Long Project 3 Report

CS 6301.011

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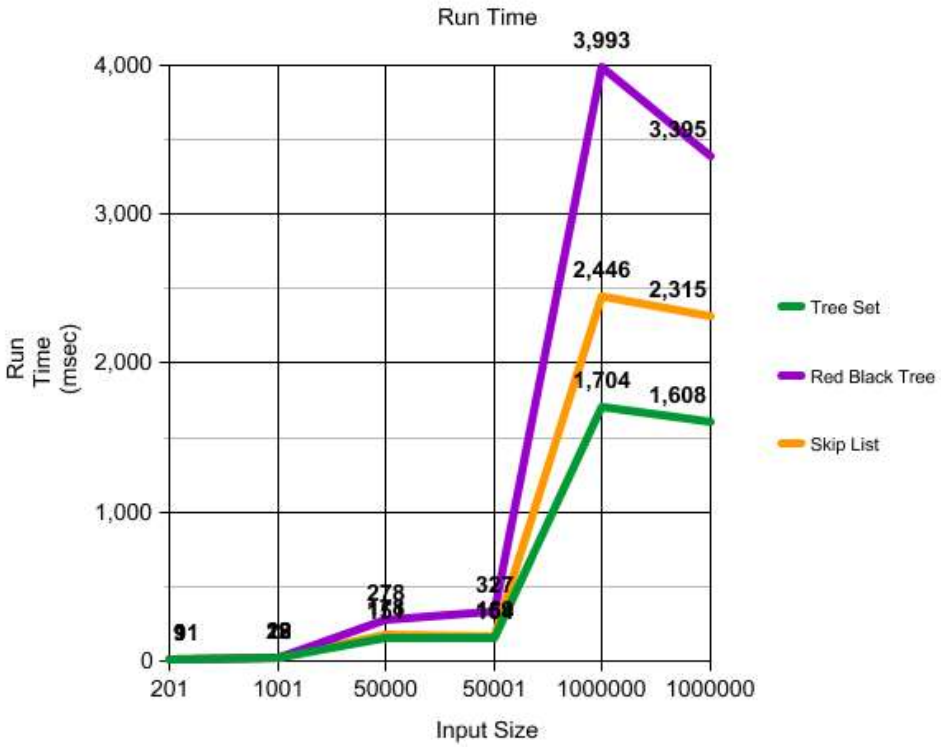
This report provides details on run time of our implementation of Red-Black Tree, Skip List, and also compares its performance with Java's TreeSet.

We ran our program on test cases provided for LP-3 as well as random numbers of size 4M, 6M, etc.

Below table shows performance on test cases provided for LP-3.

