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CS 2420

Assignment 3 Analysis Document

1. Who is your programming partner? Which of you submitted the source code of your program?

Kenny Ho is my programming partner.
I, Michelle Nguyen, submitted the source code of our program.

2. How often did you and your programming partner switch roles? Would you have preferred to switch less/more often? Why or why not?

Every half hour or so; I would prefer to switch less often because I don't think half an hour is long enough to get comfortable in the role before having to switch again.

3. Evaluate your programming partner. Do you plan to work with this person again?

Kenny is a good partner. I feel like he and I are on the same level when it comes to programming knowledge and skill, therefore we work well together. We are also both very chill when it comes to assignments therefore I did not feel rushed or panicked to do the assignment, which I like. I do plan to work with him again.

4. If you had backed the sorted set with a Java List instead of a basic array, summarize the main points in which your implementation would have differed. Do you expect that using a Java List would have more or less efficient and why? (Consider efficiency both in running time and in program development time.)

- When we constructed the set, without using an array, if we used a dynamic list such as ArrayList, we would not have to initialize the starting size.
- ArrayLists are dynamic, therefore they can add and remove elements without having to worry about us having to manually shift elements, therefore our implementation would differ because we wouldn't have to worry about shifting elements up and down in the array anymore
- LinkedLists allow users to add to positions other than the end, if we use the binarySearch method to discover where to insert the element, we could just add it at the specified index, without having to resort the whole set.
- Lists have iterator support, therefore we would not have had to implement our own iterator.
- Java Lists also already have the ability to add and remove objects via their included methods, so we wouldn't have had to implement those methods for the array.

I think using Java List would be more efficient both in running time and program development time. Program development time would be decreased due to less time put into implementing Java List's provided methods. In addition, running time would be reduced because less time would be spent shifting elements left and right.

5. What do you expect the Big-O behavior of MySortedSet's contains method to be and why?

The Big-O behavior of MySortedSet's contains method is O(logN) because it uses binarySearch, which is O(logN). Binary search has logarithmic growth rate because since you're halfing your set size every time, you always have something as log based 2 N.

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6. Plot the running time of MySortedSet's contains method for sets of sizes 100000 to 2000000 by steps of 100000. Use the timing techniques demonstrated in Lab 1. Be sure to choose a large enough value of timesToLoop to get a reasonable average of running times. Include your plot in your analysis document. Does the growth rate of these running times match the Big-oh behavior you predicted in question 5?
Yes, it does.

7. Consider your add method. For an element not already contained in the set, how long does it take to locate the correct position at which to insert the element? Create a plot of running times. Pay close attention to the problem size for which you are collecting running times. Beware that if you simply add N items, the size of the sorted set is always changing. A good strategy is to fill a sorted set with N items and time how long it takes to add one additional item. To do this repeatedly (i.e., timesToLoop), remove the item and add it again, being careful not to include the time required to call remove() in your total. In the worst-case, how much time does it take to locate the position to add an element (give your answer using Big-oh)?
Worst-case running time is O(log N).

8. How many hours did you spend on this assignment?
~ 15-20 hours