

lab 11: Queues

Instructions: Implement a Queue with whatever data structure you desire. Remember you may use code from a previous lab (*hint* *hint*).

In your lab finish the implementation of a Queue:

```
1
2 #ifndef QUEUE_H
3 #define QUEUE_H
4
5 template<class T>
6 class Queue {
7     private:
8         /* Class to implement.*/
9     public:
10         /* Empty constructor shall create an empty Queue! */
11         Queue();
12         /* Do a deep copy of queue into the this.
13          * Note: This one uses a reference to a Queue!
14          */
15         Queue(const Queue<T> &queue);
16         /* Deconstructor shall free up memory */
17         ~Queue();
18         /* Return the current length (number of items) in the queue */
19         int getLength() const;
20         /* Returns true if the queue is empty. */
21         bool isEmpty() const;
22         /* Print out the Queue */
23         void print() const;
24         /* Pushes the val to the end of the queue. */
25         bool push(const T &val);
26         /* returns the first element from the queue. */
27         T& first();
28         /* Removes the first element from the queue. */
29         void pop();
30         /* Returns if the two queues contain the same elements in the
31          * same order.
32          */
33         bool operator==(const Queue<T> &queue) const;
34         /* Add a value to the queue with respect to priority.
35          * For this function a lower number is a higher priority.
36          * EX: If the Queue is of integers and is { 5, 10, 15} and I add 7,
37          * the new queue is { 5, 7, 10, 15}.
38          */
39         void addWithPriority(const T& val);
```

```

40  /* Return the length of the shortest path, but with warps. The map is
41  * a 2D array with each cell having the following property
42  * 0: Cell is open (passable)
43  * -1: Cell is a wall (impassable)
44  * > 0: Cell is a warp.
45  * A warp is a value > 999 and warps to the position
46  * (<first three digits, second three digits).
47  * Hence 1000 warps to (1, 0), and 203109 warps to (203, 109)
48  * To get the x value: <cell>/1000
49  * To get the y value: <cell>%1000
50  * Note: Taking a warp costs 1.
51  */
52  int getShortestPathWithWarps(int **map, int width, int length, int sx, int sy,
53                               int ex, int ey);
54 };
55
56 #include "queue.cpp"
57
58 #endif

```

STL:

You may use vector, string, and list from the STL.

Write some test cases:

Create some test cases, using cxxtestgen, that you believe would cover all aspects of your code.

Memory Management:

Now that are using new, we must ensure that there is a corresponding delete to free the memory. Ensure there are no memory leaks in your code! Please run Valgrind on your tests to ensure no memory leaks!

How to turn in:

Turn in via GitHub. Ensure the file(s) are in your directory and then:

- \$ git add <files>
- \$ git commit
- \$ git push

Due Date: September 28, 2020 2359

Teamwork: No teamwork, your work must be your own.