Lab 2 Report | xuej41 | 400515671

Question 1

Minimum lengths of snake for a non-zero computation time measurement:

objPosArrayList: More than 10

objPosDLinkedList: More than 10

objPosSLinkedList: More than 10

Question 2

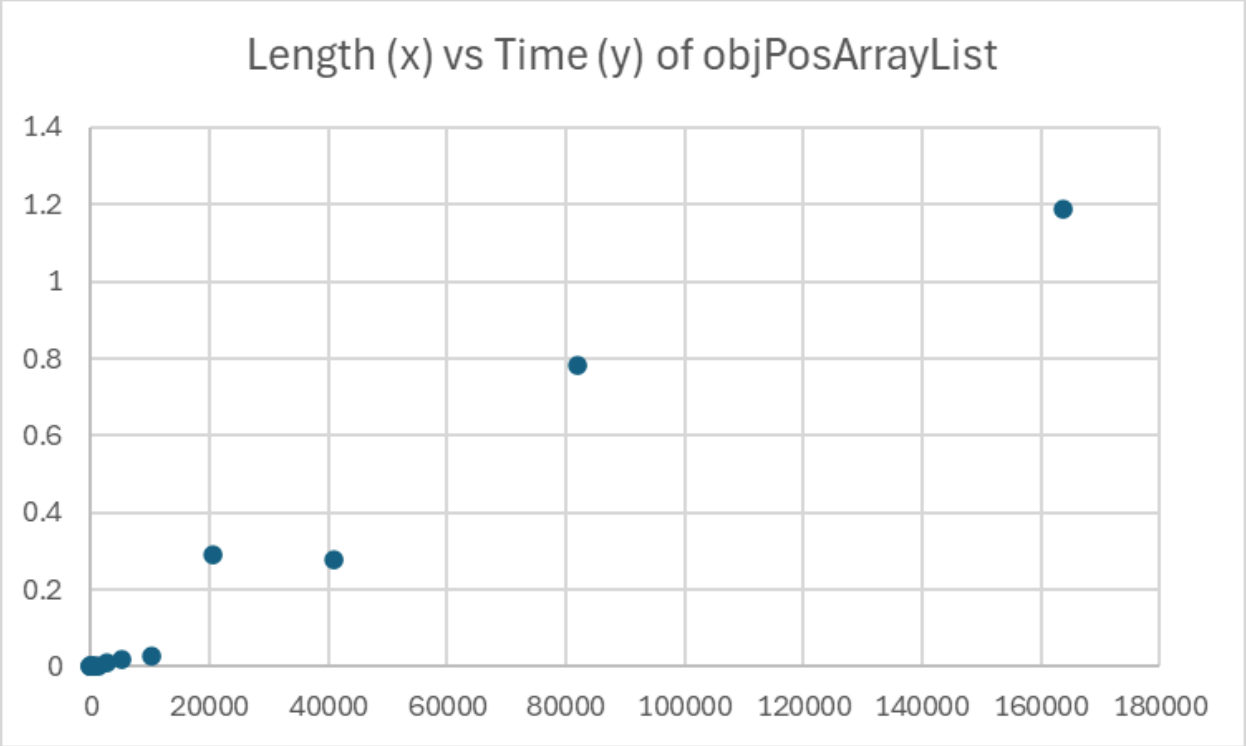
Yes, I can confirm that objPosArrayList::insetHead() has a time complexity of Θ(n), and that objPosDLinkedList and objPosSLinkedList have a time complexity of Θ(1).

Here is the table of the time measurements:

Array List		D Linked List		S Linked List	
Length	Time (ms)	Length	Time (ms)	Length	Time (ms)
10	0	10	0	10	0
20	0	20	0	20	0
40	0	40	0	40	0.00292
80	0	80	0	80	0
160	0	160	0	160	0
320	0	320	0.00522727	320	0
640	0	640	0	640	0.00225
1280	0	1280	0.00222619	1280	0
2560	0.011357	2560	0	2560	0
5120	0.020465	5120	0	5120	0
10240	0.029127	10240	0.00676543	10240	0
20480	0.292831	20480	0.00959722	20480	0
40960	0.279667	40960	0	40960	0.009011

81920	0.783773	81920	0	81920	0
163840	1.187761	163840	0.00819672	163840	0

And here is a plot of the graph for objPosArrayList:



As you can see by the tables and the graph, objPosArrayList has a confirmed time complexity of Θ(n) while the linked lists have a time complexity of Θ(1).

