Renjun Zheng Report Programming Assignment 1

02/18/2014

1. For sequence of k, the time complexity is O((logn)^2). The space complexity is also of O((logn)^2).
   I take the log3 of Size, and use two for loop with every one of them have iterate for log3 of Size times, so the total time complexity is O((logn)^2). I have malloc (logSize)^2 of memory to store the sequence.

2. Tabulation

Number of Input method	Number of Comparisons	Number of Moves	I/O Time	Sorting Time
10i	3.900000e+01	5.300000e+01	0.000000e+00	0.000000e+00
10s	1.500000e+02	1.650000e+02	0.000000e+00	0.000000e+00
1000i	2.909600e+04	3.446100e+04	0.000000e+00	0.000000e+00
1000s	1.491481e+06	8.393700e+04	0.000000e+00	0.000000e+00
10000i	4.857450e+05	5.619710e+05	0.000000e+00	0.000000e+00
10000s	1.496496e+08	1.349892e+06	0.000000e+00	2.800000e-01
100000i	7.250792e+06	8.283011e+06	3.000000e-02	4.000000e-02
100000s	1.498876e+10	1.979982e+07	4.000000e-02	2.812000e+01
1000000i	1.007193e+08	1.140415e+08	3.800000e-01	5.400000e-01
1000000s	Unavailable	Unavailable	Unavailable	Unavailable

The I/O time should be the basically same for both shell_insertion sort and shell_selection sort. The reason is they are getting same amount of input and saving same amount of output.

The sorting time for insertion sort is O(n*(logn)^2), basically satisfy the sorting time shown in the table. The number of comparison and moves should have same complexity as the time complexity

The sorting time for selection sort is O(n^2*(logn)^2),basically satisfy the sorting time shown in the table. The number of comparison and moves should have same complexity as the time complexity. The reason that selection sort cannot produce the result is too much comparison included. Every time it will go over the whole array to find the place to swap the value

3. The space complexity for the insertion sort is O(1). Because the variable in the insertion sort part are same regardless the size of the array.
   The space complexity for the selection sort is also O(1). No additional memory required for the sorting.