COSC 311   FALL 2016   Programming Project #2

Distributed: 11/21/2016   **Due**: 12/5/2016

Problem statement: Design and run experiments that support or disprove the statement, "The maximum age of an element in a priority queue has O(n) behavior."

Problem approach: Run several priority queues where you insert n elements followed by deleting all the elements. Each run, determine the maximum age of the elements in the heap. You will need to do this for several different randomly generated data sequences and for several different values of n.

Give the data and draw plots showing the maximum age as a function of n.

Referring to your results, make an argument that supports or disproves the statement.

Sanity checks:
To lend confidence in your results, run your experiment on the following three data sequences (for different sizes of n):

{1, 1, 1, 1, 1, …}

{1, 2, 3, 4, 5, …}

{n, n-1, n-2, … 3, 2, 1}

Why is the answer you obtain for each of your sanity checks reasonable?

Correctness check:
Run your experiment once on this data set (to confirm correctness of code):
5, 3, 5, 3, 1, 2, 3, 4, 6, 3, 7, 1, 2

Write-up
Your write-up must contain the following, CLEARLY LABELLED AND IN THE FOLLOWING ORDER:
1. Sanity checks, showing input and output
2. Correctness check,showing input and output
3. Table showing inputs and outputs for your experimental runs
4. Plot to visualize 3.
5. Statement justifying your choices of n. (Why is your number of n values acceptable? Why are your actual n values acceptable?)
6. Statement justifying your choice of data type/range. (Why is your choice of type acceptable? Why is it better or the same as a different choice? E.g., if you chose any int value, why is that better or the same as if you choose any int in the range [0 .. 9])
7. Write-up on why the sanity check results are reasonable.
8. Write-up on why your results support or disprove the statement regarding O(n) behavior for maximum age.

Turn in:

Hardcopy of code
Hardcopy of run on correctness test (this can be included in # 2 above)
Write-up
UML

Grade based on:
— Correctness of code, satisfying spec, write-up, experimental design 85%
— Readability, elegance, documentation 15%
— Illogical thinking/choice of design will cause loss of points.