

Assignment 5

Heaps

This assignment helps to reinforce your understanding of heaps.

Implement the following 3 methods in file [HeapPriorityQueue.java](#). Submit only file HeapPriorityQueue.java.

- `upheapRec(j)`: moves the entry at index `j` higher, if necessary, to restore the heap property. Use **recursion**. Do not use any kind of loop. (A non-recursive version of upheap percolation is given in the same file.)
- `downheapRec(j)`: moves the entry at index `j` lower, if necessary, to restore the heap property. Use **recursion**. Do not use any kind of loop. (A non-recursive version of downheap percolation is given in the same file.)
- `updateKey(currentKey, newKey)`: searches the heap for an entry with key `currentKey`; returns `-1` if the key is not found. Otherwise, it updates the key to the new value `newKey`. If the heap property is violated by this update, it moves the entry up or down the heap until the heap property is restored, and returns the index of the array cell where the updated entry is now stored. You may use loops in this method. It does not have to be recursive.

Use the main program [testProgram.java](#) to test your code. Here is the [expected output](#).

Download all the files in [this directory/folder](#) to your computer, including HeapPriorityQueue.java and testProgram.java. To compile all the files, simply issue the command:
`javac testProgram.java`

To run the main program, issue the command:
`java testProgram`

Notes

- Do not modify the given interface, class and method definitions and implementations.
 - Do not add packages to the submitted Java file.
 - The input data given in the above main program are only examples for your testing. We will use different data sets to grade your implementations.
 - Assume that all inputs are valid and distinct (no duplicate keys). Each heap entry stores a key (e.g., your student ID) and an object (e.g., your personal information). We use integer keys in this assignment, and are not concerned about the values of the associated objects/records.
 - Do not add any `System.out.print()` or `System.out.println()` to your code. We will redirect the output to a text file and parse the text when marking your program.
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