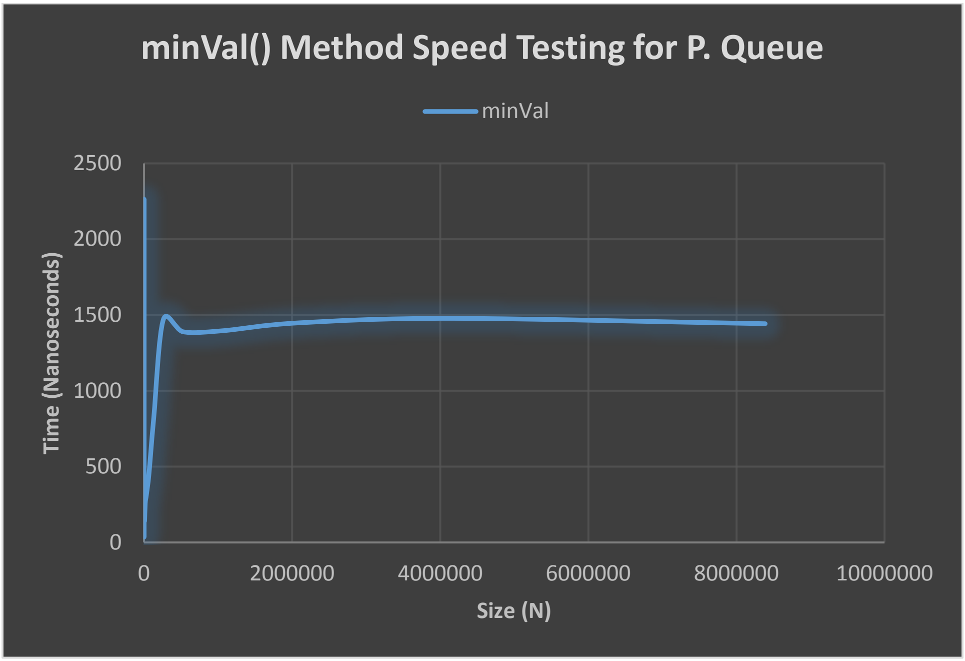
Assignment 11: Binary Heaps

Analysis Document by Jacob Brown

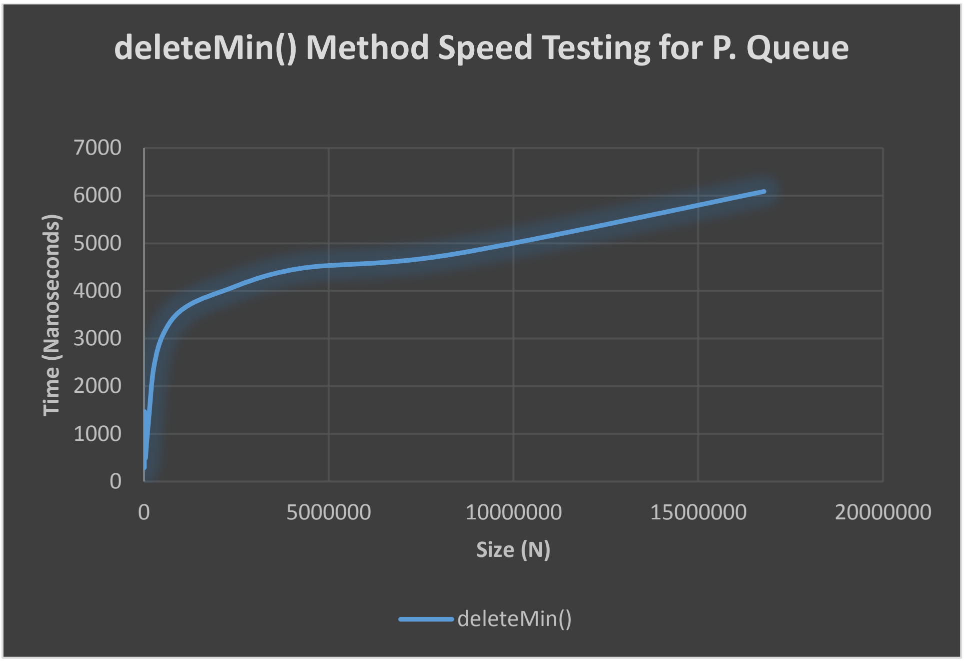
1.

