BLG 335E

ANALYSIS OF ALGORITHMS I

CRN: 10825

REPORT OF HOMEWORK #1

Submission Date: 22.10.2013

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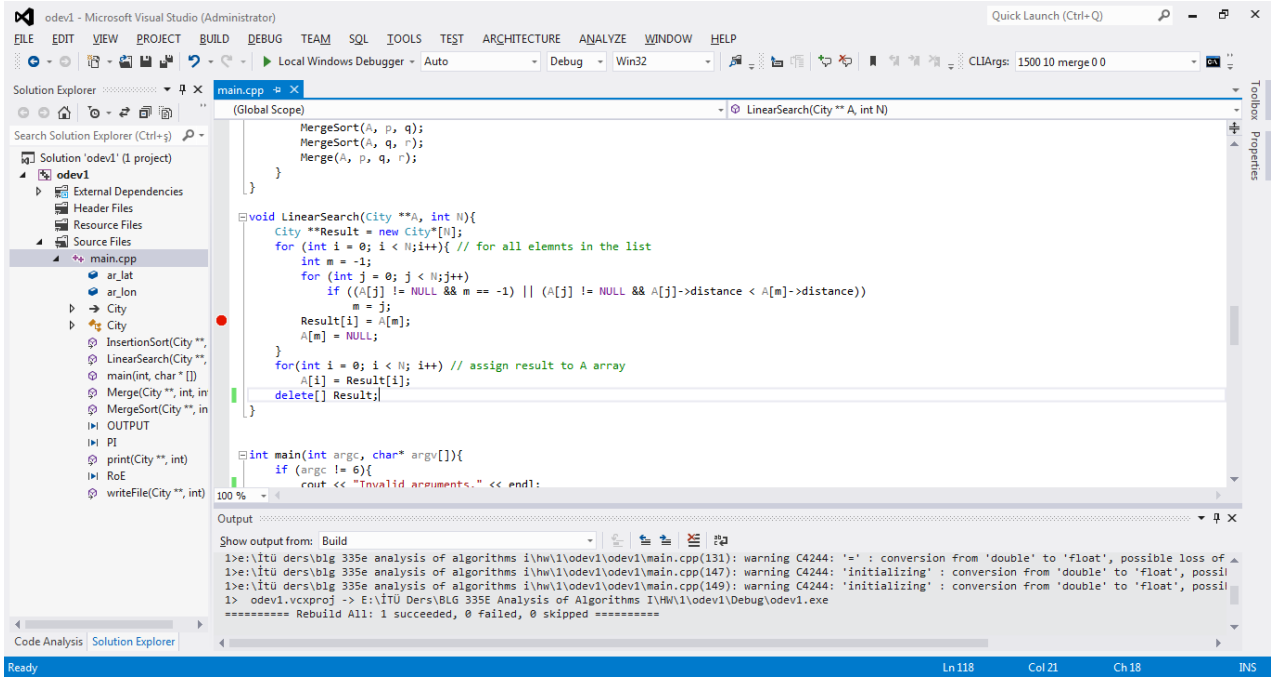
1. Introduction

