

NPTEL MOOC, JAN-FEB 2015
Week 2, Module 9

DESIGN AND ANALYSIS OF ALGORITHMS

Sorting: Concluding remarks

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Stable sorting

- * Sorting on multiple criteria
- * Assume students are listed in alphabetical order
- * Now sort students by marks
 - * After sorting, are students with equal marks still in alphabetical order?
- * Stability is crucial in applications like spreadsheets
 - * Sorting column B should not disturb previous sort on column A

Stable sorting ...

- * Quicksort, as shown, is not stable
 - * Swap operation during partitioning disturbs original order
- * Merge sort is stable if we merge carefully
 - * Do not allow elements from right to overtake elements from left
 - * Favour left list when breaking ties

Other criteria

- * Minimize data movement
- * Imagine values are heavy cartons
- * Want to reduce effort of moving values around

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Which is the best?

- * Typically Quicksort
 - * Be careful to avoid worst-case
 - * Randomize choice of pivot element
- * Mergesort is used for “external” sorting
 - * Database tables do not fit in memory
 - * Need to sort on disk

Which is the best?

- * Other $O(n \log n)$ algorithms exist
 - * Heap sort
- * Naive $O(n^2)$ not used except when data is small
- * Hybrid algorithms
 - * Use divide and conquer for large n
 - * Switch to insertion sort when n small (e.g. $n < 16$)