-solving skills and improve my skills in coding with grids and movement throughout grids. Additionally, I gained more experience programming with files as well as random number generation which may be helpful to know in the future.

The program in runtime can be seen below. Each of the text files are generated with random input which the algorithms use to determine movement.

```
Microsoft Visual Studio Debug Console

Please enter a file to store fuel content: Fuel.txt
Please enter a file to store slope values: Slope.txt
Please enter a file to store wind values: Wind.txt
TIME STAMP: 1
o o x y o o o o
o o o y y y o o
o o o y y x y o
o o o y o o y o
o x o x x y o y
o o x o y x o o
o o o y o y x o
o o o o o y x o
TIME STAMP: 2
o o x y o o o o
o o o y y y o o
o o o y y x y o
y y y y y y y o
o x y x x y o y
o o x y y x y y
o o y y y y x o
o o y y o y x y
TIME STAMP: 3
o o x y o o o o
o o o y y y o o
o o o y y x y o
y y y y y y y o
y x y x x y y y
o o x y y x y y
o o y y y y x o
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