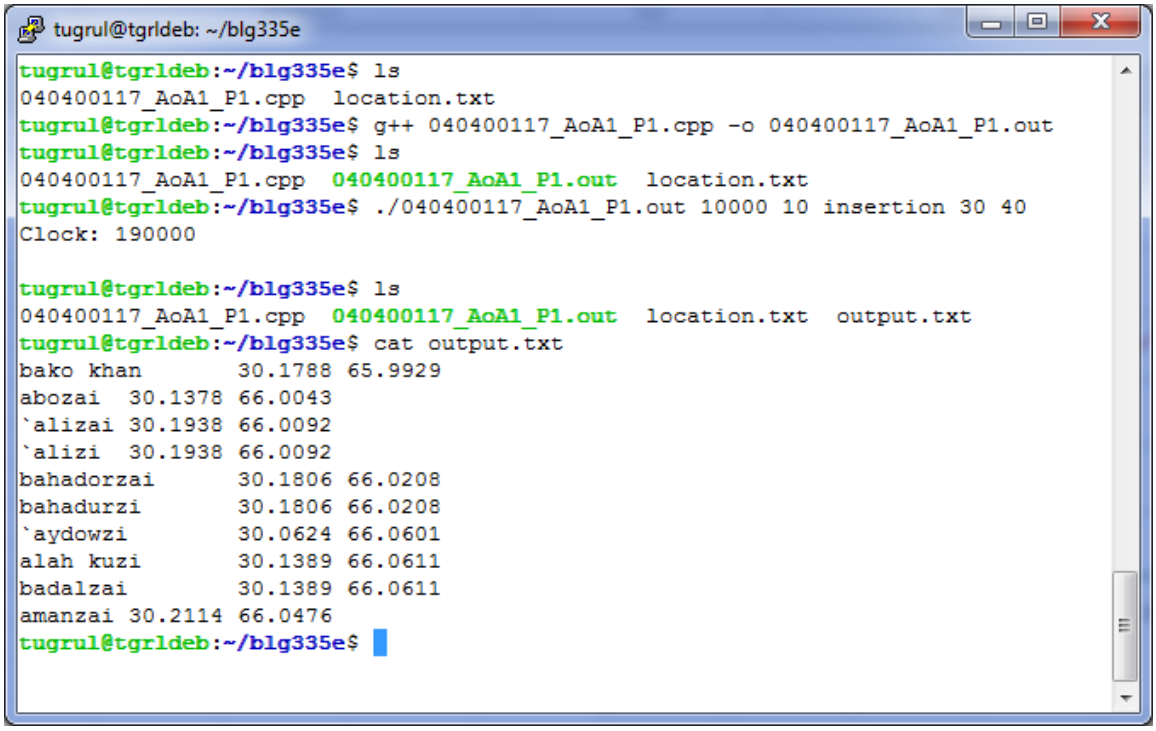
In this project, we will find closest K locations among N locations to a given location considering their coordinates on earth.

2. Development and Operating Environments

Microsoft Visual C++ 2012 environment has been used to write the source code in Windows 7 operation system and GNU g++ compiler has been used for compiling under Debian 7 operation system.



The program built and compiled without any warning or error under g++. Finally the program is executed. Sample outcome is below:



```
tugrul@tgrldeb: ~/blg335e
tugrul@tgrldeb:~/blg335e$ ls
040400117_AoA1_P1.cpp  location.txt
tugrul@tgrldeb:~/blg335e$ g++ 040400117_AoA1_P1.cpp -o 040400117_AoA1_P1.out
tugrul@tgrldeb:~/blg335e$ ls
040400117_AoA1_P1.cpp  040400117_AoA1_P1.out  location.txt
tugrul@tgrldeb:~/blg335e$ ./040400117_AoA1_P1.out 10000 10 insertion 30 40
Clock: 190000

tugrul@tgrldeb:~/blg335e$ ls
040400117_AoA1_P1.cpp  040400117_AoA1_P1.out  location.txt  output.txt
tugrul@tgrldeb:~/blg335e$ cat output.txt
bako khan       30.1788 65.9929
abozai  30.1378 66.0043
`alizai 30.1938 66.0092
`alizi  30.1938 66.0092
bahadorzai      30.1806 66.0208
bahadurzi       30.1806 66.0208
`aydowzi        30.0624 66.0601
alah kuzi       30.1389 66.0611
badalzai        30.1389 66.0611
amanzai 30.2114 66.0476
tugrul@tgrldeb:~/blg335e$
```

3. Data Structures and Variables

The program takes 5 command line arguments. Example:

./040100117_AoA1_P1 **N K algorithmType latitude longitude**

algorithmType variables can be {“**insertion**”, “**merge**” or “**linear**”}

N, K, latitude and **longitude** variables can be integer value.

Example use of the program:

```
./040100117_AoA_P1 1000 10 insertion 30 40
```

4. Analysis

Running time of sorting functions according to K and N numbers are shown below in tables:

merge		K			
		1	2	10	N/2
N	10	0	0	0	0
	100	0	0	0	0
	1000	1	1	1	1
	10000	10	10	10	10
	100000	103	102	102	103
	1000000	1140	1150	1129	1138

insertion		K			
		1	2	10	N/2
N	10	0	0	0	0
	100	0	0	0	0
	1000	2	2	2	2
	10000	108	109	109	108
	100000	6886	6768	6811	6848
	1000000	∞	∞	∞	∞

linear		K			
		1	2	10	N/2
N	10	0	0	0	0
	100	0	0	0	0
	1000	0	0	0	3
	10000	0	0	0	296
	100000	1	2	8	38480
	1000000	9	18	82	∞