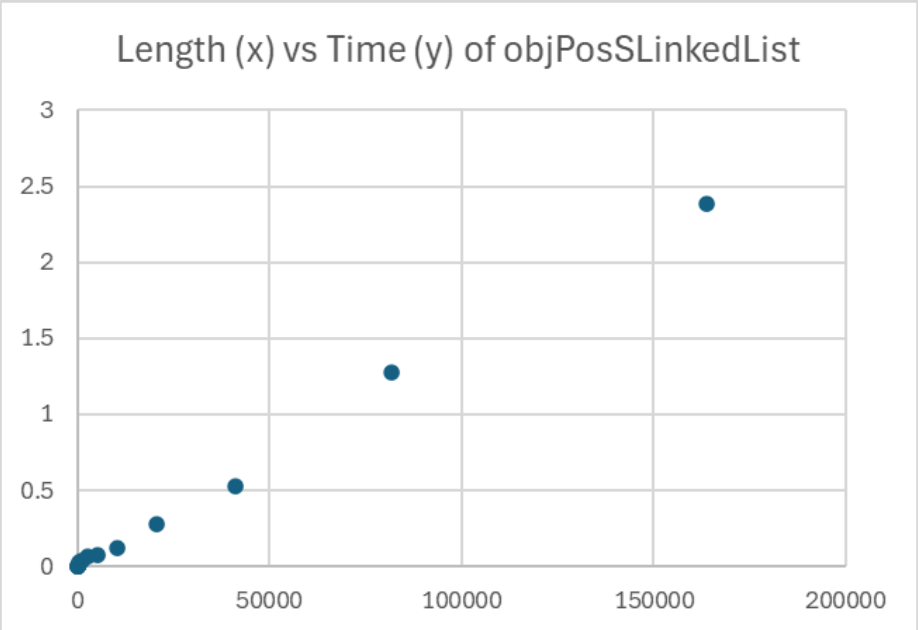
Question 3

Here is the table of measurements for the removeTail() function:

Array List		D Linked List		S Linked List	
Length	Time (ms)	Length	Time (ms)	Length	Time (ms)
10	0	10	0	10	0
20	0	20	0	20	0

40	0.002335	40	0	40	0.002924
80	0	80	0	80	0
160	0	160	0.000453	160	0
320	0	320	0	320	0.015669
640	0	640	0	640	0.028045
1280	0	1280	0	1280	0.035994
2560	0	2560	0.002313	2560	0.065218
5120	0	5120	0	5120	0.071534
10240	0.000812	10240	0	10240	0.124684
20480	0	20480	0.002217	20480	0.275329
40960	0	40960	0	40960	0.525739
81920	0	81920	0	81920	1.278602
163840	0	163840	0.003225	163840	2.385732

Here is the graph for objPosSLinkedList:



As shown by the graph and table of time measurements, it is confirmed that for the removeTail() function, objPosDLinkedList and objPosArrayList have a time complexity of Θ(1), while objPosSLinkedList has a time complexity of Θ(n).

Question 4

I did not notice a length at which objPosDLinkedList or objPosSLinkedList noticeably outperform objPosArrayList for the insertHead() function.

The same can be said for the removeTail() function. The delayConst constant in GameMechs limits the speed of everything so that a difference could not be noticed. Even if the delayConst could be removed, I would not notice a difference. At a length of 8120 or 163840, the maximum time delay for each cycle would be around 1-2 ms, which is way too small to notice. The length of the snake would have to be much larger for there to be any noticeable difference.