TA: Jade Cheng
ICS 311
Quiz Solution #2
Jan 28, 2008

Quiz #2

What are the best, average, and worst case Θ complexity of bubble sort? Justify your answers [4 pts]

Answer:

a) Average – $\Theta(n2)$ - For i from 1 to $n-1$, each pass through the array requires I comparisons (0 to i swaps). Each pass is $O(n)$. Depending on the disorder of the array, this can require up to $n-1$ passes. On average, there will be $n-k$ passes necessary. Resulting in $O(n)$ passes. $\Theta\ (n)\ *\ \Theta\ (n)\ =\ \Theta(n2)$

b) Best – $\Theta(n)$. The best case for bubble sort is if the array is already sorted. During the first pass, if there are no swaps (because it's sorted), then bubble sort terminates after 1 pass of n-1 comparisons, which is$\Theta\ (n)$.

c) Worst - $\Theta(n2)$ – Worst case is that $n-1$ passes are necessary to sort the array (if the number at the right end is the smallest, it only moves one position during each passm resulting in the $n-1$ passes. One value, the highest (lowest) is guaranteed to move from the unsorted part of the array to the sorted part.

Circle all sort algorithms below that are stable [3 pts]

Answer:

Bubble sort	⇒	Stable
Insertion sort	⇒	Stable
Merge sort	⇒	Stable

Quicksort	⇒	Not Stable
Selection sort	⇒	Stable
Shell sort	⇒	Not Stable

Stable means that items with the same value remain in the same order as in the input. Both Quicksort and Shell sort move items over others without comparing the items in between, meaning the order is not guaranteed to be the same. Bubble, Insertion, Merge, and Selection sorts are all stable.

Explain/justify at least 3 advantages and/or disadvantages of using arrays vs. linked lists for sorting (related to complexity analysis [3 pts]

Answer:

1. Advantage – direct access (speed)

2. Advantage – storage for pointers is not needed – saves space

3. Disadvantage –, reaching the lowest leaves is only log n if the tree is balanced. For a skew tree, the depth is n. This is the reason heapsort keeps the tree. balanced.