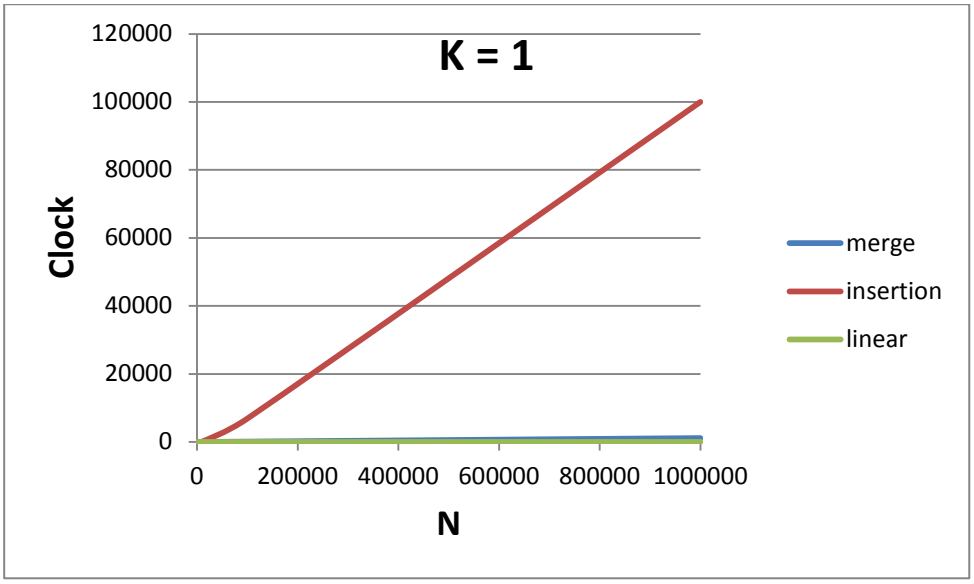
N is number of the element to be sorted and K is number of the element to demanded. As seen by the tables K does not effect on merge and insertion sorting, but K can effects only when linear sorting.

Merge sort is faster than insertion sort for N > 1000. After 1000, merge sort is becomes faster. Linear sort is handy only when K is very small or N is smaller than 1000.

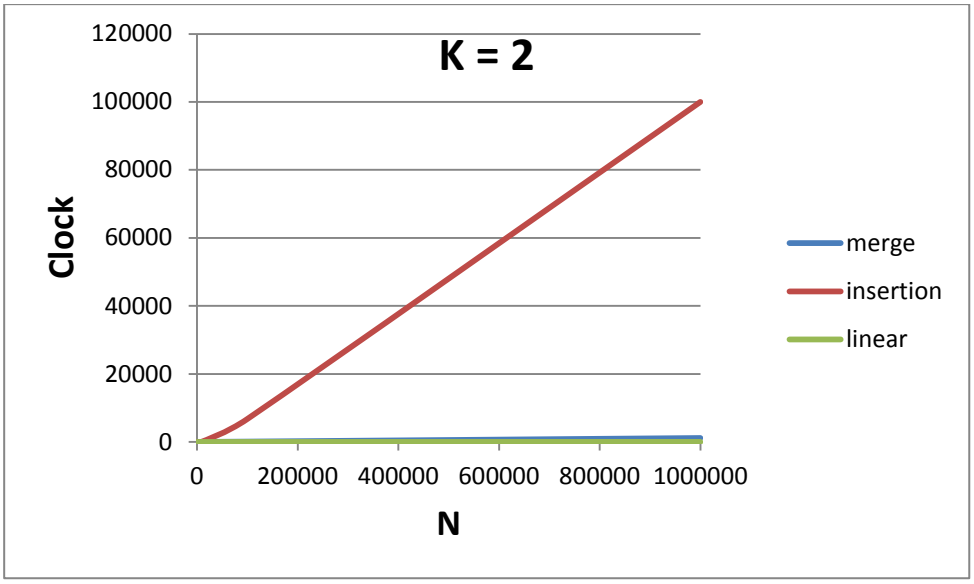
Related graphs according to N and clock numbers for all three sorting algorithms separately for K numbers are shown below.