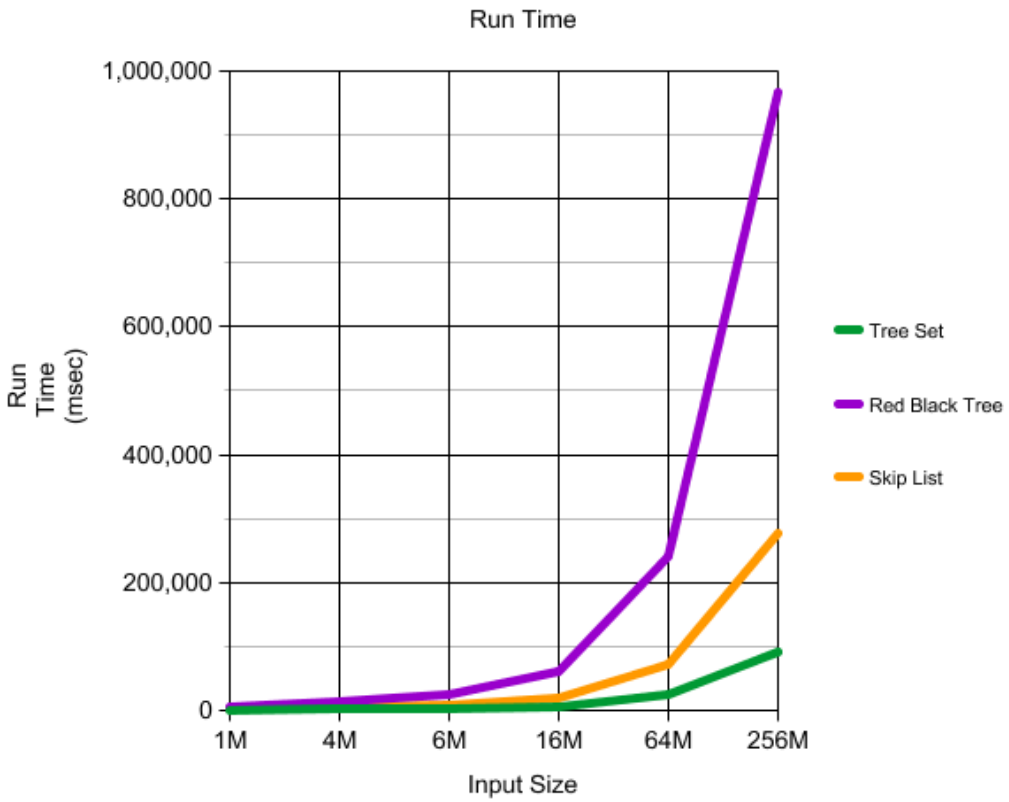
No of Operations	**TreeSet**	**Red-Black Tree**	**Skip List**
201 (sk-t01)	Time: 9 msec. Memory: 3 MB / 256 MB.	Time: 11 msec. Memory: 3 MB / 256 MB.	Time: 9 msec. Memory: 3 MB / 256 MB.
50001 (sk-t02)	Time: 154 msec. Memory: 35 MB / 256 MB.	Time: 327 msec. Memory: 142 MB / 256 MB.	Time: 169 msec. Memory: 43 MB / 256 MB.
1000000 (sk-t03)	Time: 1704 msec. Memory: 41 MB / 587 MB.	Time: 3993 msec. Memory: 282 MB / 593 MB.	Time: 2446 msec. Memory: 105 MB / 679 MB.
1001 (sk-t11)	Time: 18 msec. Memory: 4 MB / 256 MB.	Time: 22 msec. Memory: 5 MB / 256 MB.	Time: 19 msec. Memory: 4 MB / 256 MB.
50000 (sk-t12)	Time: 151 msec. Memory: 33 MB / 256 MB.	Time: 278 msec. Memory: 117 MB / 256 MB.	Time: 178 msec. Memory: 38 MB / 256 MB.
1000000 (sk-t13)	Time: 1608 msec. Memory: 60 MB / 564 MB.	Time: 3395 msec. Memory: 112 MB / 531 MB.	Time: 2315 msec. Memory: 177 MB / 1159 MB.



The above graph plots the run time of all three algorithms against the test-cases provided. As we can see, Tree Set clearly is the most efficient algorithm.

Below table shows performance of both algorithms on random numbers.

No of Operations	**TreeSet**	**Red-Black Tree**	**Skip List**
1M	Time: 682 msec. Memory: 44 MB / 256 MB.	Time: 4913 msec. Memory: 249 MB / 444 MB.	Time: 1781 msec. Memory: 69 MB / 406 MB.
4M	Time: 1922 msec. Memory: 102 MB / 256 MB.	Time: 15209 msec. Memory: 200 MB / 444 MB.	Time: 5315 msec. Memory: 106 MB / 350 MB.
6M	Time: 2615 msec. Memory: 107 MB / 256 MB.	Time: 24616 msec. Memory: 269 MB / 444 MB.	Time: 7829 msec. Memory: 159 MB / 320 MB.
16M	Time: 6600 msec. Memory: 199 MB / 264 MB.	Time: 60197 msec. Memory: 364 MB / 450 MB.	Time: 18775 msec. Memory: 182 MB / 345 MB.
64M	Time: 23955 msec. Memory: 590 MB / 832 MB.	Time: 239825 msec. Memory: 713 MB / 845 MB.	Time: 70765 msec. Memory: 696 MB / 905 MB.
256M	Time: 90332 msec. Memory: 2553 MB / 3275 MB.	Time: 966584 msec. Memory: 2136 MB / 3290 MB.	Time: 277356 msec. Memory: 2472 MB / 3335 MB.



The above graph plots the run time of all three algorithms against the millions of random number generated. As we can see, Tree Set is the most efficient.