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

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)