The graph below is a speed test involving minVal().



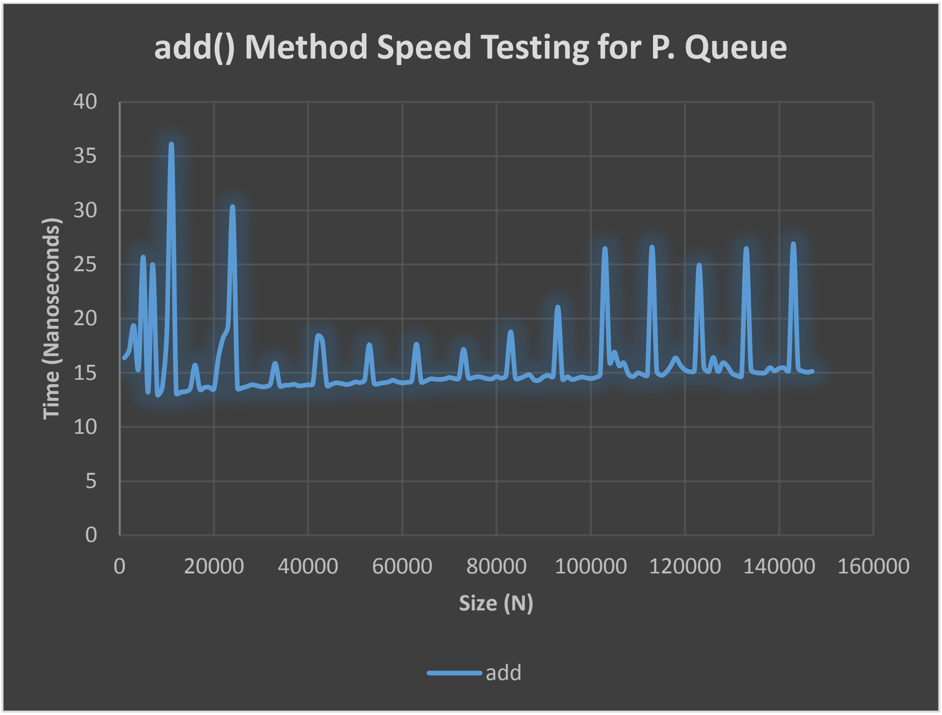
As you can see by the graph, as the size of the queue grows to a very large number, the run time is constant when checking the minimum value of a randomly generated queue. minVal() is simply the accessing of an array at index 0. O (C) is the complexity needed and that's what we got.

The graph below is a speed test involving deleteMin().



As you can see from you the graph of deleteMin() above, the complexity is O (log(N)) which is what is expected from a priority queue. The experiment deletes the minimum value of a randomly generated priority queue and then measures how much time is taken for percolation to occur.

The graph below is a speed test involving add().



With this test (The graph above) I ran the add() method and averaged the tests by doing 5,000,000 loops with each size of set to generate a very precise average for each size N. As we can see from the graph we are getting a constant time since the numbers being added are random and is unlikely to be the lowest value, we are to expect a constant complexity of O (c).

2.

From the experiments executed, we see:

minVal() is O (c), since it is accessing a known index in an array.

deleteMin() is O (log(N)), since on average values need to percolate down log N times.

add() is O (c), since the average case according to course material percolates upwards on average about 2.6 which is constant time since an average case of adding is rarely going to be the lowest value in a queue.

3.

Apart from being a very efficient data structure, a priority queue (min-max) does just that – Allows in constant time for us to know what has the highest and lowest priority. You could use a priority queue for anything that requires knowledge of the least and greatest priority. If a military general wanted to code a program which ranked the priority of military targets which should be attacked next, he could code a program which estimated the priority of attack for each military target and keep track of the target with the greatest priority and least.

4.

6 hours.