Indian Institute of Engineering Science and Technology, Shibpur

Department of Information Technology

6th Semester, 2019 (HX & HY)

Assignment 2: Sorting

1. Study of basic sorting algorithms: Implement following sorting algorithms. Randomly synthesize a number of lists of records, and then test all of these algorithms with same set of data. Take *n* (size of input) at least as 10^5, and use a single processor to run your programs. Now observe the time taken by each of your programs for each list of records, and compare the times. Finally comment on the complexities of these algorithms.
    i. Straight Selection Sort
    ii. Straight Insertion Sort
    iii. Bubble Sort

2. Observe the improvements in terms of time complexity if the above algorithms are replaced by (Two-way) Merge Sort and Heapsort. You also compare these two algorithms with each other using the setting stated in Assignment 1. You are strictly asked to follow the steps of the algorithms, and not to use recursion in the implementations. And, also comment on the time complexities of the algorithms. In the report, you also put comments on the space complexities of these two algorithms.

3. Implement the standard version of Quicksort algorithm. Experiment the algorithm with a number of randomly synthesized lists of records. Is its time complexity *O(n log n)*? Justify your answer by experimental results. Now select the *pivot* elements randomly (instead of choosing any specific element, such as first element of the list as *pivot*), and observe the change of time requirements, if any. Is the time complexity again *O(n log n)*? Discuss.