LP-3 Report

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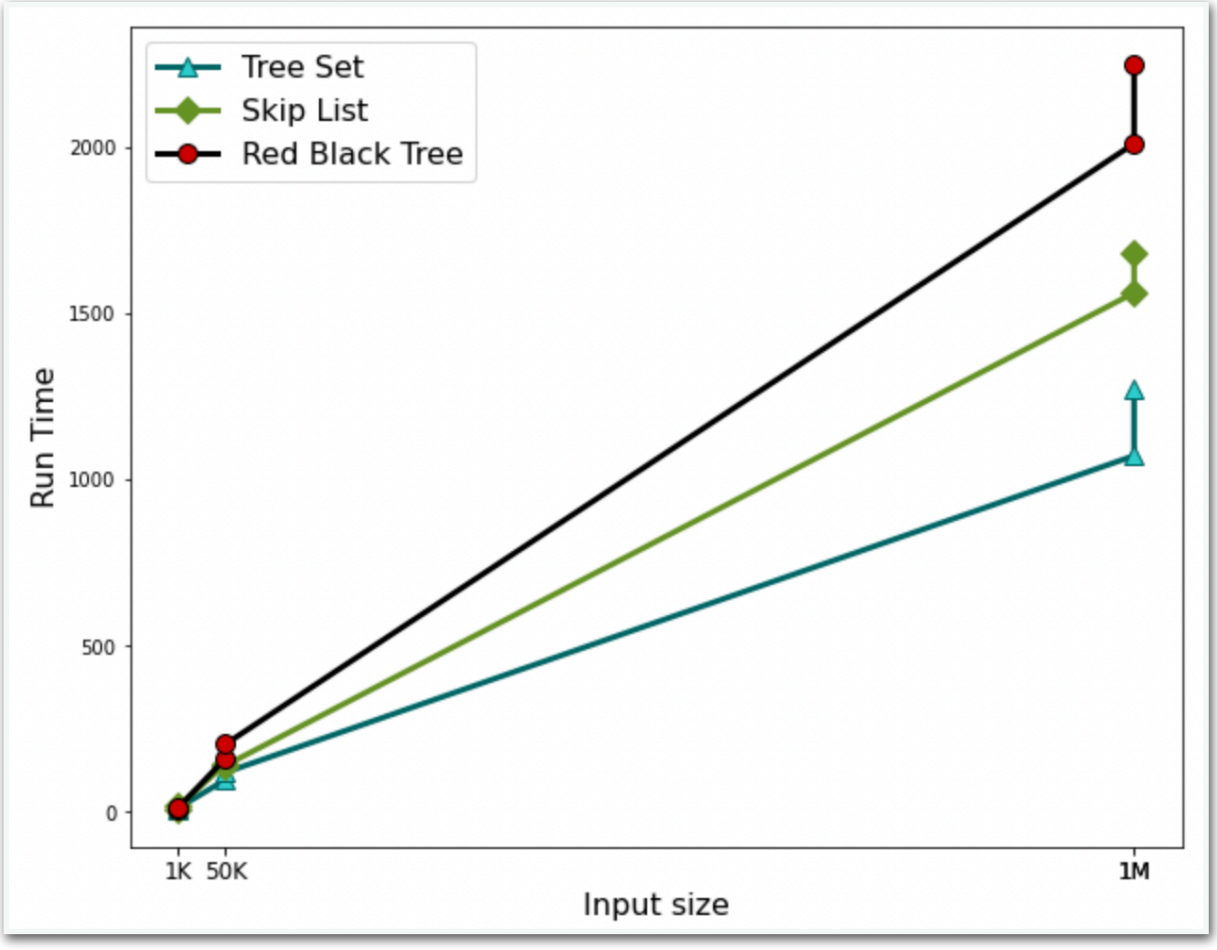
This report collates and evaluates the run time of our implementation of Red-Black Tree and Skip List. The two implementation performances are also compared with Java's TreeSet.

The table below shows the performance evaluation for all the three trees based on the test cases provided for LP-3.

LP3 Test Cases

No. Of Operations	Tree Set		Skip List		Red-Black Tree	
	Time	Memory	Time	Memory	Time	Memory
201 (sk-t01)	9 msec	3 MB / 128 MB	8 msec	3 MB / 128 MB	8 msec	3 MB / 128 MB
50001 (sk-t02)	119 msec	8 MB / 128 MB	140 msec	16 MB / 128 MB	204 msec	40 MB / 128 MB
1000000 (sk-t03)	1272 msec	125 MB / 375 MB	1684 msec	210 MB / 128 MB	2251 msec	96 MB / 548 MB
1001 (sk-t11)	13 msec	4 MB / 128 MB	18 msec	4 MB / 128 MB	14 msec	5 MB / 128 MB
50000 (sk-t12)	97 msec	4 MB / 128 MB	144 msec	9 MB / 128 MB	161 msec	16 MB / 128 MB
1000000 (sk-t13)	1072 msec	239 MB / 394 MB	1562 msec	63 MB / 128 MB	2011 msec	30 MB / 588 MB

The graph here shows the run time of the three tree algorithms against the inputs provided in the test cases. It clearly shows that Tree Set's algorithm is the most efficient, followed by Skip List and the least efficient among the three being Red-Black tree.



The table below shows the performance evaluation for all the three trees based on random numbers.

Tests based on Random numbers

No. Of Operations	Tree Set		Skip List		Red-Black Tree	
	Time	Memory	Time	Memory	Time	Memory
1M	390 msec	58 MB / 128 MB	1198 msec	90 MB / 190 MB	3187 msec	39 MB / 460 MB
4M	1260 msec	88 MB / 128 MB	3847 msec	53 MB / 168 MB	10307 msec	148 MB / 416 MB
8M	2444 msec	81 MB / 375 MB	6542 msec	112 MB / 201 MB	19697 msec	248 MB / 367 MB
16M	4711 msec	198 MB / 229 MB	13789 msec	193 MB / 267 MB	38019 msec	244 MB / 445 MB
32M	9002 msec	325 MB / 432 MB	25342 msec	264 MB / 472 MB	75543 msec	294 MB / 489 MB
64M	18116 msec	734 MB / 837 MB	49408 msec	772 MB / 870 MB	150957 msec	737 MB / 842 MB
128M	36096 msec	1142 MB / 1654 MB	99074 msec	1145 MB / 1687 MB	301165 msec	1308 MB / 1665 MB
256M	75845 msec	1994 MB / 2048 MB	247233 msec	1995 MB / 2048 MB	727006 msec	2036 MB / 2048 MB

The graph here shows the run time of the three tree algorithms against the inputs provided by random number generator. Similar to the efficiency from the test cases, Tree set is the most efficient when using larger inputs as well.