Note: For clarity of graph, I choose very large number (Ex:1000000) for ∞ when drawing graph. ∞ indicates that program takes very long time to execute or it cannot give any result in reasonable time.

We can investigate the graphs that; if we chose time functions of merge sort is m(n), insertion sort is i(n) and linear sort is l(n)



m(n) = O(l(n)) = O(i(n))



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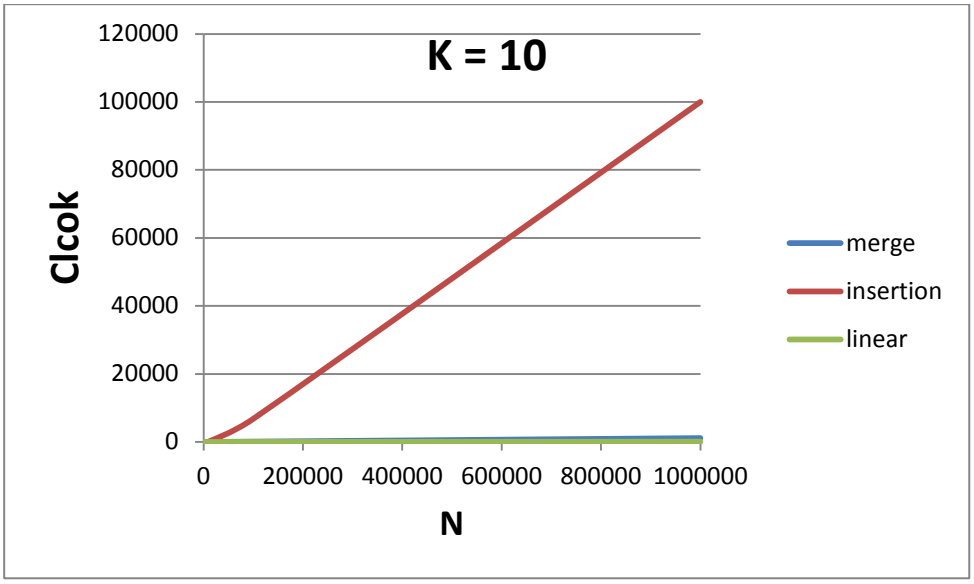
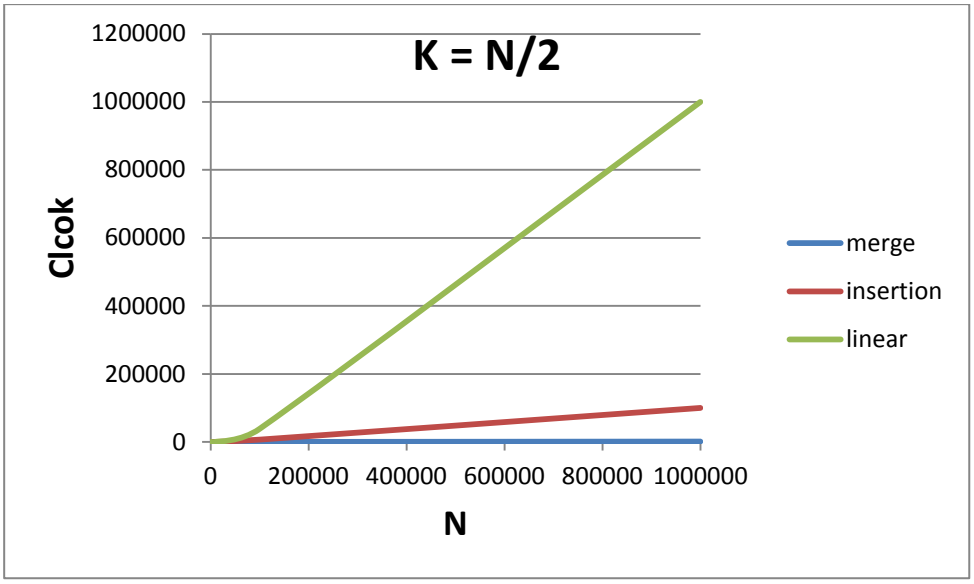


m(n) = O(l(n)) = O(i(n))



m(n) = O(i(n)) = O(l(n))

5. Conclusion

In this homework, I have become more familiar with the concept of analysis of algorithms. I had the chance to intensify my knowledge about instructing good and efficient algorithms.