CSC3002 2023 spring Assignment 6

Due 23:59, May 7, 2023

Problem 1 (Exercise 16.13, Points: 25)

Problem Description

Use the algorithm from section 16.5 to implement the `PriorityQueue` class so that it uses a heap as its underlying representation. To eliminate some of the complexity, feel free to use a vector instead of a dynamic array.

The `PriorityQueue` class includes these functions:

- The `enqueue` and `dequeue` functions to add and delete elements to/from the `PriorityQueue`.
- The `peek` and `peekPriority` functions to peek the value and priority, respectively.
- The `toString` method to convert the `PriorityQueue` into a printable `String`

Requirement Please complete functions in the file *p1PriorityQueue.cpp*. To implements some of these functions, you may need to complete the **TODO** parts in the functions `enqueueHeap`, `dequeueHeap`, `takesPriority` `swapHeapEntries` or `operator«`, but not required.

In & Out Statement

Your program receives two elements in one line, split by the space: a `string` value to be put into the `PriorityQueue` and the corresponding priority of this element. The priority can be any value that fit the type `double`.You are recommended to test this program using an input file.

- To input a text file:

```
p1.exe < in/p1.txt // for win user
./p1 < in/p1.txt // for Mac user
```

Functionalities of your implementation will be tested in the `main()` function, and you may see the file *out/p1.txt* for standard output.

About P1

- In all OJ test cases, neither the values nor the priorities will include the space character since it is regarded as a marker of input split.
- `vector` class used in this program is from C++ standard library, which is different from the `Vector` in the Stanford library. You may check here for the usage.

Problem 2 (Points: 25)

Part1:(Exercise 18.03)

Problem Description

Eliminate the recursion from the implementation of `depthFirstSearch` by using a stack to store the unexplored nodes. At the beginning of the algorithm, you simply push the starting node on the stack. Then, until the stack is empty, you repeat the following operations:

1. Pop the topmost node from the stack.
2. Visit that node.
3. Push its neighbors on the stack.

Requirement Please complete the function `dfs` in the file *p2Traverse.cpp* using `stack`.

Part2:(Exercise 18.04)

Problem Description

Finish the implementation of `BreadthFirstSearch`. Take your solution from the preceding exercise and replace the stack with a queue.

Requirement Please complete the function `bfs` in the file *p2Traverse.cpp* using `queue`.

In & Out Statement

Your program receives a file that depicts the connections among the nodes in the graph. You are recommended to test this program using an input file.

- To input a text file:

```
p2.exe < in/p2.txt // for win user
./p2 < in/p2.txt // for Mac user
```

Functionalities of your implementation will be tested in the `main()` function, and you may see the file *out/p2.txt* for standard output.

About P2

- `stack`, `queue` and `set` classes used in this program are from C++ standard library, which are different from the `Stack`, `Queue` and `Set` in the Stanford library. You may check queue document, stack document and set document for details.
- Make sure that you implement BFS via `queue` and DFS via `stack`, otherwise, your implementation will be deducted.

About this assignment

- You don't need to modify or submit any other files other than `p1PriorityQueue.cpp` and `p2Traverse.cpp`.
- Submission to OJ platform is required, while submission to Blackboard again is not necessary.
- You can only view your pre-test scores and such scores do NOT equal to your final score. Pre-test cases take up 20-40% cases of the final test (also known as formal test) cases in this assignment. The formal test will be conducted after the assignment. Your final score will ONLY depend on the codes in your latest submission.
- If you are late, 5 points will be deducted from each missing problem immediately after 00:00, and 5 points more every hour afterward until no more points can be deducted.